CEAS
Council of European Aerospace Societies

BULLETIN

AEROSPACE EUROPE

DLR Deutsches Zentrum für Luft- und Raumfahrt
German Aerospace Center

INTERVIEW WITH PROF. KAYSSER-PYZALLA, CHAIR OF THE DLR EXECUTIVE BOARD

CEAS

The Council of European Aerospace Societies (CEAS) is an International Non-Profit Organisation, with the aim to develop a framework within which the major European Aerospace Societies can work together.
It was established as a legal entity conferred under Belgium Law on 1st of January 2007. The creation of this Council was the result of a slow evolution of the 'Confederation' of European Aerospace Societies which was born fifteen years earlier, in 1992, with three nations only at that time: France, Germany and the UK.

It currently comprises:

- 11 Full Member Societies: Czech Republic (CzAeS) – France (3AF) – Germany (DGLR) – Italy (AIDAA) – The Netherlands (NVvL) – Poland (PSAA) – Romania (AAAR) – Spain (AIAE) – Sweden (FTF) – Switzerland (SVFW) – United Kingdom (RAeS);
- 5 Corporate Members: ESA, EASA, EUROCONTROL, EUROAVIA, von Karman Institute;
- 9 Societies having signed a Memorandum of Understanding (MoU) with CEAS: AAE (Air and Space Academy), AIAA (American Institute of Aeronautics and Astronautics), CSA (Chinese Society of Astronautics), EASN (European Aeronautics Science Network), EREA (European association of Research Establishments in Aeronautics), ICAS (International Council of Aeronautical Sciences), KSAS (Korean Society for Aeronautical and Space Sciences), PEGASUS (Partnership of a European Group of Aeronautics and Space Universities) and Society of Flight Test Engineers (SFTE-EC).

CEAS is governed by a Board of Trustees, with representatives of each of the Member Societies. Its Head Office is located in Belgium: c/o DLR – Rue du Trône 98 – 1050 Brussels. www.ceas.org

AEROSPACE EUROPE

Since January 2018, the CEAS has closely been associated with six European Aerospace Science and Technology Research Associations: EASN (European Aeronautics Science Network), ECCOMAS (European Community on Computational Methods in Applied Sciences), EUCASS (European Conference for Aeronautics and Space Sciences), EUROMECH (European Mechanics Society), EUROTURBO (European Turbomachinery Society) and ERCOFTAC (European Research Community on Flow Turbulence Air Combustion).
Together those various entities form the platform 'AEROSPACE EUROPE', the aim of which is to coordinate the calendar of the various conferences and workshops as well as to rationalise the information dissemination.
This new concept is the successful conclusion of a work which was conducted under the aegis of the European Commission and under its initiative.
The activities of 'AEROSPACE EUROPE' will not be limited to the partners listed above but are indeed dedicated to the whole European Aerospace Community: industry, institutions and academia.

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AEROSPACE EUROPE Bulletin

AEROSPACE EUROPE Bulletin is a quarterly publication aiming to provide the European aerospace community with high-standard information concerning current activities and preparation for the future.
Elaborated in close cooperation with the European institutions and organisations, it is structured around five headlines: Civil Aviation operations, Aeronautics Technology, Aerospace Defence & Security, Space, Education & Training and Young Professionals. All those topics are dealt with from an overall European perspective.
Readership: decision makers, scientists and engineers of European industry and institutions, education and research actors.

EDITOR: CEAS
Director of the Publication: Franco Bernelli

EDITORIAL COMMITTEE
Editor-in Chief: Jean-Pierre Sanfourche
sanfourche.jean-pierre@orange.fr

Deputy Editor-in-Chief: Lukasz Kiszkowiak
lukasz.kiszkowiak@wat.edu.pl

Committee's Members: Andrea Alaimo, Jonathan Cooper, Cornelia Hillenherms, Britta Schade, Thomas Vermin.

Art Direction & Design: Sophie Bougnon
sophie.bougnon1@sfr.fr / www.sbgraphisme.com

THE OFFICERS OF THE BOARD IN 2023:

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franco.bernelli@polimi.it
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cornelia.hillenherms@dlr.de
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lukasz.kiszkowiak@wat.edu.pl
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anders.blom@innovair.org
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andrea.alaimo@unikore.it
Financial Manager: Philip Nickenig
philip.nickenig@dglr.de
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beata.prus@pw.edu.pl
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Chair of the Space Branch: Britta Schade
Britta.Schade@esa.int

FULL MEMBERS:

Czech Republic – CzAeS
Novotneho Lavka 5 – 110 00 Prague
www.csvts.cz
President: Daniel Hanus / hanus@csvts.cz
CEAS Trustees: Daniel Hanus, Jan Rohac / xrohac@fel.cvut.cz
Point of contact: Daniel Hanus : + 420 221 082 295

France – 3AF
6,rue Galilée – F-75016 Paris
www.3af.fr
President: Louis Le Portz / louisleportz@orange.fr
CEAS Trustees: Louis Le Portz
Bruno Berthet / bruno.berthet@rafaut.fr
Point of contact: Caroline Saux / gestionmembres@aaaf.asso.fr
T : +33 1 56 64 12 31

Germany – DGLR
Godesberger Allee 70 – D- 53175 Bonn – www.dglr.de
President: Roland Gerhards / roland.gerhards@dglr.de
CEAS Trustees: Cornelia Hillenherms / cornelia.hillenherms@dlr.de
Philip Nickenig / philip.nickenig@dglr.de
Point of contact: Birgit Neuland / birgit.neuland@dglr.de
T: +49 228 30 80 50

Italy – AIDAA
Casella Postale 227 – I-00187 Roma V.R. – www.aidaa.it
President: Erasmo Carrera / erasmo.carrera@polito.it
CEAS Trustees: Alberto Milazzo / alberto.milazzo@unipd.it
Carlo Bettanini / carlo.bettanini@unipd.it
Point of contact: Daniela Vinazza / daniela@aidaa.it
T: +39 366 144 21 31

Netherlands (The) – NVvL
c/o Netherlands Aerospace Centre
Anthony Fokkerweg 2
NL- 1059 CM Amsterdam
www. nvvl.eu
President: Mark van Venrooij / mark.van.venrooij@nlr.nl
CEAS Trustees: Mark Van Venrooij, Fred Abbink / f.j.abbink@planet.nl
Point of contact: Regina Sluitjer / nvvl@nlr.nl – T: +31 88 511 3113

Poland – PSAA
Nowowiejska 24 – 00-665 Warsaw
www.psaa.meil.pw.edu.pl
President: Tomasz Goetzendorf-Grabowski – tomasz.grabowski@pw.edu.pl
CEAS Trustees: Tomasz Goetzendorf-Grabowski
Lukasz Kiszkowiak / lukasz.kiszkowiak@wat.edu.pl
Point of contact: Beata Wierzbinska-Prus / beata.prus@pw.edu.pl
T: +48 22 234 54 28

Romania – AAAR
c/o COMOTI
Bd Luliu Maniu 220D
061126 Bucharest, Sector 6 – Romania C.P. 174, O.P. 76
www.aaar.ro – www.comoti.ro
President: Virgil Stanciu / vvirgilstanciu@yahoo.com
CEAS Trustees: Valentin Silivestru / valentin.silivestru@comoti.ro
Ion Fuiorea / ifuiorea@yahoo.com
Point of contact: Valentin Silvestru
T : + 4 021 434 02 40

Spain – AIAE
Francisco Silvela 71,
Entreplanta - 28028 Madrid
www.coiae.es
President: José Manuel Hesse Martin / jmhesse@coiae.es
CEAS Trustees: José Manuel Hesse Martin, Arturo de Vicente / arturodvh@coiae.es
Point of contact: Santiago Carmona / info@coiae.es – T : + 34 01 745 30 30

Sweden – FTF
c/o SSC, PO Box 4207
SE-17154 SOLNA
www.ftfsweden.se
President: Roland Karlsson / rkrolandk@gmail.com
CEAS Trustees: Anders Blom / anders.blom@innovair.org
Petter Krus / petter.krus@liu.se
Point of contact: Björn Jonsson / bjorn.jonsson@fmv.se
T: + 46 70-782 62 61

Switzerland – SVFW
Laerchenstrasse 1 CH-5737 Menziken– www.svfw.ch
President : Jürg Wildi / juerg.wildi@bluewin.ch
CEAS Trustees: Jürg Wildi
Georges Bridel / georges.bridel@alr-aerospace.ch
Point of contact: Mirjam Hauser / mirjam.hauser@icloud.com
T: + 41 44 632 11 11

United Kingdom – RAeS
No.4 Hamilton Place – London W1 J 7 BQ – www.aerosociety.com
President: Kerissa Khan MRAeS / kerissa.khan@aerosociety.com
CEAS Trustees: Emma Bossom MRAeS / emma.bossom@aerosociety.com
Jonathan Cooper CEng FRAeS / J.E.Cooper@bristol.ac.uk
Points of contact:
Emma Bossom
T: +44 (0) 20 7670 4332
Caroline Betts / caroline.betts@aerosociety.com

CORPORATE MEMBERS:

■ ESA
24, rue du Général Bertrand – 75345 Paris Cedex 7
www.esa.int
CEAS Representative:
Britta Schade / Britta.Schade@esa.int
CEAS Space Branch Member
Anastasia Pesce / Anastasia.Pesce@esa.int
CEAS Member
Johan Steelant / Johan.Steelant@esa.int

■ EASA
Konrad - Adenauer - Ufer 3
D-50542 Cologne (Germany)
Tel.: +49 (221) 8999 0000
www.easa.europa.eu
CEAS Representative:
Jean-Christophe Nicaise – jean-christophe.nicaise@easa.europa.eu

■ EUROCONTROL
Rue de la Fusée 96 - Brussels 1130
CEAS Representative: Marc Bourgois
marc.bourgois@eurocontrol.int

■ EUROAVIA
Kluyverweg 1 - 2629 HS, Delft, NL
www.euroavia.eu
President: Irina Stoican - irina.stoican@euroavia.eu
CEAS Representative: Victoria Maria Prieto Rueda - victoria.prieto@euroavia.eu

■ Von Karman Institute
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1, avenue Camille Flammarion – F-31500 Toulouse
www.academieairespace.com

■ American Institute of Aeronautics and Astronautics (AIAA)
12700 Sunrise Valley Drive
Suite 200, Reston
VA 20191 – 5807 USA
karens@aiaa.org - www.aiaa.org

■ Chinese Society of Astronautics (CSA)
CSA Zhang yao – WANG Yiran,
n° 8, Fucheng Road, Haidian district
P.O. Box 838
100 830 Beijing, China
wangyr@spacechina.com
www.csaspace.org.cn/

■ European Aeronautics Science Network (EASN)
EASN - Rue du Trône 98 – 1050 Brussels, Belgium – https://www.easn.net
Chairman: Andreas Strohmayer (University of Stuttgart)
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kitserpes@upatras.gr

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EREA Secretary: Anne-Laure Delot – ONERA, anne-laure.delot@onera.fr
https://www.erea.org

■ International Council of the Aeronautical Sciences (ICAS)
President: Dimitri Marvis
Executive Secretary: Axel Probst
c/o DGLR – Godesberger Allee 70 – D- 53175 Bonn
icas@icas.org – www.icas.org

■ Korean Society for Aeronautical and Space Sciences (KSAS)
Room 1001, 635-4 – Yeogdam-Dong – 135-703 Gangnam – Gu Republic of Korea – ksas@ksass.or.kr
https://www.ksas.or.kr

■ Partnership of a European Group of Aeronautics and Space Universities (PEGASUS)
Chair: Emmanuel Zenou
emmanuel.zenou@isae-supaero.fr
www.pegasus-europe.org

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www.sfte-ec.org/

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Chairman: Andreas Strohmayer (University of Stuttgart)
Strohmayer@ifb.uni-stuttgart.de
Vice Chairman: Konstantinos Tserpes – University of Patras
kitserpes@upatras.gr

■ ECCOMAS: European Community on Computational Methods in Applied Sciences
Campus Nord UPC - Building C3 "Zona Comercial" – Jordi Girona, 1-3 (08034) – Barcelona (Spain)
www.eccomas.org/
eccomas@cimne.upc.edu
President: Ferdinando Auricchio
auricchio@unipv.it

■ ERCOFTAC: European Research Community on Flow Turbulence Air Combustion
https://www.ercoftac.org/
Chairman of Executive Council:
Dominic von Tenzi
admin-cado@ercoftac.org

■ EUCASS: European Conference for Aero-Space Sciences
www.eucass.eu
EUCASS President:
Alain Merlen- Lille University of Science and Technology – alain.merlen@univ-lille.fr

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https://euromech.org
President: Marc Geers – m.g.d.geers@tue.nl

■ EUROTURBO: European Turbomachinery Society
https://www.euroturbo.eu
Chairman: Raul Vasquez Diaz
Raul.Vasquez@Rolls-Royce.com

EDITORIAL

Jean-Pierre Sanfourche,
editor-in-chief
sanfourche.jean-pierre@orange.fr

Dear readers,

The present CEAS bulletin is broadly devoted to the huge climate neutral challenge aviation sector is facing.

In the interview I had with her, **Prof. Kaysser-Pyzalla** describes the various research programmes the German Aerospace Centre (DLR) is conducting with a view to reaching the 2050 aviation neutral-carbon objective. Among my questions, there was: "what is your feeling about the 'Four-Rs of a circular economy'?"

