



SE²A Magazine December 2023

Dear readers, Dear members and friends of the cluster SE²A,

With this issue, we are looking back on events, milestones achieved, and exciting news of the second half of the year 2023.

We close this successful year with new projects on board and look back on the interdisciplinary networking at the SE²A Summer School between all new doctoral researchers, the Parliamentary Evening, and the SE²A Conference.

Happy winter holidays, Merry Christmas, and a Happy New Year!



Enjoy reading and with best regards,

Prof. Dr.-Ing. Jens Friedrichs
(Spokesperson SE²A)

Dr. Doris Pester
(SE²A-Managing-Director)

LATEST NEWS

June 2023

News from the SE²A research club changING

On June 26th another changING year has come to a close. The developed projects of this year were presented, such as a wing that was designed for a model aircraft and a drone which has been developed, manufactured and launched into flight. Moreover, the participating pupils received a certificate for their engagement and great work in the context of the diverse projects. This year, it was special that changING said goodbye to its first high-school graduates after four years of participating successfully in the research club.



Group picture of the pupils presenting their changING projects

The event was opened by Dr. André Bauknecht, SE²A board member responsible for the division of equality, who congratulated the participants. Dr. Anne Geese, as the changING project leader, gave an overview of the activities of the institutes that changING collaborated with this year.

The research club of the Cluster of Excellence SE²A deals with transferring knowledge of current scientific questions to pupils from schools in the Braunschweig region. In particular female students should be given the opportunity to deal with technical issues and to strive for a technical career. So more specifically, pupils get the opportunity to work together with institutes of TU Braunschweig and realizing own projects.

[Click here](#) for a more detailed article about the presented projects. More information about changiNG can be found [here](#) on our website and on [Instagram](#).

August 2023

More than 100 participants at the SE²A Conference 2023

This year's SE²A Conference has taken place in the late summer. From August 29th to 31st 2023, more than 100 members of the Cluster of Excellence SE²A met in Goslar, in the Harz mountains to talk about their research topics related to sustainable and eco-friendly air transport system and to discuss the future of the cluster.



Group picture of SE²A Conference participants before going for a hike

The open space format with short project pitches and subsequent discussions at the posters of the individual projects was very positively received. Supported by the open space format, main research topics for the application of a second funding phase were developed. The "Walk to Talk" to the Steinberg Alm offered further opportunities to think about the ideas and topics that are important for the further development of future sustainable aviation.



Dr. Sonell Shroff at the SE²A Conference

A highlight of the second conference day was the presentation by Dr. Sonell Shroff from [Clean Aviation](#), the leading research and innovation program of the European Union with the goal of shaping air traffic towards a sustainable and climate-neutral future.

After this exciting keynote speech and many questions to Dr. Shroff, there was an intensive discussion about the further direction of the cluster. We would like to thank all participants for their great contributions.

You can find [more impressions](#) of the SE²A Conference on our website!



TU Braunschweig Summer School for Advanced Sustainable Aviation Technologies 2023



Participants of the Summer School for Advanced Sustainable Aviation Technologies 2023

This summer, for the first time, the Cluster of Excellence SE²A together with the Association for the scientific development of ATM in Europe (ASDA) offered a two-week summer school focusing on interdisciplinary exchange on the topic of sustainable aviation.

Students from international universities such as Cambridge, TU Delft as well as TU München were invited to discuss a challenging topic: transferring aviation into a more sustainable and greener transport mode. They learned about the current state

of the art in aviation research which exceeds the classical aerospace disciplines. Therefore, basic knowledge about methods and technologies were given in lectures held by professors from TU Braunschweig, the partner universities TU Delft and Tampere University, as well as from aviation industry experts. Following a virtual phase, the students could transfer their gained knowledge in practical on-site projects.

The academic part was supplemented by leisure activities and excursions. The programme included a barbecue, and guided tours through the Braunschweig research airport and as well as the city centre.

The programme was a win-win for all participants, as Professor Jens Friedrichs, spokesperson of the SE²A cluster, sums up: “I am really thrilled how quickly we found a common scientific language in this diverse group of participants from many different countries, and on this basis were able to discuss scientific approaches to solutions in a really serious and profound way.”

Professor Peter Hecker, Vice President for Research and Early Career Scientists at TU Braunschweig, adds: “The international summer schools are an excellent opportunity to further promote TU Braunschweig’s research fields among students and to show them career paths at TU Braunschweig. In this way, we may be able to welcome them back to our university as scientists in the future.”

[Click here](#) to read the full article by Sarah Henrike Hoy.

