AN AERODYNAMIC PERFORMANCE OF MAV WINGS

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DECLARATION

"I, Nik Muhammad Muzammil Bin Nik Mustapa declared that I am the sole author of this thesis. I also declare that neither any part of this thesis nor the whole of the thesis has been submitted or published for a degree at UiTM or other institutions."

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ABSTRACT

There are four common Low Reynolds Number wing's designs for fixed wing Micro Air Vehicle (MAV) which known as Rectangular, Zimmerman, Inverse Zimmerman and Ellipse wing. However, these four types of wing's design may produce different aerodynamic performance and also the comparison study among the wings is still lack. Thus, the objective of this study is to compare the aerodynamic performance of each wing's designs in order to find the optimal wing shape for Micro Air Vehicle. All four of wing's designs have undergone a FSI computational fluid analysis by using ANSYS-CFX software in order to find the wing's aerodynamic performances. The results shows that at stall angle, the Ellipse wing has the maximum lift coefficient ($C_{L_{max}}$) value recorded at 1.12 which is at least 4.33% higher than the rest of wing's designs. Based on drag coefficient (C_D) analysis, the Inverse Zimmerman Wing exhibited the lowest drag value at 0.033 which is 8.45% lower than the other wing's designs. For moment coefficient analysis, the Inverse Zimmerman Wing has produced the steepest curve slope value at -0.36 which is 17.39% higher than the other three wing's designs. This result has indicated that Inverse Zimmerman wing potentially has more stability than the other wing. Aerodynamic efficiency (C_L/C_D) study has also revealed that Zimmerman Wing recorded the highest C_L/C_D value at 6.80 and at least 1.35% higher than to the other wing. In conclusion, Zimmerman wing has the highest potential to be adopted as MAV wing due to its optimal aerodynamic efficiency.

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