This theme had been dealt with during the June 2023 International Paris Air Show at the event jointly organised by the European Commission and the association of European Research Establishments in Aeronautics (EREA), aiming at defining a doctrine corpus to tackle all greenhouse emissions from aviation. This event, whose motto was "**Rethink Aviation: Reuse, Recycle, Repair, Rebuild**', is reported in the course of the magazine, highlighting the main points EREA chairman Pawel Stezycki mentioned during his keynote speech. And with the intention to facilitate the understanding of the circularity concept, the introduction of the chapter 'Circular Aviation' of '2023 EREA Future Sky' as well as the SUSTAINair project are reproduced.

It is also reported on the annual meeting of the European Technology Transfer Offices (TTO) which was held in Berlin on 29 June to discuss about the availability of the Test Infrastructures mandatorily required to achieve the 2050 Green Deal objective.

It is clear that all sustainable aviation research projects are interdisciplinary, embedded in system-of-system thinking.

After a number of articles still relating to net zero carbon objective, essentially from Clean Aviation JU and SESAR JU/EUROCONTROL, then come the other headlines:

- Aerospace Defence and Security, with the latest developments of the FSAF-PAMMS Programme and the Next Generation Small RPAS (NGSR);
- Space with the ESA CO2M mission for Carbon Dioxide Monitoring, Starship status, Artemis II preparation and Ariane 6 report;
- Education and Training with the life of EUROAVIA.

And as usual is presented the outline of the latest issues of the CEAS Journals, hoping that the number of papers proposed to be published will continue to regularly increase.

Wishing that AEROSPACE EUROPE becomes more and more a fruitful tool for communication between CEAS members and partners, this is with greatest pleasure that I would receive your comments and suggestions for quality improvement.

Wishing you a good reading, please receive my warm regards..

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CEAS PRESIDENT'S MESSAGE

Franco Bernelli Zazzera
CEAS President 2021-2023

In a historical moment in which the world finds itself ravaged by violence and winds of war, I still want to try to bring a positive message for the development of the aerospace sector and consequently also for the development of CEAS.

The last 50 years have seen the growth of the aeronautical sector and made air travel the safest transport on Earth, thanks to continuous progress in the aircraft design, manufacturing, and operations. Air travel has deeply changed our lifestyle and economy. Today the sector is being criticized for its carbon footprint, but this is giving impetus to further technological advancement to make aviation carbon neutral. In parallel, the concept of urban air mobility is rapidly bringing to novel concepts of aircraft and operations, yet to find a consolidated market but full of interesting technological developments.

The space sector is somehow lagging behind the aeronautical sector, having seen its first products 50 years later than the aeronautic sector. However, in the last few years the space sector is really booming with a wealth of new ideas, new developments, new projects, new business models and great attention from the public and private investors, accompanied by strong interest and acceptance from the society. Europe is at the forefront of this revolution, with its new launchers, satellite navigation systems, Earth observation satellites, scientific and technological missions and, last but not least, manned missions. The growth of interest around space activities is luckily accompanied by a similar growth in the student population enrolled in academic studies relevant to the sector and that will be the future workforce. For sure, press releases on space activities are now provided almost on a daily basis and help in the dissemination of the potential and benefits of the sector. As I am writing this message, I have in my hands the October 2023 issue of the National Geographic magazine, entirely dedicated to space activities for the benefit of a large audience.

As usual, some of the latest projects and programs are presented in this Bulletin and the reader will surely enjoy the contents. It is interesting to note that these new developments are made possible and thus require a strong multi-disciplinary approach to the design, where the disciplines that we consider "core" for aerospace need to be complemented by a variety of other technical and non-technical disciplines. This paradigm change must find adequate representation also in the societies like CEAS, through adaptation in the content of the activities that are supported and eventual interaction with other societies traditionally focused on different sectors. A first step in this direction has been made in the definition of the topics for the latest CEAS conference held in Lausanne in July where, just to mention a few, topics such as Sustainable Aviation and Sustainable Space have found place, complementing the more traditional topics. But we need to do even more on this side, and I think that the corporate members of CEAS can provide a huge insight in the domains that need to be better incorporated into our future activities. Some inspiration can also come by looking at what other learned societies or International Councils/Federations are doing, adapting this to the CEAS context.

I would like to spend a few words also on the connection that CEAS has with the European students, that in my opinion should be strengthened. The CEAS member societies all have student membership, but the latest conference in Lausanne saw participation of students only from four countries represented in CEAS. This even though CEAS was willing to financially support participation of students from all CEAS countries. I see this as a large area of improvement. Students not only represent the future workforce, but they also bring fresh and novel ideas into our community and thus deserve appropriate consideration.

Let me conclude this message by thanking all the CEAS community for the support provided in the management of the Council, its Journals and events. We can always improve and do better, and I am sure we will do so, but we are yet doing well for the moment..

INTERVIEW WITH PROF. ANKE KAYSSER-PYZALLA, CHAIR OF THE DLR EXECUTIVE BOARD

By Jean-Pierre Sanfourche, Editor in Chief

Anke Kaysser-Pyzalla

Anke Kaysser-Pyzalla *studied mechanical engineering and materials science in Bochum and Darmstadt. She completed her doctorate and qualified as a university lecturer at Ruhr Univesity in Bochum.*
Following research activities at the Hahn-Meitner-Institute (HMI) and the Technical University of Berlin, she conducted research and taught as a university professor at the Vienna University of Technology from 2003 to 2005.
In 2005, she joined the management team at the Max-Planck Institut für Eisenforschung GmbH in Dusseldorf as Scientific Member, Director and then Managing Director. In 2008, she was appointed Scientific Director of the Helmholtz Centre for Materials and Energy in Berlin (Helmholtz-Zentrum Berlin für Materialien und Energie GmbH), which was created under the leadership through the merger of HMI and the Berlin Electron Storage Ring Society for Synchrotron Radiation (BESSY).

In 2017, Anke Kaysser-Pyzalla was elected President of TU Braunschweig, a post she held until the DLR Senate unanimously appointed her as the new chair of the Executive Board in 2020.

At the event organized jointly by the European Commission and the Association of European Research Establishments in Aeronautics (EREA) during Paris Le Bourget Air show in June 2023 the theme was: If we are to tackle all greenhouse emissions from air transport, we must re-think aviation with the 4 R's of a circular economy: "Redesign,Repair, Reuse, Recycle". What is your general feeling about this philosophy?
DLR's vision is zero-emission aviation. We are developing highly integrated technologies, methods, processes and solutions for climate-compatible aviation, thereby contributing towards the European Green Deal. For this goal, the entire aircraft lifecycle must be considered more closely in the future, from material formation, all the way through to development, production, operation, maintenance and decommissioning. All of this will be embedded into an overall assessment of the air transport system and will enable a comprehensive analysis of the impact of all aspects of aviation on the environment in general and on the climate in particular. It will then be possible to determine the necessary innovations and implement them in a more targeted manner. DLR person-

Vision of a future hydrogen economy - Credit: DLR (CC BY-NC-ND 3.0)

Efficient long-range aircraft with UHBR engines and laminar flow wing. Credit: © DLR. All rights reserved

nel are involved in interdisciplinary research and development, from components and technologies, through to the technical challenges of new aircraft concepts, including future propulsion systems, all incorporated into the complex interactions of emission-reduced air transport. With this, we support the 4 Rs in all fields with our research goals in exchange with all stakeholders, naturally including our friends within EREA.

The European Commission is taking several initiatives in the framework of the EU's Circular economy Action Plan, aiming for a fully circular economy by 2050. How do you conceive a fully circular aviation industry and the different technical and operational advances that need to be accomplished to enable a fully circular air transport system within the 2050 target timeframe?

Technological developments in aviation form part of a complex overall aircraft design system that encompasses production, air and ground operations and maintenance. To achieve the challenging goal of fully circular aviation, further digitalisation plays a key role, as it will make it possible to map the complexities of aircraft along the 'digital thread' – from design, through production and operation, right up to decommissioning. Expertise in the aviation system as a whole is absolutely vital. The assessment using the DLR tool ALICIA (All Condition Operations and Innovative Cockpit Infrastructure) of all the novel and existing technologies integrated into respective aircraft, all virtually flying in the emission-reduced air transport system, encompasses all aspects of its operations and their effects. Its findings will be used to assess the impacts and facilitate potential redesigns, from the level of the overall air transport system, down to a single component or technology. Thanks to its overall systems capability in aviation research, DLR has the expertise to act as an architect and integrator in this field. Following our Aeronautics strategy, which describes the path towards zero-emission aviation, at least these milestones should be achieved by 2050: The energy requirements of future aircraft need to be halved by the middle of the century by reducing aerodynamic drag and total weight, together with innovative flight control and sensor systems. On short- to medium-haul flights, fuel cells combined with hydrogen enter service. Highly efficient turbofan engines along with Power-to-Liquid (PtL) produced kerosene (Sustainable Aviation Fuel; SAF) or even hydrogen should enable climate-compatible operation on medium- to long-haul flights. And, very important already in the short-term and even more so in the long-term, an improved air traffic management that allows climate-optimised flight paths to reduce both carbon-dioxide- and non-carbon-dioxide effects significantly.

How is DLR collaborating with the other aerospace establishments within the EREA framework?

Under one of my predecessors, Prof. Walter Kröll, DLR was one of the co-founders of EREA and its main objectives. These are to promote and represent the joint interests of its members, to intensify the cooperation between its members and with third parties in the field of aeronautics and to facilitate the ultimate goal of the members, the integrated management of joint activities. In this way, EREA contributes to Europe's role as a global player in aeronautics.

DLR has been supporting these objectives by contributing in and to all EREA Groups and EREA activities, such as providing strategy and policy guidelines as part of the EREA Board. In the Executive Secretariat, DLR contributes to the preparation of position papers towards European research and innovation policies and to the organisation of events like the EREA Young Researchers Seminar. The coordination regarding European programmes such as Horizon Europe and the European Defence Fund is achieved through DLR contributions in the Aeronautical Research Group and the Defence Research Group. For the preparation of research cooperation, EREA has created the Joint Research Initiative Future Sky under DLR leadership. This initiative is divided into six themes: Safety, Energy, Quiet Air Transport, Urban Air Mobility, Security for Aviation and Circular Aviation. Research projects and proposals are submitted under these Future Sky themes to Horizon Europe.

Is DLR participating in the Future Sky Project SUSTAINair funded by the European Commission?
Yes, we are participating. This project is very important as it sets the focus on sustainability for the entire lifecycle of an aircraft – applying circular economy principles to the design, manufacturing, operations and end-of-life phases of aircraft. Within SUSTAINair, the DLR Institute of Materials Research is building on its experience in the development of additive manufacturing and the processing of novel alloys, and its expertise in state-of-the art materials characterisation. For example, DLR is developing techniques to combine dissimilar materials – in particular, plastics and metals – for lighter and more efficient aircraft. In the field of 3D printing, we are investigating how different metal powder alloys form and how they could be used and recycled in the aircraft manufacturing process. Titanium alloys for highly stressed structures are seen as one promising possibility.

What are the major research activities DLR is currently conducting as regards the decarbonization of aviation? What are the main things you are concentrating on over the short- to medium-term on the one hand, and in the longer term on the other hand?
We are considering the entire climate impact of aviation, which consists of carbon dioxide emissions and non-carbon-dioxide-effects, with contrails and nitrogen oxides as the major contributors. Therefore, we are facing a wide range of challenges. Firstly, we must continue to improve today's aircraft, increasing their efficiency to reduce their climate impact. Secondly, we need to pave the way for a whole new generation of aircraft. Among other things, this will require new aircraft configurations, propulsion systems, lightweight construction methods and system architectures. New energy carriers such as Sustainable Aviation Fuel (SAF) and, in the longer term, hydrogen, will play an important role in reducing the climate impact of both carbon dioxide emissions and non-carbon-dioxide effects. Flying climate-friendly routes is another promising short- to medium-term option, which, however, requires establishing the right technological and operational conditions that will lead to an emission-reduced air transport system.

For example, within DLR's project EXACT (Exploration of Electrical Aircraft Concepts and Technologies) – see illustration of the front page – we investigated various concepts for future short- and medium- haul hybrid electric aircraft. As part of DLR's project KuuL, we examined how even small changes in long – haul flights can have a large impact on climate – compatible aviation.

Could you say something about the most significant demonstrators DLR is developing?
DLR has recently taken delivery of its new D328 UpLIft research aircraft. The flying testbed will translate research into practical applications on the way to climate-compatible air transport in a variety of ways. With its modular design, it will be open to as many interested partners as possible – particularly SMEs and start-ups without their own flight test facilities. In this way, promising propulsion, fuel and system technologies for the decarbonisation of air transport can be tested quickly and under real flight conditions in order to significantly accelerate their development. The path to climate-compatible air transport first requires a precise understanding of the climate impact of the various system and propulsion concepts under very different operating conditions. For this reason, some of planned modification of the aircraft is the equipment for burning fully synthetic fuels and the simulation of hydrogen exhaust gases, whose climate impact will be measured and quantified in flight.

Visualisation of the PtL Technology Platform (TPP) - Credit: DLR (CC BY-NC-ND 3.0)

The area of new materials is quite an important domain. What are the main subjects on which DLR is particularly focusing?
At DLR, we are focusing on multidisciplinary lightweight system construction using modern lightweight materials, innovative integration and assembly concepts, Structural Health Monitoring (SHM), system and cabin integration as well as the incorporation of secondary structures and load reduction. For this, we are working towards making ground-based demonstrators possible by 2030 and preparing for certification through flight tests by 2040. For example, DLR, together with the industry partners Premium AEROTEC, Airbus and Aernnova, has recently developed a fuselage component made entirely of carbon-fibre-reinforced thermoplastic. The special plastic makes the component less vulnerable to damage and approximately one ton lighter than its aluminium counterpart.