Watch [here](#) a video with some impressions.

September 2023

The Cluster of Excellence SE²A cycled for a better climate!

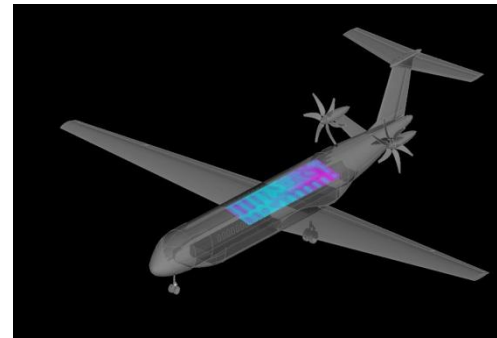
We are happy that we were again invited to participate in this year's "STADTRADELN" as part of the TU Braunschweig. Our team "SE²A on bike" consisted of 11 participants who cycled a total of almost 2.000 km between August 27th and September 16th. We are pleased that more members of the cluster decided to take part in this year's city cycling event and that we have cycled even more climate-friendly kilometres than last year.



Some of the STADTRADELN participants of TU Braunschweig

With a km count of 443, SE²A doctoral researcher Daniel Hahn is far ahead of all other participants. Congratulations! Learn more about STADTRADELN by reading the [magazine article of TU Braunschweig](#).

Noise research: simulation of cabin noise



Representation of cabin noise at seat height for an aircraft configuration from SE²A.

The SE²A researchers at the Institute of Acoustics and the Institute of Dynamics and Vibrations at TU Braunschweig are working on new aircraft concepts as part of noise research. More specifically, the researchers are working on the development of methods to predict and control cabin noise.

With the help of simulations and calculations, predictions can be made about how noise "spreads out" in an aircraft cabin and thus contribute to the development of new concepts. [In the magazine of TU Braunschweig](#), you will find a detailed presentation of current noise research findings at the TU and the SE²A Cluster of Excellence, written by [Yannik Hüpel](#) (SE²A researcher), [Prof. Sabine Langer](#) (Institute for Acoustics & SE²A project lead) and [Jun.-Prof. Ulrich Römer](#) (Institute of Dynamics and Vibrations & SE²A leader of ICA B "Flight Physics and Vehicle Systems").

“There is no silver bullet that will save the climate”



Prof. Jens Friedrichs

Prof. Jens Friedrichs, spokesperson of the cluster and head of the Institute of Jet Propulsion and Turbomachinery at TU Braunschweig, was interviewed by the TU Braunschweig magazine. More specifically, questions addressed were the solutions that are emerging and how the cluster is being acknowledged internationally.

[Click here](#) to read the full interview in

the magazine of TU Braunschweig.

Welcome to SE²A, Federica Ferraro!



Jun.-Prof. Federica Ferraro

Federica Ferraro joined as a new Junior Professor the Institute of Flight Propulsion and Turbomachinery. The cluster is pleased that her junior professorship at TU Braunschweig is linked to the active participation in the Cluster of Excellence! Warm welcome! [Click here](#) to read more about her research on replacement of fossil fuels with more climate-friendly and renewable options.

Awarded again: Prof. Anne Paschke for being one of the top “40 under 40”



Prof. Anne Paschke

Prof. Anne Paschke is once again a top “40 under 40” winner. Each year, a jury selects 40 exceptional people for the Capital magazine in different categories. These 40 people must meet two requirements: They must be under 40 and must have achieved something extraordinary within the past year. In the Cluster of Excellence SE²A, Prof.

Paschke is working on the Evaluation and Advancement of Aviation Law.

Congratulations!

[Click here](#) to read more about Prof. Anne Paschke and the award.

October 2023

The Cluster of Excellence SE²A welcomes the first-year students of TU Braunschweig



Booth in front of the Eintracht Stadion

Together with the SE²A changING team, the Cluster of Excellence introduced itself as a research center at the TU Braunschweig's central reception for first-year students on October 23rd 2023. The students were welcomed by the President Prof. Angela Ittel, the Vice Presidents Prof. Tatjana Schneider as well



Group picture of Dina Al-Kharabsheh (changING), Dr. Anne Geese (changING), Dr. Doris Pester (SE²A) and Tatjana Szalkau (SE²A)

as Prof. Knut Baumann and musically accompanied, among others, by the Erasmus Student Network. After the welcome event Dina Al-Kharabsheh, Dr. Anne Geese, Dr. Doris Pester and Tatjana Szalkau, were happy to answer questions from interested first-year students, directly at the Eintracht Stadion. We are very pleased about the great interest in the Cluster and

would like to extend a warm welcome at TU Braunschweig!

