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国際会議名

AIAA AVIATION Forum 2021

会議主催国と会議の開催日程：

USA, August 2-6, 2021 (online)

発表タイトルと著者

“An Optimization Study of Strake Implementation on a Spaceplane”

Muhammad Hilmi Al Fatih, Koji Shimoyama, Kazumasa Kamisori

1. 研究発表の内容

Takeoff and landing performance is vital to realize a reusable spaceplane. One way to improve it is by taking advantage of the generated vortex flow above the wing. This effect can be strengthened by introducing aerodynamic devices such as strake. This study addresses a single-objective and two-objectives optimization problem of implementing strake to a base spaceplane configuration. A family of strake shapes is explored to find the optimum design with the assist of Bayesian optimization and Kriging surrogate modeling. The strake shape is parameterized by B-Spline, width, and the upstream starting point of the strake. The optimum results exhibit a promising aerodynamic performance at several flow conditions. The optimum shape that maximizes lift at subsonic is characterized by a leading-edge having a concave curvature in the first half and smoothly turn into a convex curvature before it merges with the main wing leading-edge. It successfully delays the stall onset as well as improves the lift in general.

2. 今回の出張・発表で学んだこと

The conference is held online this time due to covid situation. Regardless, there are still a lot of things to prepare. From the manuscript preparation to conform to the standard of the conference paper, as well as preparing the slides and presentation video. In many cases, our time is devoted a lot on presentation practice to make the presentation duration as accurate as possible. However, in this case, it is a little bit easier as we can adjust easily.

In terms of the conference itself, I gained a lot of insights, especially related to my study. There are still many things that seemed to be far from my field, but turned out to be pretty close and related. I also got to learn the updates from other researchers about the research direction of my current field. Beside attending my own session, I attended several plenary lectures to gain a wider insight about aviation in general. One side note that makes it less fun is the fact that it is held online, I could not get an opportunity to talk and chat directly with other researchers. Also, the time difference makes me feeling not so good as I was lacking sleep, thus I could not devote myself to attend all sessions. As for my presentation, I got several questions regarding the method I am using in my study. It was a nice discussion.

3. 本プログラムへの感想

To be honest, I never knew if this program exists. Fortunately, my supervisor recommended me for this award. I am really happy for that, especially for the chance that I can participate in my dream

conference with full support from IFS. I hope this program would be advertised more so to attract many students to take part in this program.

4. 指導教員所見

まず、コロナ禍で様々な制約がある中で、研究のモチベーションを失うことなく、国際会議発表にふさわしい研究成果を揃えることができた頑張り进行评估したい。会議はオンライン開催のため、発表自体は事前収録であったが、それを視た世界中の研究者から多くの質問を頂戴し、滞りなく質疑に対応することができた。今回の経験を糧にして、本研究の更なる発展を期待している。

5. 発表時の写真など

The image shows a video presentation slide and a Zoom meeting grid. The slide, titled "An Optimization Study of Strake Implementation on a Spaceplane", lists the authors: Muhammad Hilmi Al Fatih, Koji Shimoyama, and Kazumasa Kamisori. It also mentions the Institute of Fluid Science, Tohoku University, and the Department of Aerospace Engineering, Tohoku University. The presentation was given at PD Aerospace during AIAA Aviation on 05 Aug 2021. The copyright is attributed to Muhammad Hilmi Al Fatih, published by the American Institute of Aeronautics and Astronautics, Inc., with permission.

The Zoom meeting grid shows several participants, including:

- Leifur Thor Leifsson
- Muhammad Hilmi Al Fatih
- Toru Akhuni
- David Rodriguez
- Ramiz Anwar Khan
- Wei Liao
- Boris Diskin
- Rei Yamashita
- Yusuf Demiroglu
- Jon C
- michael
- Marshall C. Galbraith
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- Melissa Carter
- Christopher Chi...
- Andreas Lucius