How is DLR participating in Clean Aviation programmes?
We were a key participant in the predecessor programmes Clean Sky and Clean Sky 2, in which DLR was leading the technology evaluator. On this basis, DLR was involved in the preparation of Clean Aviation and logically became one of the founding members of the Clean Aviation Joint Undertaking. On the basis of its successful cooperation with its partners from industry and universities, DLR is participating in 19 out of 28 funded Clean Aviation projects across all three objectives – hybrid electric regional aircraft, ultra-efficient short and medium range aircraft and disruptive technologies to enable hydrogen powered aircraft. In two of these projects, DLR is coordinating the consortium. With this participation, we are showing our commitment to achieving the goals of Clean Aviation on the way to climate-neutral aviation.

How is DLR participating in SESAR programmes?
Similarly to Clean Aviation, DLR was already involved in the execution of the predecessor programmes SESAR and SESAR 2020 and thus in the preparations for SESAR-3. As a founding member of SESAR-3, we are contributing to the implementation of the SESAR-3 programme by participating in 21 funded projects, five of which are being coordinated by DLR. With its participation in 16 funded projects in industrial research and five in exploratory research, DLR is contributing to the delivery of the Digital European Sky as the primary goal of SESAR-3. In AT-One, together with its partner NLR, DLR is addressing the entire air traffic management system from airport to airport.

With a view to strongly encouraging innovation, you have set up the Innovation, Technology, Transfer and Research Infrastructure (ITTRI) department. This new department has just started, what are you expecting?
As the German Aerospace Center, we make important contributions to this area with our research activities in aeronautics, space, energy, transport, digitalisation and security. By interlinking research and innovation processes, DLR fulfils the socio-political task of harnessing scientific research findings to sustainably safeguard the innovative excellence and competitiveness of industry for the benefit of society. DLR seeks to bring research and industry ever closer by promoting the transfer of expertise and technologies from research to application. Collaboration with companies is key to us in this process, as 'there can be no innovation without business partners'. Valuable knowledge is shared promptly with industry, which gives rise to innovations based on DLR's research findings. Industrial partners convert DLR's technologies and expertise into market success.

In conclusion, may I ask you to express your three top priority actions for the months ahead?
We are very busy bringing our new D328 UpLIft research aircraft into service and preparing for the first research flights in the months to come. The path to climate-compatible air transport first requires a precise understanding of the climate impact of the various system and propulsion concepts under very different operating conditions. In another flight campaign to be conducted together with airline partner Deutsche Lufthansa AG, we will use approximately 100 regularly planned flights to investigate how contrail formation can be prevented in the most efficient way by means of alternative flight routes. This is a very promising pathway to rapidly reducing the climate impact of aviation.
With these national priorities, combined with DLR's contributions to Clean Aviation, SESAR-3 as well as the aviation-related collaborative research projects in Horizon Europe, DLR is helping the European aviation sector pave the way towards climate-neutral aviation by 2050, and thus realising the new European vision for sustainable aviation 'Fly the Green Deal', which was presented last year by ACARE at the ILA Berlin Air Show. As mentioned earlier, the main issues are addressing hybrid-electric, hydrogen-powered and ultra-efficient aircraft, the production, certification and use of SAFs as well as improvements in the European ATM system, including climate-neutral routing.

DLR AT A GLANCE

Cutting-edge research from fundamental principles through to applications

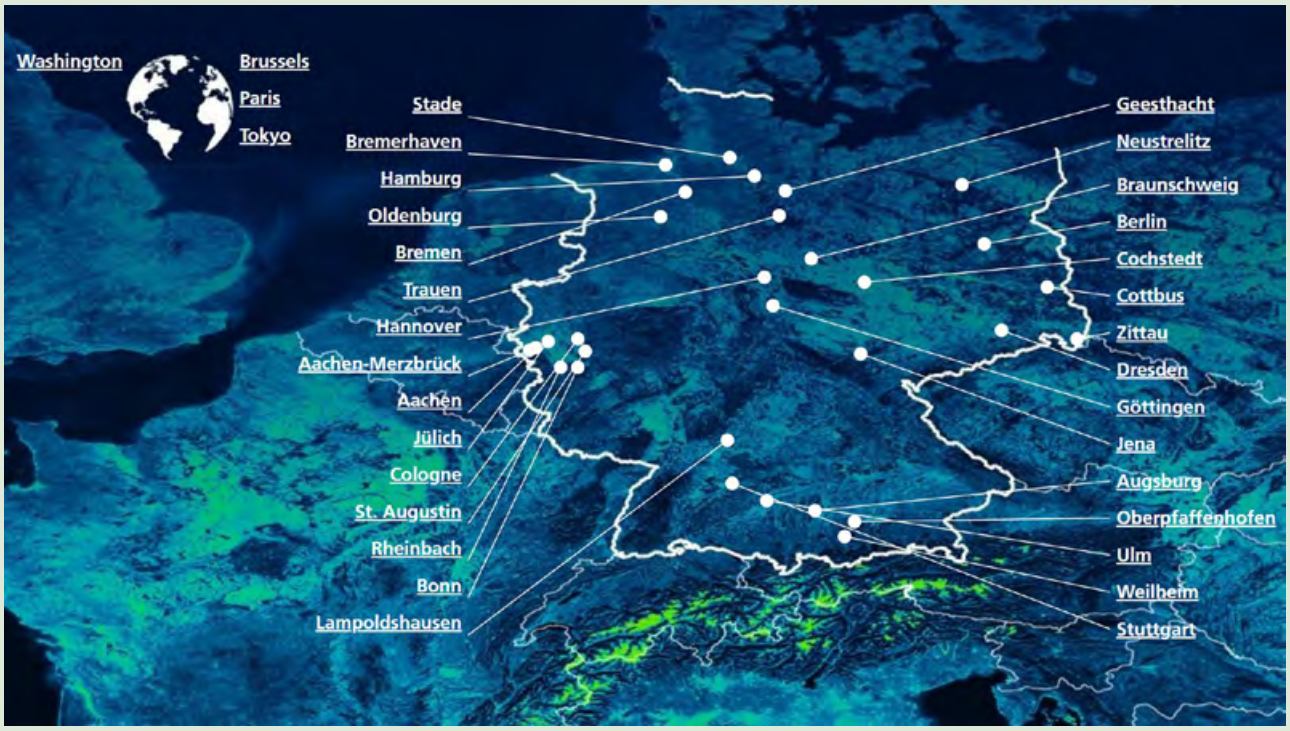
The German Aerospace Center (Deutsches Zentrum für Luft und Raumfahrt; DLR) is the Federal Republic of Germany's research centre for aeronautics and space. It conducts research and development activities in the fields of aeronautics, space, energy, transport, security and digitalisation. The German Space Agency at DLR plans and implements the national space programme on behalf of the federal government. Two DLR project management agencies oversee funding programmes and support knowledge transfer.

DLR employs approximately 10,000 people at 30 locations in Germany: Cologne (Headquarters and location of the Executive Board), Augsburg, Berlin, Bonn, Braunschweig, Bremen, Bremerhaven, Cochstedt, Cottbus, Dresden, Geesthacht, Göttingen, Hamburg, Hanover, Jena, Jülich, Lampoldshausen, Neustrelitz, Oberpfaffenhofen, Oldenburg, Rheinbach, Sankt Augustin, Stade, Stuttgart, Trauen, Ulm, Weilheim and Zittau. DLR also has offices in Brussels, Paris, Tokyo and Washington D.C.

Climate, mobility and technology are changing globally. DLR uses the expertise of its 55 research institutes and facilities to develop solutions to these challenges. All employees share a mission – to explore Earth and space and develop technologies for a sustainable future. By transferring technology, DLR contributes to strengthening Germany's position as a prime location for research and industry.

Aerial view of DLR Headquarters in Cologne-Porz

DLR and its predecessor organisations have a history spanning over 115 years, including one of the world's first institutions dedicated to aeronautics research. Key research and countless inventions that now shape and improve modern life emerged within DLR and its forerunners, among them fundamental theories of flying and the modern swept wing that enabled today's cruise flight.



Map of the different sites of DLR

THE EC-EREA JOINT EVENT AT LE BOURGET AIRSHOW, JUNE 2023

Excerpts from EREA Newletter July 2023

RE-THINKING AVIATION: SECTOR CALLS FOR CIRCULARITY

At the 2023 Le Bourget Paris Air Show, the European Commission (EC) and the association of European Research Establishments in Aeronautics (EREA) jointly organised an event aiming at defining a general doctrine with a view to tackling ALL greenhouse emissions from aviation.

The motto of this event was:
'ReThink Aviation – ReUse, ReCycle, RePair, ReBuild'
A recycling mandate as is common in the automotive sector, more research into circular materials and circular-by-design aircraft, etc.: these are just a few of the ideas voiced by the panellists at this event. The EC recently took several initiatives in the framework of the EU's CEAP, aiming at a fully circular economy by 2050. For EREA and the Future Sky Circular Aviation Team, the objective is clear: to enable a fully circular flight by 2050.

Figure 1: ***EC-EREA Joint event 'ReThink Aviation – ReUse, ReCycle, RePair, ReBuild' at Le Bourget Air Show, June 2023***
L-R: Pawel Stezycki, Chair of EREA, Director general of ILOT – Isabell Gradert, Airbus, head of central Research & Technology and Material Track Leader – Lionel G. Roques, TARMAC AEROSAVE, VP Sales – Ligeia Paletti, EREA Future Sky Circular Aviation, co-chair and Circular Economy Expert at NLR – Fatima de Gloria de Sousa, Air France-KLM Group, VP Sustainability – Rosalinde van der Vlies, DGRTD, Director of the Clean Planet Directorate -

Rosalind Van Der Vlies (DG RTD Director of Clean Planet Directorate, Anna Christmann (Federal Government Coordinator of German Aerospace Policy) and Pawel Stezycki (EREA Chair) – who gave keynote speeches – recalled what is currently being done to enable a transition towards circularity. The European Commission has funded projects, such as SUSTAINair, that make a meaningful technical contribution, but also Airbus, Air France-KLM and Tarmac Aerosave are taking significant steps.

Bringing together key stakeholders from the aviation sector was the first step in the journey towards circularity, but certainly not the last. The technical challenges are significant and budgets to tackle them remain limited. In addition, raw materials are becoming more scarce whilst eroding the EU's economic independence in the world. As such, circularity serves not only the EU's Green Deal goals, but also the need for strategic autonomy.

One crucial next step is to seek cross sector cooperation as there is much to learn from other sectors, such as automotive, that have a history of circular practices.

MAIN POINTS MENTIONED BY EREA CHAIR PAWEL STEZYCKI DURING HIS KEYNOTE SPEECH

a. The idea of circularity is a fundamental pillar of EU GREEN DEAL and its application in aviation is embedded in ACARE's the Fly the Green Deal Vision.

b. The urgency of Climate Crisis in undeniable and decarbonisation will contribute significantly to reduce the impact of aviation, but

- To achieve decarbonisation and the energy transition, resources and materials are needed, critical materials and in particular, not only topics to focus on, circularity of materials is also very crucial.

c. EREA has been working on the topic of circularity for a long time, but since 2018, under Future Sky Theme – Circularity in Aviation – we bundled these activities under the circularity banner:
- New idea introduced which also fits EREA's vision for the future of aviation described in the EREA Vision Study released in 2020;
- We need to cooperate and promote it.

d. Circular economy is not only more than dealing with resources and critical materials. As it influences the entire life cycle of products, from cradle to cradle Circularity need to be considered in the design. In this sense, aviation – in particular aircraft structures, but not only – should be considered from the very beginning of design.

e. As the development time in aviation is long, the need of fast introduction due to the stage of plane design is necessary:
- Aviation already should have started the process of decarbonisation and circularity 10 years earlier due to the process of designing aircraft and structures as planes ar already produced and will be in service for 30 years;
- It needs the change in the process and digitalisation to speed up the introduction of circularity.

f. As is the case in other sectors, such as automotive, a regulatory framework is a driving force for change. We also need regulatory processes that they will introduce the circularity in aviation, targets not not only for recycling, but even more important for reuse and remanufacturing, Europe should be the leader in circularity and lead the world in this transition.

g. Adopting the concept of circularity is a paradigm shift, requiring not only intensive R&D efforts, but also close cooperation among its stakeholders. At the same time, circularity is not new to many other sectors. We must be open to learning from sectors like the automotive industry and others.

h. To introduce the complete solutions to the market, to improve the process and promote the competitiveness - Future Sky Circularity in Aviation Theme has introduced the roadmap 'How we could proceed'. But much needs to be done, also in terms of R&D listen to the challenges of industry in their transition to circularity and get together towards the solutions.

The latter is the reason we are here today, to offer EREA's knowledge and brightest brains to the entire aviation community, and together with the European Commissions, support in the transition to circular economy in aviation, as part of the transition to a truly sustainable aviation, one that fits one of the four scenarios of the EREA Vision study for the future: **"Optimising together"**.

