

STUDI KOMPARASI PERFORMA AERODINAMIKA TERHADAP PENAMBAHAN STRUKTUR *WINGLET* PADA SAYAP PUNA KARGO

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ABSTRAK

Rancangan awal sayap Pesawat Udara Nir Awak (PUNA) atau yang dikenal dengan *Unmanned Aerial Vehicle (UAV)* kargo dibuat tanpa dilengkapi dengan struktur *winglet*. Spesifikasi dan kemampuan terbang PUNA kargo memungkinkan terjadinya *induced drag* yang diakibatkan oleh *vortex* pada bagian sayap saat beroperasi. Salah satu upaya untuk mengatasi *vortex* ini adalah dengan melakukan penambahan struktur *winglet*. Pada pengembangan pertama sayap PUNA kargo dilakukan penambahan struktur *whitcomb winglet* yang mendapatkan hasil kurang maksimal. Pada pengembangan kedua melalui penelitian ini dilakukan dengan melakukan perbandingan performa aerodinamika pada variasi model sayap PUNA kargo tanpa *winglet*, dengan penambahan *whitcomb winglet* dan *blended winglet*.

Penelitian ini dilakukan menggunakan metode simulasi *Computational Fluid Dynamics 3D* melalui *software Ansys fluent* dan didukung oleh *software Solidworks 2018*. Simulasi dilakukan pada sayap PUNA kargo yang memiliki bentuk dasar *airfoil NACA 23018*. Pengaturan parameter simulasi dilakukan mendekati sesuai dengan kondisi asli pada ketinggian 20.000 *feet*. *Output* dari simulasi ini adalah nilai *coefficient of lift*, *coefficient of drag*, kontur *streamline* dan *vortex region*. Hasil penelitian sayap PUNA kargo menunjukkan bahwa penambahan jenis *blended winglet* meningkatkan performa aerodinamika sayap sebesar 7,40%, sedangkan penambahan *whitcomb winglet* menurunkan performa sayap hingga -18,18%.

Kata kunci: *computational fluid dynamic, angle of attack, PUNA, winglet*

COMPARATIVE STUDY OF AERODYNAMIC PERFORMANCE ON THE ADDITIONAL WINGLET STRUCTURE AT UAV CARGO WING

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ABSTRACT

The initial design of the UAV cargo wing was made without being equipped with a winglet structure. The specifications and flight capabilities of UAV cargo allow for induced drag generated by the vortex on the wing during operation. One of the efforts to overcome this vortex is to add winglet structures. In the first development of the UAV cargo wing, the addition of a whit comb winglet structure was carried out which generated in less optimal results. In the second development, this research was carried out by comparing aerodynamic performance on variations of the UAV cargo wing model without winglets, with the addition of whit comb winglets and blended winglets.

This research was conducted using the Computational Fluid Dynamic 3D simulation method through the fluent Ansys software and also supported by Solidworks 2018. The simulation was carried out on the UAV cargo wing which has the basic shape of the NACA 23018 airfoil. The simulation parameter settings were carried out close to the original conditions at an altitude of 20,000 feet. The output of this simulation was the value of the lift coefficient, drag coefficient, streamlined contour and vortex region. The results of the UAV cargo wing research showed that the addition of the blended winglet increased the wing's aerodynamic performance by 7.40%, while the addition of the whit comb winglet decreased the wing's performance by -18.18%.

Keywords: *computational fluid dynamic, angle of attack, UAV, winglet*

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