[Click here](#) for more information about the central reception for first-year students.

November 2023

Mobility of the future: SE²A at the parliamentary evening in Berlin

What will mobility look like in the future? On November 30th 2023, SE²A was part of the exchange between politics, science and industry at the parliamentary evening at the Niedersachsen State Representation in Berlin. The cluster presented one of TU Braunschweigs core research areas “mobility”.

It was enriching to go into conversation about tomorrow’s air transport: Braunschweig as a location with an excellent research infrastructure and its



From left to right: Lennart Lobitz, Dr. Doris Pester, Prof. Jens Friedrichs

own research airport. Therefore, this emphasises the relevance of the research at the cluster.

Prof. Jens Friedrichs (spokesperson), Dr. Doris Pester (CEO), and Lennart Lobitz (SE²A doctoral researcher) represented the Cluster of Excellence.

Furthermore, we are pleased that Prof. Angela Ittel, president of TU Braunschweig as well as other members of the TU joint the discussion of future aviation.



Group picture of TU Braunschweig members at the Parliamentary Evening

[Click here](#) to read more about the parliamentary event in Berlin in the TU Braunschweig magazine and [here](#) for pictures.

RECAP OF SE²A PAPER OF THE MONTH



SE²A Paper of the Month 2023



Tobias Müller - "Hydrogen-powered aviation in Germany: A macroeconomic perspective and methodological approach of fuel supply chain integration into an economy-wide dataset"

Alexander Barke - "Green batteries for clean skies: Sustainability assessment of lithium-sulfur all-solid-state batteries for electric aircraft"



Valerio Mosca - "Multidisciplinary Design Optimization of Transonic Wings with Boundary Layer Suction"

Bastian Kirsch - "CFD Parameter Studies using an Actuator Disk to Quantify the Interactions on an Airfoil Segment for Distributed Propulsion"

Yannic Beyer - "An Aeroelastic Flight Dynamics Model for Gust Load Alleviation of Energy-Efficient Passenger Airplanes"



Eun Ju Jeon - "A room-temperature high performance all-solid-state lithium-sulfur battery enabled by a cross-linked copolymer@ceramic hybrid solid electrolyte"

Dominik Blechschmidt - "A Machine Learning Approach for the Prediction of Time-Averaged Unsteady Flows in Turbomachinery"



Picture of Lennart Lobitz during the tour through SE²A facilities, here: Institute of Aircraft Design and Lightweight Structures (IFL)

NEWS FROM THE SE²A RESEARCH TRAINING GROUP

SE²A Summer School for doctoral researchers 2023



Group work on Science Communication

Following the Kickoff-Meeting, the SE²A doctoral researchers of the second cohort met again at the SE²A Summer School from October 17th to 19th. Intensive workshops on day 1 and 2, a guided tour through some of the SE²A facilities and a

city tour through Braunschweig, offered the opportunity for networking and exchange. We are pleased that also the SE²A doctoral researchers from our partner university TU Delft participated. Topic this year: How do I structure and present my work? The workshops addressed relevant research methods on the one hand and the practice of good science communication on the other.



Left: Anika Stegeman, right: Dr. Doris Pester



City tour through Braunschweig

In addition, it was exciting to note that the SE²A doctoral researchers approached and implemented the tasks within their group work in diverse ways. Therefore, the final presentation of results opened up the opportunity for discussion and interdisciplinary exchange.

The cluster would like to thank [Prof. Dr.-Ing. David Inkermann](#) (Faculty for Engineering at TU Clausthal) and [Anika Stegeman](#) (Coordinator International Science Communication at TU Braunschweig) for providing the enriching

workshop content as well as the Institute of Jet Propulsion and Turbomachinery (IFAS), Institute of Fluid Mechanics (ISM), Institute of Aircraft Design and Lightweight Structures (IFL) and the Institute of Flight Guidance (IFF) for giving the starting doctoral researchers an insight into the SE²A facilities.

You can find [more impressions](#) of the SE²A Summer School on our website!

SE²A Short Course Programme

The Short Courses give an introduction into the theoretical principals of the cluster's major topics in the integrated cluster areas and serve as an introduction to these. Furthermore, they are intended to strengthen interdisciplinary understanding and exchange between those research areas. Three courses have already taken place in 2023, which were on “Fundamentals of Aerodynamics”, “Aircraft Design” and on “Fundamentals of Aircraft Propulsion & Combustion for Sustainable Aviation”. In 2024, we are looking forward to five more Short Courses.

