

ANALISIS AERODINAMIKA PADA AIRFOIL NACA M15 DENGAN PARAMETER *GROUND EFFECT* MENGGUNAKAN *SOFTWARE* BERBASIS *COMPUTATIONAL FLUID DYNAMICS*

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ABSTRAK

Sebagai negara kepulauan, Indonesia memiliki permasalahan krusial mengenai aspek transportasi antar pulau yang penting dikaji. *Wing-in-ground (WIG) craft* merupakan satu solusi sistem transportasi penghubung antar pulau karena memiliki mobilitas yang lebih baik dari kapal dan operasional yang lebih murah dari pesawat. Sehingga, kajian mengenai performa *WIG craft* perlu dilakukan untuk mengetahui aspek kecocokan implementasi *WIG craft*.

Pada penelitian ini dikaji pengaruh perubahan *angle of attack* terhadap ketinggian *WIG craft* pada airfoil M15. Kajian berbasis komputasi dinamika dilakukan untuk mendapatkan hasil nilai dari ketinggian dan *angle of attack* yang divariasikan. Parameter variasi ketinggian yang dikaji pada rentang $0,5c$ hingga unbound dengan variasi *angle of attack* sebesar 0° hingga 18° . Kecepatan udara diatur pada 28 m/s dan panjang *chord(c)* 1 m . Pendekatan turbulente berbasis S-A dipilih dalam observasi aliran turbulen pada airfoil. Selanjutnya, validasi dan grid study juga dilakukan untuk memastikan keabsahan hasil dari penelitian ini.

Dari hasil validasi dengan eksperimen didapatkan *error* sebesar $24,92\%$ dan $3,00\%$ untuk CL dan CD pada jumlah mesh paling optimum sebesar 311121 . Pada variasi sudut serang didapatkan nilai CL paling tinggi pada sudut serang 16° dan di ketinggian unbound. Hasil tersebut jika dibandingkan dengan nilai CL pada $0,05c$, memiliki penurunan nilai CL sebesar $52,03\%$. Di sisi lain, nilai CD terendah didapatkan pada sudut serang 2° di ketinggian unbound. Jika dibandingkan dengan kondisi pada $0,05c$, nilai CD mengalami penurunan sebesar $15,06\%$. Hasil penelitian ini memiliki kesesuaian dengan penelitian-penelitian sebelumnya. Terlebih, penelitian ini ke depan akan bermanfaat dalam pertimbangan perancangan dan pemilihan airfoil pada *WIG-craft*.

Kata kunci: *ground effect*, NACA M15, *coefficient of lift*, *coefficient of drag*, *computational fluid dynamics*

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COMPUTATIONAL FLUID DYNAMICS**

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ABSTRACT

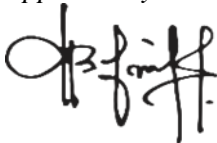
As an archipelagic country, Indonesia has crucial problems regarding aspects of inter-island transportation that are important to study. Wing-in-ground (WIG) craft is a solution to the inter-island transportation system because it has better mobility than ships and is cheaper to operate than planes. Thus, a study on the performance of the WIG craft needs to be carried out to determine the suitability aspect of the implementation of the WIG craft.

In this study, the effect of changing the angle of attack on the height of the WIG craft on the M15 airfoil was examined. Computational dynamics-based studies were carried out to obtain results where the values of the height and angle of attack were varied. The altitude variation parameter that was studied was in the range of $0.5c$ to unbound where the variation in angle of attack was 0° to 18° . Airspeed was set to 28 m/s and chord(c) length of 1 m. The S-A based turbulent approach was chosen in the observation of turbulent flow in the airfoil. Furthermore, validation and grid study were also conducted to ensure the validity of the results of this study.

From the experimental validation results, the error was 24.92% and 3.00% for CL and CD at the most optimum number of mesh, namely 311121. In the variation of the angle of attack, the highest CL value was obtained at the angle of attack of 16° and at the height of unbound. As for these results, when compared with the CL value at $0.05c$, the CL value decreased by 52.03%. On the other hand, the lowest CD value was found at an angle of attack of 2° at the unbound height. When compared to the condition at $0.05c$, the CD value decreased by 15.06%. The results of this study were in agreement with previous studies. Moreover, this research in the future will be useful in considering the design and selection of airfoils on WIG-craft.

Keyword: *ground effect, NACA M15, coefficient of lift, coefficient of drag, computational fluid dynamics*

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