Morphing Wing for Trucks: Greater Stability in Cornering

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The following scientific research seeks to determine through computational analysis and experimental tests; which is the best angle of attack to achieve greater stability of a truck of an inverted NACA 2412 Morphing Wing when cornering. The hypothesis establishes that when designing an inverted NACA 2412 Morphing Wing, and being adjusted to an angle of attack of 60°, it will reach its optimal condition for the increase of downforce; therefore, improving the stability and efficiency of the truck during cornering. The research consists of three parts. In the first part, a computational design was created and behavioral simulations were conducted which allowed to obtain more accurate data for the wing design. Then, the inverted NACA 2412 Morphing Wing prototype was built. To validate the results obtained by computational analysis, experimental tests were carried out using the prototype. In conclusion, after performing two sections of five tests using different positions of the angle; it was determined that the best angle of attack is between 55º and 60º producing a downforce near the 33% of the truck mass; using less air resistance. However, between 55 º to 60 º there is a 0.3% of downforce difference because it depends on atmospheric conditions. It was determined that there is a stability increase of 3% to 4%, having a 1.3% difference in real scale truck when compared to the proportion of the speed prototype. These results will be of great benefit to implement in any design of morphing wings for greater stability in trucks.

Awards Won:
Arconic Foundation: Sustainable Design In Transportation, Second Award $1,500