FOUR MAIN POINTS ARE TO BE UNDERLINED

1. **A lot has been done, yet more needs to be done to implement circularity in the aviation, especially the need to find how to combine economic aspects and environmental benefits. It is possible to achieve aviation which is circular and competitive, but it cannot be done only by technological solutions.**

2. **To proceed with changes, we need regulations and regulators onboard to speed up things, and also to make sure that aviation remains safe.**

3. **Interaction and cooperation of industry and research is essential, not only within aviation partners but also in other sectors.**

4. **We need to be more ambitious, but ambition means more innovative, and this means more funding and commitment from the European Commission and industry if we want to reach the zero-aviation emission by 2050.**

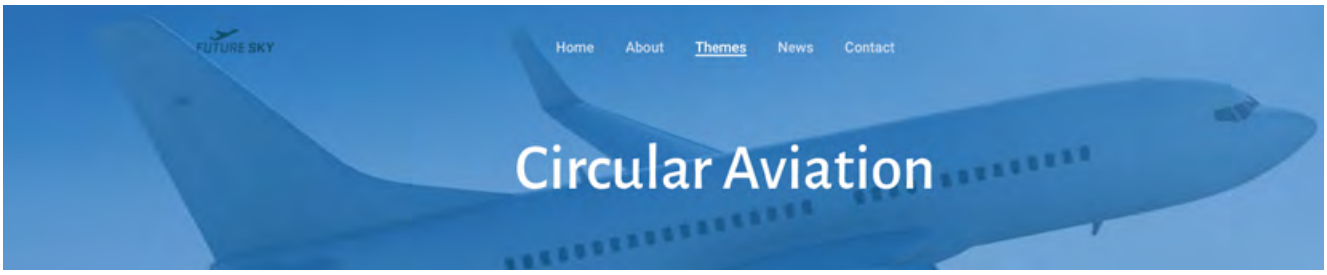
ABOUT EREA

EREA, the association of European Research Establishments in Aeronautics is a non-profit organisation which gathers Europe's most outstanding research centres active in the field of aeronautics and air transport.

5,982 employees in aviation research

€ 560,000,000 spent on research in aviation

CIRCULAR AVIATION



In order to ease the understanding of the 'circularity' concept, here below is reproduced the introduction of the chapter CIRCULAR AVIATION of 2023 EREA Future Sky.

The increasing environmental awareness within the European society is challenging the aviation sector to intensify its efforts towards a greener, cleaner and more sustainable aviation, by reducing its environmental impact in terms on consumption, waste and emissions connected to all aviation activities and operations. The principles of circularity, or circular economy, shall provide a framework to re-evaluate the complete, cradle-to-cradle, life cycle of each aspect of aviation, enabling the transition to circular aviation.

The vision of FlightPath 2050 describes how aviation will be actively engaged in "protecting the environment and the energy supply", providing "sustainable [...] connectivity for passengers and freights", and "protecting the environment and enabling the use of sustainable energy and alternative energy sources".

Insofar sustainability in aviation mainly referred to reducing polluting emissions from operations; therefore, the focus has been on high efficiency gas engines, lightweight solutions, alternative fuels and (hybrid-) electric solutions. Though useful, this approach only covers part of the lifecycle of an aircraft, and only a limited amount of the overall energy consumption and pollution emissions related to aviation. Recently, sustainability has also approached aspects related to production and manufacturing, both the traditional manufacturing process for old aircraft, and the recent, innovative processes and advanced materials for new aircraft designs. Although the design and manufacture of recyclable air vehicle is one of FlightPath 2050's goals, most aspects such as production, end-of-life solutions, maintenance and (most of) operations of aircraft and airports have been neglected in the life cycle analysis.
Circular economy principles focus on minimizing systematic leakages and negative externalities; such principles can enhance the already ongoing research activities and industrial implementations of more sustainable solutions in aviation, by expanding their current fields of application (from local to global) and by initiating new applications. Applying sustainable solutions only locally will never allow achieving the reduction in emissions desired to reduce the effects of the climate change. The overall aircraft lifecycle, from cradle to cradle, needs to be reassessed.
During the design phase, the cost of the entire lifecycle (cradle-to-cradle, including resourcing raw materials and disposal at end of life) shall be evaluated and design decisions based on this. Design solutions incorporating recycled materials and/or with focus on extended durability and ease to repair, disassemble, and reuse, shall be encouraged.

During the manufacturing process, the environmental impact is managed through a better control of used materials, reducing waste and energy consumption at manufacturing facilities and rationalizing the logistics (for example, favouring local production). First-time-right solutions are fully integrated in the workflow.

During operations, the full operational status can be maintained by integrating the information from the structural health monitoring system with the repair solutions designed synergistically with the aircraft itself. Refurbishment is favoured by modular design of structural components and interiors.

At the end of an aircraft lifecycle, the objective is to reuse and recycle up to 95% of aircraft parts, with particular focus on including composite materials used in aircraft manufacturing.

Under the umbrella of Future Sky Theme 6 on Circular Aviation, every research topic concerning aviation could be placed. A limited, and therefore by far not exhaustive, list of topics, which should be object of research, is:

Design
- Choice of materials;
- Design to improve durability, structural integrity and ease to repair, to upgrade…;
- Design for modularity;
- Design for disassemble, in order to maximize the recovery of valuable materials and components,

Production
- Reduce scrap and waste by first-time-right approaches;
- Improve efficient use of tooling / flexible manufacturing.

Operation
- Operational use of the aircraft (already part of programs like SESAR, not part of this FS theme);
- Alternative propulsion like (hybrid-)electric (already part of Energy theme);
- Alternative fuels (id.);
- Maintenance, Repair and Overhaul (MRO).

End-of-life
- Recycling of materials;
- Reuse of components and systems.

Airports
- Zero emission and zero waste airports;
- Integration of airport infrastructures with community infrastructures.

Airlines
- No waste flights;
- All electric ground operations.

Policy and regulation
- Encourage reuse and recycle projects
- Taxes

Business models
- For airlines (for example, ownership versus lease or co-sharing of aircrafts);
- For airports;
- For manufacturers.

From https://futuresky.eu/themes/circular-aviation/

THE ANNUAL MEETING OF THE EUROPEAN TECHNOLOGY TRANSFER OFFICES (TTO) CIRCLE WAS HELD IN BERLIN ON 29 JUNE 2023

Excerpts from EREA Newletter July 2023

During the 14th meeting of the European Technology Transfer Offices (TTO) Circle in Berlin at the end of June. The TTO Circle is a network established by the JRC, bringing together the technology transfer offices of major Research and technology Organisations in Europe. EREA and the Directorate General for Research and Innovation, European Commission, participated in a round table highlighting on the one hand the importance of strengthening the capabilities of Technology Infrastructures in Europe and on the other hand the need for close cooperation and coordination with EU Member States.

For reaching the goals of carbon neutral aviation in 2050, one key factor is the availability of the right experiment, test and validation facilities or Technology Infrastructures (TIs), which is what addressed Pawel Stezycki, Chair of EREA

The unique collaboration between the European Commission and Europe's leading Research Establishments in aviation was the basis for the panel 'Technology Infrastructures: a New Approach to Sustainable Collaboration with partners' at this TTO Circle Event. EREA Chair Pawel Stezycki and Andrea Gentili, Clean Planet Partnership Manager and Deputy Head of Unit *'Low Emission Future Industries'* at the Directorate-General for Research and Innovation at the European Commission, debated the necessity for European Programme dedicated to Technology Infrastructures.
Concretely, this collaboration brought forward a pilot initiative on Aviation Research and Technology Infrastructures (ARTI), aiming to tackle the most pressing bottle necks in terms of TIs. The work so far has been focused on mapping the infrastructures, making use of EREA's own mapping as well as the results of the RINGO project [1]. The second step is to create a roadmap in order to define the needs in terms of developing new infrastructures or upgrading existing ones. The pilot is expected to run from 2025 to 2027.

Joint investment in facilities is as logical as it is difficult, which why piloting this process is essential. As Pawel Stezicky mentioned, as Research Establishments we are capable of assessing what is needed to reach the goals that are set, but it is important to note that Member States are the key player in making this all happen, as was also observed in the JRC conference and workshop report *'Towards the implementation of an EU Strategy for Technology Infrastructures'*.

[1] *RINGO, project funded under Horizon 2020 under grant agreement No 724102. Research Infrastructures Needs, Gaps and Overlaps for the aviation sector in Europe with respect to fulfilment of the goals specified in 'FlightPath 2050'. http://ec.europa/transport/modes/air/doc/flightpath2050.pdf .*

SUSTAINair – CIRCULAR ECONOMY FOR THE AVIATION AND AEROSPACE SECTORS - SOLUTIONS FOR CIRCULAR AVIATION

https://www.sustainair.eu/

The SUSTAINair project gives aviation sector a runway to transition into a low-carbon competitive economy while tackling the increase in resource consumption, waste and emissions in industries along the entire aviation component value chain.

4R'S OF CIRCULAR ECONOMY: REDESIGN, REPAIR, REUSE, RECYCLE

The waste of high-quality, aerospace-grade materials is one the biggest challenges to sustainable aerospace engineering. SUSTAINair applies circular economy principles to the design, manufacturing, operations and end-of-life phases of aircraft. This includes:

- Circular design of individual components and joining technologies for airframe construction (including morphing);
- Real-time structural health monitoring of materials and joints during operations;
- Improved maintenance and repair technologies to extend aircraft life time;
- Rivet removal demonstrator using robotics and water jet cutting for improved recovery of high-quality aluminium recycling materials.

Explore circular approach to different stages of aircraft life-cycle by clicking on the stage of interest

HYDROGEN-POWERED AVIATION RESEARCH AND INNOVATION

A joint technical workshop was organised on 25-26 April 2023 in Brussels with the participation of Clean Aviation JU and Clean Hydrogen JU in order to discuss the current roadmap in place across both partnerships aiming at accelerating the introduction of hydrogen as energy carrier for aviation. The participants confirmed that hydrogen technologies are seen as potentially plausible and competitive solutions to power commercial aviation and reduce its climate impact from 2035.

Key messages delivered at the technical workshop:
"Hydrogen-Powered Aviation Research and Innovation – Discussing year-2024 priorities for the Clean Aviation and the Clean Hydrogen programmes"

Synergies between the two partnerships are being developed upstream with strategic/programmatic alignment through a Clean Aviation-Clean H2 joint technical roadmap, and downstream with aligned approach during project implementation.
Discussions focused on potential gaps and barriers in the joint technical roadmap, in particular concerning i. aircraft architectures, ii. liquid H2 (LH2) fuel on board, distribution, and storage, iii. H2 burn gas turbines powertrain system, iv. H2 fuel-cell integrated powertrain system, v. refuelling, airport infrastructures and ground operations and vi. safety and certifications.

The participants presented the Clean Aviation/Clean H2 on-going projects on H2-powered technologies, pointing out to several technical challenges, and highlighting gaps and barriers of the technical roadmap at both aircraft and airport infrastructure levels.

The following key recommendations were made at the workshop:

1. Accelerate the H2 technology maturation, integration and demonstration in order to ensure 2035 EIS by increasing **focus on the "Route to TRL6"** in the demonstration phase of Clean Aviation (Phase 2).
2. **Increase alignment between the Clean Aviation partnership, the Clean H2 partnership and Horizon Europe Cluster 5 Work Programme** (WP) at the level of technical roadmap, objectives, activities, targeted maturity levels and timeline of the calls for proposals to maximise contribution of Clean H2 and HE Cluster 5 WP to the Clean Aviation demonstration phase (Phase 2).
3. Gain more understanding on the **climate impac**t of H2-powered aviation emissions (non-CO2 emissions), as it is critical to decision-making process for the down-selection of the concepts to be demonstrated in Clean Aviation Phase 2.
4. **No immediate needs to launch activities on aircraft technologies in 2024** under Clean H2 and/or Clean Aviation partnerships, as the key ones are currently being performed as part of the Clean Aviation and the Clean H2 projects or will soon be launched through the Clean Aviation/Clean H2 2023 Calls for Proposals, in line with the joint technical roadmap, and respective SRIAs.
5. **Urgently initiate R&D on LH2 infrastructure at airports in the 2023-2024 timeframe**, under the Cluster 5 Work Programme 2023-2024 or under the Clean H2 partnership WP 2024. In particular the following topic areas should be addressed:
   a. Large-scale LH2 storage tanks.
   b. Ground-based supply system for LH2 distribution.
   c. Technology and protocols for ground based LH2 refuelling.
   d. New standards and safety/certification (for all items above).
   e. LH2 demand and supply-matching models.
6. Urgently address the **lack of suitable LH2 testing infrastructures/facilities** (e.g. propulsion testing, airport infrastructure testing) for Clean Aviation Phase 2's demonstration and maturation up to TRL6. It was noted that important investments would be required to realise such testing infrastructures which are critical to the demonstration of H2 technologies in Clean Aviation Phase 2.
7. Address the **insufficient access to H2 skilled personnel** – there is a need for specific education and training.

FOR ACHIEVING NET-ZERO CARBON BY 2050 : THE ANTICIPATION OF IATA

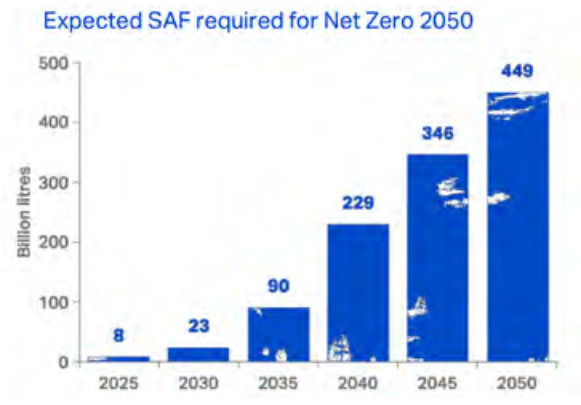
THE INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA) HAS RECENTLY RELEASED A STUDY SHOWING THE IMPORTANCE OF THE SUSTAINABLE AVIATION FUELS (SAF) TO ACHIEVE NET-ZERO CARBON IN 2050. IN EFFECT, IT ESTIMATES THAT SAF COULD CONTRIBUTE AROUND 65% OF THE REDUCTION IN EMISSIONS NEEDED BY AVIATION TO REACH THIS GOAL, WHICH WILL THEREFORE REQUIRE A MASSIVE INCREASE IN PRODUCTION "

WHAT IS SAF?

