بسم الله الرحمن الرحيم

تم رفع هذه الرسالة بواسطة / سلوي محمود عقل

بقسم التوثيق الإلكتروني بمركز الشبكات وتكنولوجيا المعلومات دون أدنى

مسئولية عن محتوى هذه الرسالة.

ملاحظات: لا يوجد
ACTIVE CONTROL OF TURBULENT FLOW SEPARATION OVER A FLAPPED AIRFOIL USING FLUIDIC OSCILLATOR

By

Ashraf Kassem Attaalla Kassem

A Thesis Submitted to the Faculty of Engineering at Cairo University in Partial Fulfillment of the Requirements for the Degree of

MASTER OF SCIENCE in Aerospace Engineering

FACULTY OF ENGINEERING, CAIRO UNIVERSITY GIZA, EGYPT 2022
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FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
2022
Title of Thesis:

Active Control of Turbulent Flow Separation over a Flapped Airfoil Using Fluidic Oscillator

Key Words:

Flow over a Flapped Airfoil; Fluidic Oscillator; Flow Separation Control; URANS; \( k-\omega \) SST Turbulence Modeling

Summary:

Flow detachment from lifted bodies like airfoils causes a remarkable decrease in its aerodynamic performance. Therefore, the current work aims to recover the performance by considering a fluidic oscillator device that adds momentum energy near the separation zone to recover the separated boundary layer. Since the flow is turbulent, RANS modeling was used, and the problem was simulated using OpenFOAM software. Validation is an essential step to select the adequate turbulence model to detect separation by comparing the results with experimental and numerical published work. Actuation parameters were investigated to optimize the performance.
Disclaimer

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute.

I further declare that I have appropriately acknowledged all sources used and have cited them in the references section.

Name: Ashraf Kassem Attaalla Kassem Date: / / 2022

Signature:
Acknowledgment

First of all, great thanks to Allah Almighty who supported and guided me all the way and blessed me with all of his blessings.

No words can describe the massive role and support from my supervisors, Prof. Dr. Mohammed Madbouli and Assoc. Prof. Dr. Amr Guaily. They aided and advised me all the way with guidance. They continuously offered their time and knowledge with deep forbearance.

My Family is the final key to my work puzzle. They gave me all kinds of moral support to make it done. I give my gratitude to all of my family members.

Finally, I wish to express my full gratitude to all whose supported me with any kind of support and help to produce the current work.
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