Delft University of Technology
Faculty of Aerospace Engineering
Department of Aerospace Structures and Materials
P.O. Box 5058 | 2600 GB Delft | The Netherlands

Announcement of the position for a PhD student (m/f/d, full-time) on

"Load alleviation by unconventional use of control surfaces"

(starting January 1st, 2023 – temporary position for four years)

Background

A significant reduction in greenhouse gas emissions is required to achieve ambitious climate protection targets, also for future aircraft. One promising approach is the alleviation of aerodynamic loads acting on the aircraft's wings, enabling radical mass reduction of the wing primary structures and, directly and through secondary effects, also a reduction of overall aircraft mass. This leads to reduced energy consumption and emissions. Previous research in the Cluster of Excellence SE²A (Sustainable and Energy-Efficient Aviation) and at Delft University of Technology focused on active and passive concepts that can contribute to alleviating manoeuvre and dynamic loads. However, a realizable holistic load alleviation concept should combine both active and passive load alleviation concepts in a suitable manner in order to realize a maximum and efficient load reduction. Such a holistic concept, as shown in the Figure 1, is to be investigated in the upcoming research project "Hybrid load alleviation by fluidic/reversed control and nonlinear structures (HyCoNoS)".

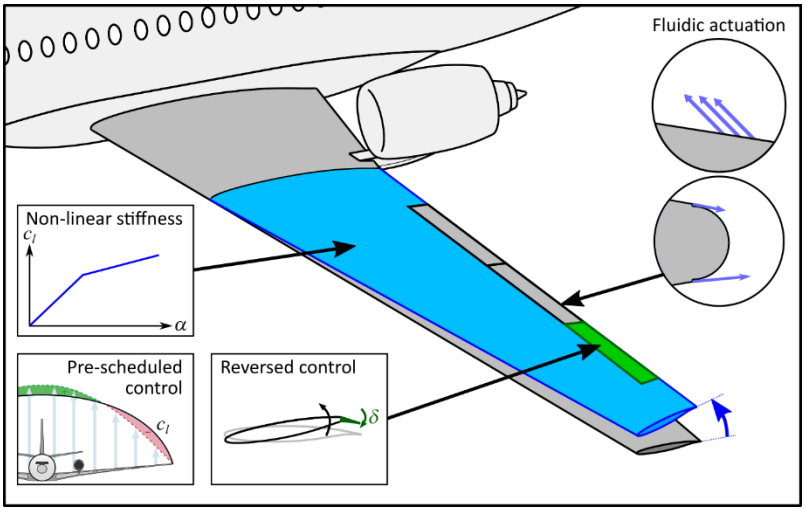

Figure 1: Holistic load alleviation concept

Task description

The announced position is located at the Aerospace Structures and Materials department of the Faculty of Aerospace Engineering, Delft University of Technology. This part of the HyCoNoS research project focuses on the application of prescheduled (un)conventional control surfaces in aeroelastically reversed mode to gust and manoeuvre load alleviation to derive a wing design which is partially sized by 1g loads instead of the usual load cases required by the certification authorities. Such a wing design should demonstrate a significant mass savings in the primary structure of the wing leading to significant reduction of greenhouse gas emissions.

In the first phase, a low-fidelity aeroelastic framework called Proteus, developed at TU Delft, will be used to perform a control surface topology layout study and optimization will be carried out to maximize the control authority in reversed control mode and ensure sufficient manoeuvrability on the wing level when certain control surfaces switch from normal to reversed mode.

In the second phase, synergies between the proposed load alleviation technologies within the entire HyCoNoS project . Depending on the identified synergies, dedicated models will be developed to re-evaluate the load alleviation capability of such a hybrid load alleviation approach. This part of research will be conducted in close collaboration with the other two PhD researchers working in the HyCoNoS project and other research groups of the SE²A cluster that focus on load control approaches, overall aircraft design and collaborative, multi-disciplinary system design.