SAFs are liquid fuels currently used in commercial aviation, which can reduce Co_2 emissions by up to 80%. They can be produced from a number of sources including waste fats, oils and greases, municipal solid wastes, agricultural and forestry residues, wet wastes or non-food crops cultivated on marginal land.They can also be produced syntheticically via a process bythat captures directly from the air SAFs can can be considered 'sustainable', as they their sources (feedstocks) do not compete with food crops or output, nor require resource usage such as water or land clearing, and more broadly, do not promote environmental challenges such as deforestation, soil productivity less or biodiversity loss. Whereas fossil fuels add to the overall level of CO_2, by emitting carbon that has been previously locked away, SAF recycles the CO_2 which has been absorbed by the biomass used in the feedstock during the course of its life.

CONTRIBUTION OF SAFS TO ACHIEVING NET-ZERO CARBON IN 2050

The here below figure shows the 65% estimation of SAFs' contribution to achieving net-zero carbon emissions by air transport at 2050 time horizon. It can be observed that the other sources of contribution are relatively small:



Expected SAFs required for Net-Zero 2050

Offsetting.carbon capture **19%** - New technologies (like hydrogen powered aircraft) **13%** - Infrastructures/operations efficiencies like flight routing **3%**.

This will require a massive increase in production as *figure 2* shows. The largest acceleration is expected in the 2030s: as policy support becomes global, SAFs become competitive with fossil kerosene and credible offsets become scarcer.

THE STATE OF SUSTAINABLE AVIATION FUEL (SAF) IN 2023

[Table] Source IATA 2023 estimates

LATEST MILESTONES CONCERNING SUSTAINABLE AVIATION FUELS IN PRACTICE

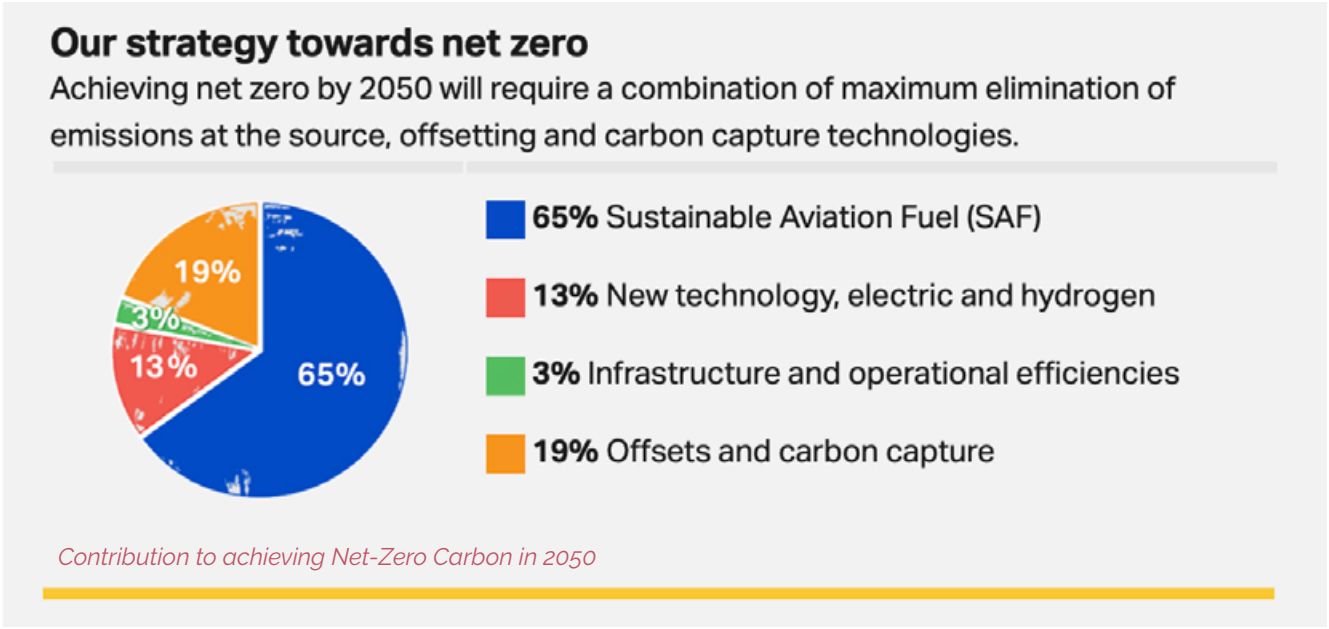
- June 2017: at the 73rd IATA AGM in Cancun, IATA members agreed a resolution on the deployment of SAFs;
- November 2019: commercial flights exceed 250,000 and more than 45 airlines gain experience using SAFs;
- October 2021: the 77th IATA AGM in Boston approved a resolution for the global air transport industry to achieve net-zero carbon emissions by 2050. This commitment is in line with COP21 Paris Agreement goal for limiting global warming well below 2°C. A potential scenario is that 65% of this will be abated through SAFs;
- October 2022: at the 41st ICAO Assembly, adoption of a Long Term Aspirational Goal (LTAG) to achieve net-zero CO2 emissions by 2050.
- 2022: SAF production tripled to 300 million liters from 100million liters in 2021.

THE IATA'S STRATEGIC ACTION PLAN

- **Industry actions**

The Air Transport Action Group (ATAG) study examines the potential of different decarbonisation options.

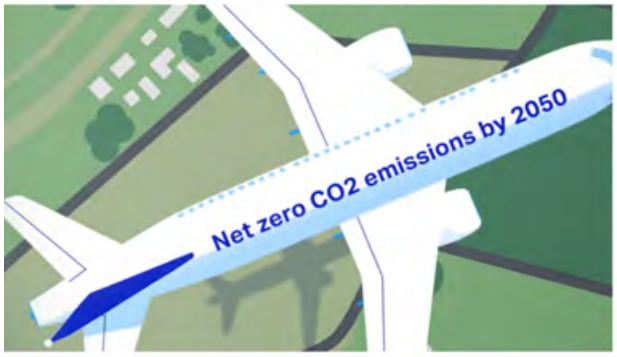
Provide industry leadership and publicly available gui-



Contribution to achieving Net-Zero Carbon in 2050

dance material on best practice concerning sustainability standards, accounting procedures, logistics, communication, effective policy and business case development.
Influence policy negotiations to ensure aviation can opt into existing ground transport policies, and in some cases, have aviation preferentially incentivized to use SAFs?
Industry is working on adopting best practices for globally recognized Book & Claim systems.

• Role of governments
To develop policies that efficiently accelerate the commercial production and deployment of SAFs.
Through the adoption of the Long Term Aspirational



> Click to the picture to see the website

Group (LTAG), governments share the same target for aviation's decarbonisation ans interst in the success of SAFs and need to put in place comprehensive policies and incentives for SAFs.

• For more information, refer to IATA's SAF Policy paper
• The USA and the EU are pursuing different approaches to SAF policy development: see factsheet

THE CHALLENGE OF LONG-HAUL FLIGHT DECARBONISATION: WHEN CAN CUTTING-EDGE ENERGIES AND TECHNOLOGIES MAKE A DIFFERENCE?

THIS IS THE SUBJECT DEALT WITH IN THE EUROCONTROL THINK PAPER ISSUE #21

Decarbonising long-haul flights – which currently account for over 50% of all aviation CO2 emissions from the EU27+UK area, despite making up only 10% of flights – is both a high priority and a massive challenge.

And almost 90% of these CO_2 emissions are produced by widebody aircraft.
While sustainable aviation fuels (SAFs) and operational air traffic management (ATM) improvements offer a clear path to reducing emissions, here we assess whether game-changing technologies, such as batteries, fuel cells, hydrogen, methane, ammonia or solar energy, could make a difference – and if so, when.
We take a hypothetical widebody flying from Paris to Singapore to analyse how much time, energy and cost it would take to perform that flight, and what that would entail in technical terms, for each new technology.
We find that in each case it will take several decades before any of these technologies could be adapted to power a widebody flying long-distance.
Therefore, to decarbonise long-haul flights, it is of vital importance to make real progress now on other technological and operational solutions. This includes in particular a massive increase in SAF supply/usage and the need to move forward with fleet renewal – all of which, as we will be exploring in our next Think Paper, pose their own challenges.

"Helping aviation achieve its challenging decarbonisation goals is a key priority for EUROCONTROL, and analytical studies like this play a key role in highlighting the challenges ahead – and indicating ways in which the sector can advance. This Think Paper shows how game-changing technologies have huge potential but, for now, are far from being able to make that decarbonisation breakthrough – which highlights the need in parallel to advance on SAF usage, fleet renewal and ATM improvements such as optimised trajectories."

Raúl Medina
DIRECTOR GENERAL EUROCONTROL

Just under 10% of flights from the EU27+UK area are longhaul (i.e. flying more than 3,000 km), but these account for over 50% of all aviation CO2 emissions – and if no major progress is made, over 60% by 2050. This makes decarbonising long-haul flights both a high priority, as aviation looks to slash its carbon footprint, and a massive challenge where almost 90% of these CO2 emissions are produced by a few heavy aircraft families, such as the B777, the A380, the B747, the A330, the A340, the A350 and the B787.
Much has been said about the urgency of ramping up the production and use of sustainable aviation fuels (SAFs), which indeed – along with operational improvements – offer a clear path to reduce quickly emissions.

But what about truly game-changing technologies such as batteries, fuel cells, hydrogen, methane, ammonia or solar energy? This paper takes a hypothetical scenario – a large widebody flying from Paris to Singapore – and assesses how much time, energy and cost it would take to perform that flight, and what that would entail in technical terms, for each new technology.
The answer in each case is that we are, unfortunately, a long way from being able to use any of these technologies before several decades for any large-size aeroplane.

Therefore, to decarbonise long-haul flights, it is imperative to also advance on other technological and operational solutions, in particular massively increasing SAF supply/ usage and fleet renewal – which, as we will be exploring in our next Think Paper, poses its own huge challenges.

EUROCONTROL

Think Paper #21 – 22 August 2023

KEY FINDINGS

- **Electric batteries** in their current form would make a long-haul flight too heavy to take off. Only a massive step-change in battery density, nearly tripling the energy density every decade for the next three decades, could solve this challenge.

- A large aeroplane using **liquid hydrogen combustion** would be able to take off and land, but a large cryogenic tank and supporting infrastructure is lacking. An LH2 combustion aircraft would also produce significant contrails that would need to be further studied. Using fuel cells would further increase the cost and take-off weight.

- Flying using **liquid methane** would enable a wide-body to take off and land. It poses a number of technical challenges and high cost, even if the necessary infrastructure is closer to being ready.

- **Ammonia** produced from green hydrogen is deemed a promising hydrogen carrier. Nonetheless, its use would lead to an excessively heavy long-haul aircraft.

- To have enough **solar panels** to power an A380, you would need to cover the plane – and add at least 7.4km of panels behind, making this the least practical solution of all.

- All of these solutions would require **colossal amounts of electricity** to generate the required power. To decarbonise all EU27+UK long-haul traffic by 2050, aviation would need between a net square of 24 km to 35 km of solar photovoltaic panels at the average EU solar irradiance 3.98kW/m2/day, or 2,853 to 6,374 offshore 20-MW wind turbines or 10% to 23% of all EU electricity.

- The **level of decarbonisation depends** largely on the **carbon intensity of electricity** used during the entire process **from well to wake.** Wind-generated electricity shows a remarkable $CO_{2\text{-eq}}$ reduction of -79% to -96% compared to conventional jet fuel. Photovoltaic electricity may have a slight decrease in CO_2-eq reduction efficiency, ranging from +7% to -69%. Utilising **coal-sourced electricity** for flying using these solutions could **increase the $CO_{2\text{-eq}}$ emissions by 3 times (for battery aircraft) to 11 times (for liquid hydrogen fuel cell aircraft)**.

GEESE: HOW MIGRATING BIRDS ARE INSPAIRING MORE SUSTAINABLE AVIATION

SESAR partners are joining forces to test wake energy recovery (WER) in order to optimise fuel use and reduce CO_2 emission. Gain Environmental Efficiency by Saving Energy (GEESE) is a new SESAR industrial research project funded within the framework of the Digital European Sky, which will map out how to enable WER operations for transatlantic and continental flights.

© SESAR 3 Joint Undertaking

Migratory birds such as geese often fly in formation to save energy by taking advantage of the changed airflow in each bird's wake. Like a bird, a moving airplane leaves a wake of disturbed air, creating an updraft that allows thea following aircraft to cut down on engine thrust, fuel use and emissions.

Led by Airbus, the EUR 10 million project funded by Horizon Europe and industry will bring together a range of stakeholders, including Eurocontrol, DSNA, Air France, On, Indra, ENAC, DLR, AirNav, Bulatsa, CIRA, UAB, Frequentis, Boeing, French Bee, NATS, Virgin and Delta Airlines, to investigate how to introduce WER into air traffic operations.

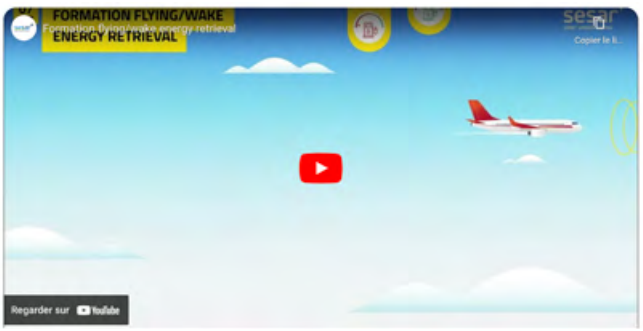
Specifically, the project will elaborate an initial concept of operations (CONOPS) to enable Europe to North Atlantic WER operations, analysing safety aspects and the impact on legacy systems. The project will also provide operational solutions for the extension of WER operations within European domestic airspace. As an enabler to operations, the project will investigate non-CO_2 potential benefits of formations, in addition to better known CO_2 benefits.