The cluster wants to thank all participating PIs for organising the content of the SE²A Short Courses! Please [visit our website](#) for more detailed information on the individual courses! **All SE²A Short Courses of 2023/24:**

SE²A Short Courses

Topic: "Fundamentals of Aerodynamics" Lecture by: Prof. Rolf Radespiel When: 08.11.2023	Topic: "Fundamentals of Electrification of Aircraft" Lecture by: Prof. Bernd Ponick & Prof. Axel Mertens When: 18.01.2024	Topic: "Fundamentals of Lightweight Structures" Lecture by: Prof. Sebastian Heimbs When: 06.02.2024
Topic: "Aircraft Design" Lecture by: Dr. Stanislav Karpuk When: 15.11.2023	Topic: "Life-Cycle-Assessment/Engineering" Lecture by: Prof. Christoph Herrmann & Dr. Felipe Cerdas When: 22.01.2024	Topic: "Alternative aircraft energy supply systems" Lecture by: Prof. Richard Hanke-Rauschenbach & Prof. Georg Garnweitner When: 09.02.2024
Topic: "Fundamentals of Aircraft Propulsion & Combustion for Sustainable Aviation" Lecture by: Prof. Jens Friedrichs & Prof. Friedrich Dinkelacker When: 15.12.2023	Topic: "Noise Assessment" Lecture by: Prof. Sabine C. Langer & Dr. Tobias Ring When: 31.01.2024	

SE²A Research Training Group: Coordination Team

The programme for SE²A doctoral researchers is now conducted by a team with changing members of each integrated cluster area as well as Prof. Gabriele Raabe as board member and Tatjana Szalkau as scientific coordinator. Within this team, ideas for interesting workshops for the upcoming year were collected, as well as for the programme for this year's SE²A Summer School for doctoral researchers. We want to thank all volunteers of this year for participating, discussing and setting up interesting topics: Prof. Sebastian Stiller and Dominik Wittenberg (ICA A), Dr. Nicolas Fezans and Valerio Mosca (ICA B) and Prof. Michael Heere and Lennart Kösters (ICA C).

RESEARCH

The Cluster of Excellence "Sustainable and Energy-Efficient Aviation" is an interdisciplinary research center 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. Technische Universität Braunschweig, the German Aerospace Center (DLR), Leibniz University Hannover (LUH), the Braunschweig University of Art (HBK) and the National Metrology Institute of Germany (PTB) have joined forces in this extraordinary scientific undertaking. The Cluster organisation is structured in three Integrated Cluster Areas (ICA) reflecting the mission-critical research demands and following a coherent and coordinated roadmap. The three ICAs resulting from our assessment of critical research demand are:



ICA A: Assessment of the Air Transport System

The goal of this cluster area is the development of comprehensive criteria and metrics for sustainable air transport that can serve as a basis for decision-making and future scenarios. [More information](#)



ICA B: Flight Physics and Vehicle Systems

This cluster area takes an in-depth look at technologies that have the potential to significantly reduce the power required from the propulsion system. [More information](#)



ICA C: Energy Storage and Conversion

Even with major advances in aircraft drag and propulsion efficiency, carbon emissions can only be reduced, while carbon-free aviation requires new concepts for the energy supply. The cluster looks at advanced lithium-sulfur chemistry for solid-state batteries as well as load bearing batteries. [More information](#)

EVENT ANNOUNCEMENTS

Zukunftstag | 25 April 2024 | TU Braunschweig



SE²A will be again part of the future day at TU Braunschweig that will take place on the 25th April 2024. Information on registration details and the programme will follow soon!

IdeenExpo | 08 – 16 June 2024 | Hanover



The IdeenExpo 2024 will take place between the 8th and 16th of June 2024. SE²A will be part of the event, which is targeted to pupils who want to experience technology and science in a tangible way.

[More information](#)

ILA Berlin | 05 – 09 June 2024 | Berlin



Every two years, ILA Berlin brings the global aerospace industry to the heart of Europe. Industry representatives, policymakers, armed forces and academia come together under the motto #PioneeringAerospace to discuss current challenges and opportunities. [More Information](#)

DLRK 2024 | 30 September – 02 October | Hamburg



The congress is the central event of the German-speaking aerospace community. As a multidisciplinary event, the DLRK offers all participants a platform to present significant findings, progress and developments in the aerospace industry. [More Information](#)

More about SE²A



The SE²A-Magazine will be published twice a year. For further information please visit our website: <http://www.tu-braunschweig.de/se2a>

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