TU Delft and Cluster of Excellence SE²A

Delft University of Technology is built on strong foundations. As creators of the world-famous Dutch waterworks and pioneers in biotech, TU Delft is a top international university combining science, engineering and design. It delivers world class results in education, research and innovation to address challenges in the areas of energy, climate, mobility, health and digital society. For generations, our engineers have proven to be entrepreneurial problem-solvers, both in business and in a social context.

The Faculty of Aerospace Engineering at Delft University of Technology is one of the world's most highly ranked (and most comprehensive) research, education and innovation communities devoted entirely to aerospace engineering. More than 200 science staff, around 250 PhD candidates and over 2,700 BSc and MSc students apply aerospace engineering disciplines to address the global societal challenges that threaten us today, climate change without doubt being the most important. Our focal subjects: sustainable aerospace, big data and artificial intelligence, bio-inspired engineering and smart instruments and systems. Working at the faculty means working together. With partners in other faculties, knowledge institutes, governments and industry, both aerospace and non-aerospace. Working in field labs and innovation hubs on our university campus and beyond.

TU Delft has joined forces with TU Braunschweig in Cluster of Excellence SE2A on Sustatainable and Energy-Efficient Aviation which was awarded to TU Braunschweig by the German Research Foundation (DFG) in 2019. The Cluster of Excellence SE²A is an interdisciplinary research centre with the purpose of investigating technologies for a sustainable and eco-friendly air transport system. Scientists from aerospace, electrical, energy and chemical engineering are working on the reduction of emissions and noise, as well as recycling and life-cycle concepts for airframes and improvements in air traffic management.

We seek candidates that have:

- received an above-average grade for their master degree in mechanical engineering, aerospace engineering, applied physics or a related field
- profound knowledge in aeroelasticity and ideally also in aerodynamics and structural mechanics
- profound experience with implementing numerical simulations in software environment

Furthermore, we expect:

- self-initiative and result-oriented working approach
- creative approach for developing innovative methods and solutions
- good command of written and spoken English
- willingness to travel, including short stays abroad (the PhD candidate will spend between 12 to 18 month at TU Braunschweig and 30 to 36 months at TU Delft)
- willingness to work closely with the scientific and technical staff of the involved institutes and project partners
- an exemption from the UN knowledge embargo might be required[1]

[1] https://www.government.nl/topics/secondary-vocational-education-mbo-and-tertiary-higher-education/exemption-certain-engineering-or-nuclear-related-courses-of-study

The earliest start of the position is on January 1st, 2023. The position is limited to a period of four years.

The TU Delft strives in all areas and positions to reduce under-representation in the sense of the NGG. Therefore, applications from women are particularly welcome. Severely handicapped persons are preferred in case of equal suitability. Proof of eligibility must be submitted. Application costs cannot be reimbursed. Personal data will be stored for the purposes of the application process.

Application documents:
Your application documents in English language should be submitted as a single combined pdf document consisting of a cover letter (including your motivation), CV, academic performance record (grades during Bachelor and Master studies including grading scale details), proof of English language proficiency, and a copy of your Master's thesis or comparable student theses.

Please send your application by **December 15th , 2022** via email:

Dr. Jurij Sodja or Dr. Roeland De Breuker
Aerospace Structures and Materials
Faculty of Aerospace Engineering
Delft University of Technology
Kluyverweg 1, 2629 HS, Delft
email: j.sodja@tudelft.nl or r.debreuker@tudelft.nl

If you have any further questions, please feel free to contact us via the above email address.

Mission statement
The mission of TU Delft is summarised by the following points:

• We perform world-class research by combining science, engineering and design in a socially responsible manner. Thus, we advance and share the benefits of technology.

• We develop and enhance the expertise of tomorrow’s engineering leaders and educate professional, high-level and responsible engineers throughout their careers.

• We help to develop and deliver technology-driven, innovative solutions to societal problems through

collaborations with leading national and international partners whilst being firmly rooted in Delft.

• We continuously improve our collective effectiveness, performance and organisational resilience through the principles and practice of professionalism, collaboration and openness.