WER sees a pair of aircraft flying in formation, one around 1.5nm (3km) behind the other, allowing the trailing jet to benefit from the lift generated by the preceding aircraft's vortices, reducing the thrust required from its engines. The initial modelling suggests airlines could save between five and ten per cent of fuel per trip.

The project will make use of a fast- and real-time simulation platform, feeding it with operational data, in order to mimic live operations and prepare for a series of dry run test flights. Airline partners will work together to update their flight plans to find suitable aircraft to pair, taking into account routing and other considerations.

Critical to its success is that both Boeing and Airbus have joined forces on the project, thereby ensuring that the concept of operations is aligned across manufacturers and interoperability can be achieved for different aircraft types. Equally critical is the participation of air navigation service providers, such as DSNA, Bulatsa and NATS, given the importance of making WER operational feasible from an air traffic control perspective. In addition to the fuel-saving – and CO_2 emissions reduction – the benefits of the WER it could also have a positive impact on contrail formation. This will be assessed by project partner DLR at its aerospace research institute.

Read press article



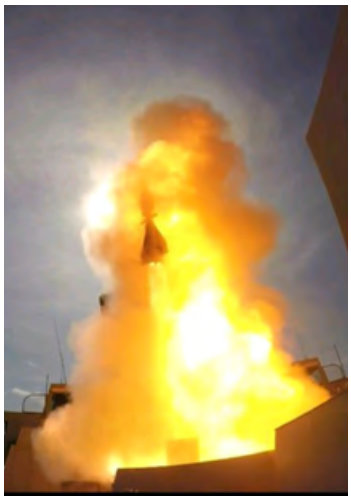
THE FSAF-PAAMS PROGRAMME: INTERVIEW WITH FRANCIS CELESTE, PROGRAMME MANAGER AT OCCAR

Could you remind us in a few words of the historical background of FSAF-PAAMS programme?

- Future Surface to Air Family (FSAF) is a programme launched in 1989 around the Aster interceptor missiles for the Franco-Italian development of the ground-based Air Defence System (SAMP/T) and naval-based Air Defence System (SAAM). The United Kingdom joined France and Italy in the naval domain in 1999 for the PAAMS programme to equip the 6 Type-45 destroyers as well as the 4 Horizon class frigates with an additional protection capability. Both programmes were integrated in the OCCAR portfolio in 2001. More recently, FSAF-PAAMS introduced the CAMM-ER missile capabilities for Italy.

I would like now to review together with you the status of the successive phases of the programme:
i) phase 1 Feasibility study;
ii) Phase 2 Development;
iii) Production of firing section
deliveries to the customers;
iv) In Service Support.

- More than 1000 missiles were produced, 12 SAMP/T sections and 12 flagships equipped for the benefit of the French Air Force, French Navy, Royal Navy, Italian Navy and Italian Army. Recently, the Italian Air force joined the community with the goal of renewing ground capabilities SAMP/T (SAMP/T NG programme). OCCAR-EA/ FSAF-PAAMS manages the In-Service Support of the delivered systems, their Mid-Life Renovations and manages the capability evolutions offered by the Aster 30 Block 1 New Technologies (B1NT).



Aster 15 missile fired in October 2023 from FREMM Alpino frigate © Italian Navy/CSSN

The CAMM-ER production contract was signed in the end of 2022. What are the main objectives of CAMM-ER and their customers? What is the present status of advancement of this contract?

CAMM-ER Surface to Air project aims to provide a Short Range Air Defence (SHORAD) fulfilling Italian Army and Air Force needs and requirements. Following the signature of the production contract in 2022, OCCAR-EA is managing the programme, which is on track.

May I ask you the top priority action you plan to conduct in the coming months?

- Our main goal is to meet the end user´s requirements. Among the key objectives, the qualification of Aster 30 B1 NT including its firing on a test range is a very important milestone.

Launch module of ground-to-air system (SAMP/T) deployed in Spain on February 2022. © Sébastien LAFARGUE / armée de l'Air et de l'Espace

EDA TO SUPPORT TWO FURTHER PESCO PROJECTS IN THE AIR AND MARITIME DOMAINS

The European Defence Agency (EDA) will support two new projects developing the next generation of systems for European defence under the Permanent Structured Cooperation (PESCO) initiative. In the air domain, the Next Generation Small RPAS (NGSR) project will pave the way for an advanced unmanned aerial system (UAS) prototype by 2027, while in maritime, the Essential Elements of European Escort (4E) project, sets out to identify and detail the essential elements of future surface warships within the EU from 2030 to 2045. EDA's Steering Board recently approved the launch of specific EDA ad hoc projects for both, following a request from the participating Member States (pMS) involved.

NEXT GENERATION OF TACTICAL UNMANNED AERIAL SYSTEMS – TOWARDS A PROTOTYPE

The goal of this project is to develop a new generation of tactical UAS with versatile capabilities. It aims to serve various purposes, such as supporting army units, maritime and air operations, and civilian activities. The war against Ukraine demonstrates the importance of persistent surveillance provided by unmanned systems. The UAS will be designed to be adaptable to different mission requirements and will incorporate autonomous features to ease pilot and operator workload. NGSR project is led by Spain, in collaboration with Germany, Slovenia, Portugal, Romania, and Hungary.

Running for four years, EDA's NGSR 'Category B' Project has a twofold objective. Firstly, it aims to harmonise the requirements among pMS, ensuring a unified approach to the UAS's development. Secondly, the project will support the development of the prototype through a contract with industry.

The tactical UAS that will be developed under this project will meet common requirements and be versatile enough to undertake various missions, ranging from high-intensity conflicts to peace enforcement and support to civilian authorities. It will have the ability to take off and land without a runway, cover medium ranges (up to 200 km), and sustain missions for 5-10 hours. The use of advanced technology will allow for flexibility, modular payloads, and interoperability to maximise effectiveness.

To facilitate the smooth execution of the project, EDA will play a crucial role. The Agency will provide overall coordination, administration, and management of the project. Furthermore, the EDA will lend its expertise to the requirements developed by pMS, supporting their harmonisation. The Agency also stands ready to facilitate the engagement with industry based on pMS requirements.

In addition, the EDA will negotiate, conclude, and manage the contract with the industry on behalf of the pMS, ensuring timely reporting and payments throughout the project's duration. The Agency will work closely with the pMS and industry to coordinate the development of the prototype. By offering next generation ISR capabilities, the NGSR project aims to improve crisis response capabilities and enhance the effectiveness of European armed forces in various operational environments.

PESCO: Permanent Structured Cooperation:
https://www.pesco.europa.eu/about/

CARBON DIOXIDE MONITORING: INTERVIEW OF VALÉRIE FERNANDEZ BOULANGER, CO2M MISSION MANAGER AT ESA/ESTEC

By Anastasia Pesce, ESA Lead Engineer Product Quality and CEAS Space Branch member

Could you give us in a few words your background and experience?

Following a PhD in Signal theory and working in space business as detection chain Engineer for Thales Alenia Space, I joined the European Space Agency (ESA) in the same role in 2005 and started to work for the Sentinel-2 Project (part of Copernicus first Generation) from its ITT preparation up to the successful launch and commissioning of the first 2 A/B satellites. I have then continued my career as a Payload manager in the Sentinel-2 C/D series development. That period coincided with the European Commission's need to expand further the capabilities of the Copernicus program, and where CO2 Monitoring (CO2M) emerged. I coordinated the team from its start to establish the CO2M technical requirements necessary for the overall space and ground system development and was selected as ESA CO2M project manager end of 2019 to run the development of the mission up to commissioning.

TELL US ABOUT THE CO2M MISSION

The Copernicus Carbon Dioxide Monitoring mission, or CO2M mission for short, is one of six Europe's Copernicus Sentinel Expansion missions that will be the first to measure systematically all around the world, how much carbon dioxide is released into the atmosphere from human activity. Although measurements on the ground have made it possible to track general changes in the carbon dioxide content of the atmosphere, it is not possible to make reliable statements about anthropogenic emissions from individual countries or even individual regions and cities. The new space-based measurements will enhance the overall observability with global comparison and seasonal evolutions.

What is the status of the mission development?

The CO2M development phase started in August 2020 and has followed the requirements consolidation and the preliminary design steps. We entered the C-phase in May 2022 with the consolidation of the design and now we have reached the review milestones for the payload that starts in October 2023 and the overall space segment CDR planned in March 2024. We have been working since the Kick-off with a very challenging and tight schedule that has required us to advance the manufacturing of the flight satellite structure, now assembled, and with the tank unit under integration. Most of the flight hardware is in its manufacturing steps or final tests before delivery to the satellite or payload prime for starting assembly.

Figure 1: The Copernicus CO2M (Carbon Dioxide Monitoring) mission is one of Europe's new high-priority satellite missions and will be the first ***to measure how much carbon dioxide is released into the atmosphere specifically through human activity*** *(image credit: OHB)*

What are the new elements and technology challenges of the CO2M mission?

This mission is composed of 3 instruments with two of them (CO2I and MAP) being completely new development while the cloud imager is based on an existing design from the Proba-V instrument. With the schedule constraints, the approach was to consider already achieved (TRL5/6) technologies like for example the SWIR (Short-Wave Infrared) detectors of the CO2I spectrometer that were developed for Sentinel-5 payload and were under qualification at the start of the project. The control of reliable manufacturing and minimizing defects has been a challenge, now successfully achieved with the first flight units available. But some new technology developments were required to reach the stringent spectral performance and accuracies of the CO2I, like a large tri-Babinet scrambler to cover the required field of view or the 2-dimensional slit homogenizer composed of more than 100 carbon fibers. On the polarimeter side, the focal plane also embarked on a new development that piles up detector pixels, micropolarisers, and filters of micron size. The stacking and the overall alignment process being repeated over 1 million pixels of 4 detectors makes the overall focal plane very challenging to get on time.

What are the milestones coming up for your team/ project?
While the project team prepares the CDRs, there are also other milestones for the CO2M mission that we are mastering closely in particular the ones related to the launcher. We have kicked off our contract with Arianespace for VEGA-C in February 2023 and we are now progressing toward the preliminary mission analysis review (PMAR). The payload PFM AIT is also now under preparation in parallel of the CDR with the intention to start in January 2024.

What are the next big challenges for the mission?
Like for all satellite development, the manufacturing of the flight hardware is a period of truth with sometimes delicate decisions to mitigate "design for performance" versus schedule delays. The balancing to be done between risks and costs while maintaining confidence in the work from the industry requires a daily and continuous follow-up of our team. Maintaining comprehensive communication among the parties is key to reaching adequate decisions.

What are the CO2M performance analyses remaining to be achieved?
The developments of the instruments and the platform unit subsystems have considered engineering models (BB/EM/OM/STM) before going to a proto-flight model. These de-risking programs were considering measurements that relate to optical, radiometric, and spectral features but also structural and thermal behaviors of electronics or optical units. Once successfully completed, these programs will support the authorizing of the flight units' production. Now we are completing the EM/OM program at the instrument level and platform level. They are elements that consolidate the mechanical and thermal models but also prepare the operational verification of the satellite. All these analyses are important to have to consolidate the overall design for the CDR.
The next step of analyses will come along the AIT campaign when sets of performance will be generated with the first step at sub-assembly of the instrument level (optical spectrometer, detections chains, MAP camera, etc.) to confirm the major parameters necessary to generate the set of end-to-end on ground performance before flight.

How do you feel as CO2M gets so close to its launch date?
Developing a satellite is a beautiful work that encompasses engineering, team management, and leadership. When progressing towards a launch, it is always with the satisfaction of reaching the reason why we made all these efforts.

CEOS esa **THE CEOS DATABASE**
Updated for 2023

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Instruments | Table | Index
Measurements | Overview | Timelines
Datasets | Activity
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CEOS EO HANDBOOK – MISSION SUMMARY - Sentinel CO2M-C

Full Name	CO2M-C	**Status**	Planned
Mission Agencies	ESA, COM, EUMETSAT	**Launch Date**	2026
Mission Links	mission site	**EOL Date**	2034
EO Portal Info		**NORAD Catalog #**	
		International Designator	
Orbit Type	Sun-synchronous	**Orbit Period**	99.5 minutes
Orbit Sense	Descending	**Orbit Inclination**	97.7 deg
Orbit Altitude	735 km	**Orbit Longitude**	
Orbit LST	11:30 (at DN)	**Repeat Cycle**	11 days

Objectives and Applications To provide Copernicus with a CO2 monitoring and verification support capacity, capable of estimating anthropogenic CO2 emissions at country and megacity scales.

Mission Measurements

Category	*Parameter*	*Instrument(s)*
Atmosphere	Aerosols	MAP
	Cloud type, amount and cloud top temperature	CLIM
	Trace gases (excluding ozone)	CO2I

Mission Instruments
CLIM - 3-band CLoud Imager
CO2I - Integrated CO2 & NO2 Imaging spectrometer
MAP - Multi-Angular Multi-band Polarimeter

OpenSearch Datasets *No IDN OpenSearch datasets found.*

Want to explore more? Try FedEO by ESA or CMR OpenSearch by NASA

Space project life is full of surprises that do not allow you to get bored! I feel privileged to have been there from the early days of the CO2M mission made by industry 5 years ago. Getting closer to the launch is to get closer to CO2M supporting the climate change actions. Every step made with Industry is with a challenge to get the mission ready on time. It is exciting and at the same time allows me to be proud of the project team's achievements. It is tough for all of us but possible because of the unprecedented results that the CO2M mission will be able to generate!

What are your greatest hopes for the mission?
It is a mission directly connected to one of the critical topics discussed worldwide: climate change impacts. This is even more important that the observations from this mission are known from the public who does not understand space work. I expect that the CO2M mission will bring capabilities to generate key information for decision-makers that can be translated into actions that are urgent to take to safeguard our blue planet.

What are the next big challenges for the mission after launch?
Before reaching the routine phase, the satellite will be in 6 months period of commissioning. The ESA project team will lead this period to confirm that all performances that were measured on the ground are also there in orbit. It is a period where some assumptions and estimates will have to be confirmed and where expected operational concepts are in line with the tests made on the ground. When the in-orbit commissioning review is reached, the team will surely feel better!

What do you see as the challenges to overcome for you and your team?
One of the major challenges was to start this contract including negotiations in the middle of the COVID time when only distancing work was allowed. It was difficult to build a team spirit and maintain an adequate flow of information. The challenge was also related to being sure that everyone was with the level of understanding it should and not left aside. Now I appreciate being back on site, with the chance to address fast the daily news and have direct contact to feel the beat of the team mood.

You have been working in ESA for 18 years. How would you say your experience at ESA is helping you in your job?
Working for the Agency for nearly 20 years has given me the chance to grow in a privileged environment with the possibility to manage people from very different horizons, with different views and ideas. This has been an important contributor to built-up experience and to develop methods to convince and support internal and external teams in front of difficulties. In addition, working for the Agency as a project manager is to be at the crossroads of decisions with internal, industrial, and political stakeholders that would need to be understood and fed with relevant inputs. It stimulates and brings a lot of understanding of the end-to-end chain of communication. It becomes key when decisions must be made fast and to keep confidence in our daily work.

Anastasia.Pesce@esa.int
Valerie.Fernandez@esa.int

CO2M QUICK FACTS

Mission type	EO
Agency	ESA, COM, EUMETSAT
Mission status	Approved
Launch date	2025
End of life date	2034
Ref: CEOS EO Handbook	See CO2M (Carbon Dioxide-Monitoring) Mission summary

References:

[1] *https://www.esa.int/Applications/Observing_the_Earth/Copernicus/Full_steam_ahead_for_carbon_dioxide_monitoring_mission*
[2] *https://www.eoportal.org/satellite-missions/co2m#development-status*
[3] *https://www.eoportal.org/satellite-missions/co2mThe CO2M Copernicus (Carbon Dioxide Monitoring) Mission*
[4] *See CO2M (Carbon Dioxide Monitoring) Mission summary*

ABOUT STARSHIP

SPACEX SAID IT HAS IMPLEMENTED ALL 57 ACTIONS REQUIRED FOR THE NEXT FLIGHT, AND COMPLETED ITS INVESTIGATIONS.

This summer SpaceX did dramatic engine fires of Starship to prepare for the next flight.
BUT, the U.S. Federal Aviation Administration (FAA) cautioned in late September that the required regulatory processes for addressing issues on the first flight is not yet complete. In addition, FAA has not yet awarded a license for the second launch. And furthermore, SpaceX also needs to receive environmental approval from the U.S. Fish and Wildlife Service.
Once these key items are taken care of, SpaceX will likely launch quickly. Elon Musk says that Starship is ready to go, from a technical standpoint.

Figure 1: SpaceX founder Elon Musk. Image credit: Michael Gonzalez/Getty Images

Related: SpaceX to launch next Starship test flight 'soon', Elon Musk says (photos)
Flight 2, the upcoming Starship launch, will include key changes Space X recently implemented to Starship. For example, the company aims to to "hot stage" the system, meaning that Starship will light its second stage engines before the vehicle(s two stages have fully separated.

"I would say that it is the riskiest part of the flight. If the engines light and the ship does not blow itself up during staging, then I think we have got a decent chance of reaching orbit", Elon Musk said. Presuming that happens according to plan, Starship will make less than a complete orbit to Earth ans splash down in the Pacific off the coast of Hawaii,
The next key test in-flight will be the heat shield, so far untested.

https://www.space.com/spacex-elon-musk-starship-expectations-second-flight?utm_term-BOB4

Figure 2: SpaceX's fully stacked Starship vehicle stands on the orbital mount at the Starbase site in South Texas – 30 September 2023 – Image credit: SpaceXGonzalez/Getty Images

ARTEMIS II LAUNCH DATE: NOVEMBER 2024

LOCKEED MARTIN, NASA WORKING AROUND THE CLOCK TO FINISH ARTEMIS II ASSEMBLY AND HOLD NOVEMBER 2024 LAUNCH DATE

The Orion spacecraft for the Artemis II mission is nearing final assembly and testing at prime contractor Lockheed Martin's Kennedy Space Center (KSC) production facility. After a final standalone test on the Orion crew module (CM), it is expected to be mated to the service module (SM) in mid-September. If there are no problems in the remaining months of testing, Lockheed Martin believes they can complete their work by the end of April next year.

NASA is planning Artemis II as a week-and-a-half long, lunar-flyby mission; it will be the first crewed test flight for Orion and the Space Launch System (SLS) and the four-person astronaut crew recently visited KSC together for the first time to see their spacecraft. With major hardware like Orion and the SLS Core Stage not yet completed, the space agency is retaining its late November 2024 launch forecast as a "work to" date, although the pace of work is currently "a number of weeks" behind that forecast.

Crew and service modules scheduled to be mated for flight in September

NASA and Lockheed Martin hosted a media event on Aug. 8 in the Neil Armstrong Operations and Checkout (O&C) Building at KSC. Assembly and testing of Orion spacecraft are conducted in the high bay and low bay of the facility in what is called the industrial operations zone (IOZ).

To know more:

- https://www.nasaspaceflight.com/2023/08/orion-update-081523/

Factsheet

- https://en.wikipedia.org/wiki/Artemis_2

ARIANE 6 JOINT UPDATE REPORT, 21 SEPTEMBER 2023

The Ariane 6 Launcher Task Force consists of top management at ESA, the overall Ariane 6 procuring entity and launch system architect, launch base prime contractor and French space agency CNES, launcher system prime contractor ArianeGroup and launch service provider Arianespace. This group reports regularly on progress being made towards inaugural flight of the new Ariane 6 launcher.

KEY MILESTONES TOWARDS INAUGURAL FLIGHT:

• 1 September 2023: Upper stage hot firing test, Lampoldshausen, Germany.
The data from the test at German aerospace agency DLR's test centre is now analysed and shows excellent results. The test of the stage included more than 11 minutes (680 seconds) of operation of the Vinci re-ignitable engine in two boosts, including two boosts of the Auxiliary Power Unit (APU) in parallel with the operation of the Vinci engine. Analysis showed a very good operation of the two engines at the same time – which plays an essential role in the versatility and restarting capability of the Ariane 6 upper stage.

• 5 September 2023:Combined tests, hot firing test of the main stage with Vulcain 2.1, Kourou, French Guiana.
A Wet Dress Rehearsal with the combined test launcher's specimen installed on the Ariane 6 launch pad in Kourou, French Guiana, was successfully completed. The Vulcain 2.1 engine was ignited and fired for four seconds before being shut down by the on-board software as planned. This test made it possible to validate the sequence of checks carried out before the solid booster ignition and a liftoff of Ariane 6.

This test was a major milestone in the combined tests campaign. It contributes to qualification of the launch sequence operations and engine ignition on the launch pad, and to qualification of the launcher. The test demonstrated the excellent maturity of the operational organisation and means.

NEXT MILESTONES:

Combined tests, long-duration hot firing of the main stage with Vulcain 2.1 engine, Kourou, French Guiana.
Similar to the previous one, this test will end with about eight minutes (470 seconds) of firing of the Vulcain 2.1 engine, representing the entire flight phase of the core stage.
During a normal procedure in preparation of the stage for the test, an anomaly was detected affecting the hydraulic group of the thrust vector control system. The role of the thrust vector control is to maintain the launcher's attitude by gimballing the Vulcain 2.1 engine during flight. Further investigations are necessary before running this long-duration hot firing test, which can no longer take place on 3 October. The task force will provide an update when the conclusions of the investigation are known.

As per standing plan, the Ariane 6 inaugural flight launch period estimate will only be given when the combined long firing test will have been carried out and the test results analysed.

End-2023: Upper stage hot firing test, Lampoldshausen, Germany.
Further hot-firing test of the upper stage is planned to examine stage behaviour in degraded cases.

Ariane 6 is an all-new design, created to succeed Ariane 5 as Europe's heavy-lift launch system. With Ariane 6's upper stage restart capability, Europe's launch capability will be tailored to the needs of multiple payload missions, for example to orbit satellite constellations. This autonomous capability to reach Earth orbit and deep space supports Europe's navigation, Earth observation, scientific and security programmes. Ongoing development of Europe's space transportation capabilities is made possible by the sustained dedication of thousands of talented people working in ESA's 22 Member States.

THE ELECTORAL MEETING OF THE EUROAVIA CONGRESS – EMEAC

By Irina Stoican and Elena Tonucci

As the European Association of Aerospace Students, EUROAVIA represents more than 3000 students from 42 universities in 18 countries. Founded in 1959, EUROAVIA aims to be the bridge connecting companies, universities, and students.

OUR VALUES

By promoting a set of shared values centred on teamwork, equality, cultural awareness, innovation, hard work, and international networking, EUROAVIA seeks to develop both present and future leaders. As a non-profit and apolitical organisation, EUROAVIA is managed entirely by volunteer students. The values of the association are clearly reflected through our objectives, defined as such:

- Promoting European cooperation in the aerospace field by providing opportunities for our members to meet, exchange and learn at all levels.
- Representing internationally European aerospace students.
- Acquainting student members with their future working environment by stimulating contacts with the industry.

THE ELECTORAL MEETING OF THE EUROAVIA CONGRESS TOOK PLACE FROM 3 TO 7 APRIL 2023

■ First Day of the Congress – 3rd of April 2023

EMEAC stands as a crucial General Meeting within EUROAVIA, gathering the International Board, Local Group representatives, and International Working Groups. It serves as a platform for in-depth discussions on the association's future.

The primary goal of an EMEAC is to appoint the new officers for the Designated International Board (DIB).

However, numerous important activities and discussions are carried out during the Congress, often holding significant importance for the association's future. Over a span of six months, the DIB officers meticulously develop the Business Plan and the Financial Plan, pivotal documents that outline EUROAVIA's operations for the upcoming Business Year.

This year's EMEAC was hosted in **Bremen (Germany)** from the **2nd to the 8th of April 2023.**

In October 2022, the International Board began its activity, and for this year as well, the association enjoyed a **full female leadership**. For the Business Year 2022-2023, EUROAVIA was led by Irina Stoican (Romania) as President, with Victoria Prieto (Spain) as Vice-President, Francesca D'Aversa (Italy) continuing as Secretary, while Chiara Pennuti (Italy) taking on the role of Treasurer and Andrea Hidalgo (Spain) of Executive Member.
Andrea Hidalgo took over the role of Acting Treasuer in February 2023, after Chiara Pennuti resigned due to personal reasons. Therefore, in the first day of the EMEAC, Chiara's exoneration was voted by the members of the Congress, and Andrea **was approved as Treasurer** for the remaining time of the Business Year.
The first day covered more than just this. During the Parallel Session, the Local Groups were divided into four separate groups. Here, they had the chance to delve

Figure 1: Electoral Meeting of the EUROAVIA Congress (EMEAC) held in Bremen (Germany) in April 2023.

deeper into each other's work. Each Local Group showcased their local projects and activities, encouraging a space for questions and mutual inspiration.

Figure 2: The International Board 22-23, from left to right: Andrea Hidalgo (Treasurer), Victoria Prieto (Vice-President), Irina Stoican (President), Francesca D'Aversa (Secretary)

In this EMEAC, EUROAVIA also welcomed two Affiliated Societies. Following their presentations and the positive outcome of the voting, **PAS Oeiras** (Portugal) and **PAS Samsun** (Turkey) joined our family. Sadly, PAS Stockholm was dismissed due to lack of members to carry on the local activity, and PAS Kyiv entered in a stand-by process due to the ongoing war in Ukraine.

■ **Second Day of the Congress – 4th of April 2023**

At the EMEAC, the International Board provided comprehensive updates on the activities done in the first half of the Business Year. This was done through the presentation of the **Business** and **Financial Midterm Reports.**

The Business Midterm Report was structured into three key sections: projects, Working Groups, and collaborations with external partners.

This presentation included technical projects such as the **Air Cargo Challenge 2024, Airbus Sloshing Rocket Workshop, PACE Contest,** the new engineering challenge **Ideathon** and the second edition of the online networking event **Future & Beyond.** Additionally, a new event called **InSpace** was organised for the first time this year. The discussion also extended to the **European Grants projects**, internal activities such as the **EUROAVIA Mentoring Programme AS Roundtables, WG Open Days**, and the **EUROAVIA Database**.

To close the congress, it was time for the **Open Space Session**. The representatives of the Congress were divided into teams and discussed effective solutions for the three following issues inside EUROAVIA. The first topic involved **local and European grants**, the second was regarding h**ow to search for sponsors for International Events**, and the third was about **how to improve local and international participation**. A presentation was held during the last day of the Congress, summarizing the solutions found by the EUROAVIA members.

■ **Third Day of the Congress – 6th of April 2023**

After a free day for the city tour and the sponsors presentation, the time for the election of the candidates came. This year, two EUROAVIAns expressed their intention to take over the responsibility of managing the association and presented their ideas to the Congress.

The first candidate was **Pavitarpal Singhlitt** (Germany), also known to the members as Pav. He comes from AS Aachen, which he joined back in 2018. He decided to run for a position in the DIB to share his experience with new members and give back what he has learned during his path in EUROAVIA. He has a lot of **experience**, and he has a deep knowledge of the association and the **people involved** in it.

Figure 3: The Designated International Board Officer for 2023-2024, Pavitarpal Singhlitt

The second candidate was **Mara-Alessandra Gogiu** (Romania). Mara comes from AS Bucharest, and her motivation to run for a DIB position is trying to do her best to improve EUROAVIA. Her ideas included organizing **professional training sessions** and team-building activities for the members of the WGs, as well as getting more **feedback** from current members to improve the current activities.

After their presentations and an extensive round of questions from the LG representatives, the Congress voted and decided to accept **Pavipartal Singhlitt** as **DIB Officer.**

■ **Fourth Day of the Congress – 7th of April 2023**

The last day of the Congress was focused on a discussion regarding the creation of a 5-year plan. The congress voted to give its support to the IB towards the creation of a **5-year plan to shape the future of EUROAVIA in the long term**. In fact, organizing activities and starting time-consuming projects is extremely difficult when the IB changes every year. This plan would therefore serve, as many associations and companies already do, to give a general direction and a scope to the EUROAVIA activities, in order to reach ambitious objectives in the long run.

EUROAVIA is grateful for the **amazing job** that the members of the Local Groups and International Working Groups are doing, for all the **amazing ideas** shared during the EMEAC 2023 and for the future plans that are built from **a mutual effort and dedication.**

EUROAVIA: THE END OF A BUSINESS YEAR

By Irina Stoican

Continuing our legacy, this year saw the successful execution of notable initiatives like the Airbus Sloshing Workshop, Future and Beyond, and the introduction of Ideathon and PACE Contest. These projects are **a testament to our commitment to providing young engineers with opportunities to develop technical and soft skills during their university years.** They also embody the continuity of our vision, building upon the achievements of past Boards. And so, as we approach the conclusion of another fruitful year, EUROAVIA celebrates reaching yet another milestone on our journey, the end of a successful Business Year and the start of another promising one. This year, an ExMEAC and AMEAC were organised in **Seville (Spain)** from the 24th of September to the 1st of October 2023.

The Extra Meeting of the EUROAVIA Congress (ExMEAC) and Annual Meeting of the EUROAVIA Congress (AMEAC)

■ **First Day of the ExMEAC – 25th of September 2023**

Following the decision of the Congress in the EMEAC 2023, the International Board formed a taskforce dedicated to the creating of **a strategic 5-year plan** that would define the **vision of the association for the upcoming years.** This comprehensive strategy aimed to solidify EUROAVIA's position in the industry and elevate its impact on aviation enthusiasts and professionals worldwide. Addressing the needs of our members, ideas and visions were developed. Overall, EUROAVIA's 5-year plan represents a forward-thinking and holistic approach, **reflecting the association's commitment to advancing the aerospace industry and empowering young leaders for a bright future.**

The main points defined in the 5-year plan were:

- **Evolution with the European aerospace industr**y by focusing on cross-disciplinarity and the implementing the European values in the activities of the association.
- **Improving the visibility** of EUROAVIA by implementing new communication strategies and supporting companies in the Human Resources and hiring efforts.
- **Stabilising the economic situation** of the association by applying to European grants, improving the sponsors acquisition strategy and creating a EUROAVIA Foundation.
- **Improving the connection** with EUROAVIA members.
- **Restructuring EUROAVIA's data management.**
- **Creating new concepts of EUROAVIA events** including Regional Events and International Field Trips.
- **Reinforcing the EUROAVIA Training System**.
- Creating a **better quality and service** for the EUROAVIA technical teams.

According to the Statues and Bylaws of EUROAVIA, the International Board of the association must be formed by **at least three members**, filling the positions of President, Secretary and Treasurer. Following the elections that took place in April 2023, only Pavitarpal Singhlitt was voted as DIB for the Business Year 2023-2024, therefore an ExMEAC was organised to elect new officers who would join the International Board.

The first candidate was Leo Buchner (Germany) from AS Munich. He has an extensive experience in the association, joining EUROAVIA in 2019. He presented himself as a candidate in order **to push the boundaries of EUROAVIA's impact and unlock new opportunities for the growth and success of our members.** Leo describes himself as a "shaper" and an "implementer", and he has played a crucial role in the creation of the 5-year plan.

The second candidate was **Amanda Román Navarro** (Spain) from AS Terrassa. Amanda joined the association during the pandemic, in September 2020. **Disciplined and team-oriented**, she always finds new ways to

constantly challenge herself to develop her skills. She believes that for this year the imperative **to identify and establish strategic partnerships** with potential sponsors becomes increasingly vital.

Figure 1: The International Board 23-24, from left to right: Pavitarpal Singhlitt (Secretary), Amanda Román (Treasurer), Leo Buchner (President)

Both Leo and Amanda were accepted by the Congress as officers of the International Board, joining Pavitarpal for the next Business Year. The following positions were decided for the next year: Leo Buchner as President, Pavitarpal Singhlitt as Secretary and Amanda Román as Treasure.

■ **First Day of the AMEAC – 26th of September 2023**
The first day of the AMEAC was dedicated to the revision of the EUROAVIA Bylaws and the dismissal of AS Madrid and AM LPU due to the lack of members and local activities. However, EUROAVIA welcomed a new Local Group, PAS Lyon (France).

■ **Second Day of the AMEAC – 27th of September 2023**
As the Business Year came to an end, the International Board of 2022-2023 presented **the Business and the Financial Reports**. A comprehensive analysis of the achievements was made and presented to the Congress, as well as points to be improved for the following Business Year. Additionally, the participants took place in a WGs Olympic, an interactive activity organised by the members active in the international side of EUROAVIA to promote the work and the activities of the Working Groups.

The initiative was a great success, and many participants showed interest in joining the international Working Groups.

■ **Third Day of the AMEAC – 29th of September 2023**
Following a day dedicated to the city tour and the sponsors presentation, the third day was marked by the presentation of the **Business** and **Financial Plans** by the Designated International Board. The Congress shared their questions and their feedback to the DIB.

Their hard work and dedication to EUROAVIA was clearly seen in the projects and ideas they want to implement in the future.

Figure 2: Annual Meeting of the EUROAVIA Congress (AMEAC) held in Sevilla (Spain) in September 2023

■ **Fourth Day of the AMEAC – 30th of September 2023**

The fourth day, also the last day of the AMEAC, started with the acceptance of the Business and Fiannacial Plans. Before moving to the **handover ceremony**, the participants had the opportunity to learn about the upcoming edition of the **PACE Contest**, a technical project organised by EUROAVIA in collaboration with PACE TXT. This year's edition will be a team challenge focused on **Extended Reality**.

The handover ceremony marked the beginning of a new Business Year, full of inspiration, ambition and motivation. **The Former International Board** passed on the symbols of EUROAVIA to **the new International Board** in office. The Congress ended with the celebration of the Member of the Year, a great honour awarded to the member with the most outstanding achievements in the whole Business Year, and the EUROAVIA Cup, the prize dedicated to the most active Local Group. This year, the awards were given to Mara-Alessandra Gogiu from AS Bucharest and the EUROAVIA Cup was won by AS Forli-Bologna.

What was presented above is only a small part of the achievements of this year. We are looking forward to seeing the accomplishments of the new IB in the next EMEAC that will take place in Istanbul (Turkey) in April 2024. Additionally, next year EUROAVIA is celebrating **65 years of existence** that will be honoured in the special event, **the Lustrum**. The association will continue its journey and carry on the EUROAVIAn spirit. The future holds limitless possibilities, and we eagerly look forward to soaring towards new heights as we embark on the next phase of EUROAVIA's adventure.

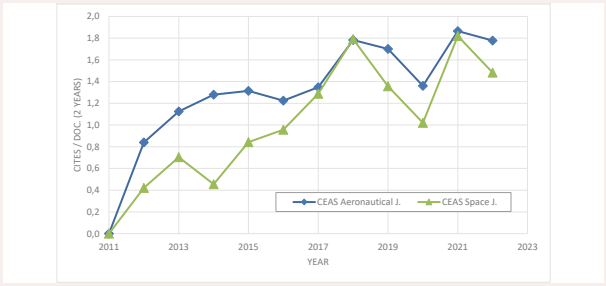
Figure 3: The handover ceremony between the International Board 22-23 and the International Board 23-24

OUTLINE OF THE LATEST ISSUES OF THE CEAS SPACE JOURNAL AND THE CEAS AERONAUTICAL JOURNAL

The journals were created under the umbrella of the Council of European Aerospace Societies (CEAS) to provide an appropriate platform for excellent scientific publications submitted by scientists and engineers. The German Aerospace Centre (DLR) and the European Space Agency (ESA) support the Journals, which are published by Springer Nature.

The **CEAS Space Journal** is devoted to excellent new developments and results in all areas of space-related science and technology, including important spin-off capabilities and applications as well as ground-based support systems and manufacturing advancements.
The **CEAS Aeronautical Journal** is devoted to publishing new developments and outstanding results in all areas of aeronautics-related science and technology, including design and manufacturing of aircraft, rotorcraft, and unmanned aerial vehicles.
Both journals play an increasingly important role in representing European knowledge in aerospace research. Nevertheless, the biggest challenge is still to attract an acceptable number of high caliber scientists and engineers to submit articles for publication. Therefore, we invite you and your colleagues to contribute to the development of these journals by publishing your hard-earned results. Papers which are considered suitable will be subjected to a comprehensive blind peer-review process for potential publication in the CEAS Journals.
A list of articles published in the latest issues of both CEAS Journals is attached.

The Managing Editors:
– Andrea Dieball
– Cornelia Hillenherms
– Wilhelm Kordulla
– Stefan Leuko
– Johan Steelant



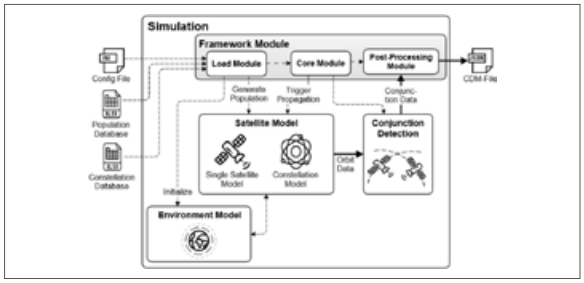
"Cites / Doc (2 years)" counts the number of citations received by documents from a journal and divides them by the total number of documents published in that journal in the past two years – similar to the Impact Factor™.

CEAS SPACE JOURNAL

Volume 15, Issue 5, September 2023

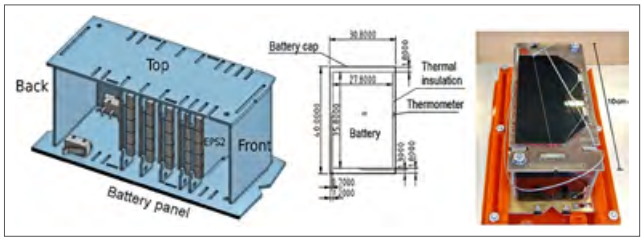
SIMULATION OF SATELLITES AND CONSTELLATIONS FOR THE ASSESSMENT OF COLLISION AVOIDANCE OPERATIONS

S. Burgis, L. Rohrmüller, M. Michel & R. Bertrand /
Published online: 15 September 2022 (Open Access)



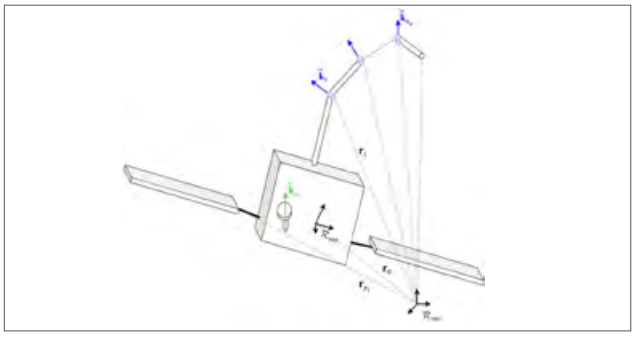
POROUS ALUMINUM OXIDE INSULATION MATERIALS TESTED IN SPACE MISSION

P. Adám, L. Dudás, O. Temesi, A. Nagy & K. Sinkó /
Published online: 27 September 2022 (Open Access)



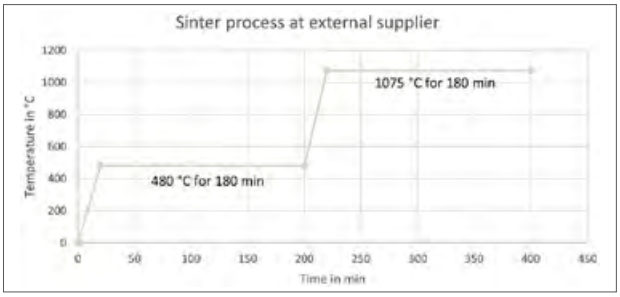
DYNAMICS AND ROBUST CONTROL OF A SPACE MANIPULATOR WITH FLEXIBLE APPENDAGES FOR ON-ORBIT SERVICING

S. Kraiem, M. Rognant, J.M. Biannic & Y. Brière /
Published online: 14 October 2022



INVESTIGATION OF THE MANUFACTURABILITY OF A COPPER COIL FOR USE IN SPACE COMPONENTS BY MEANS OF THE FUSED FILAMENT FABRICATION PROCESS

S. Uffelmann & S. Pestotnik / Published online: 15 October 2022 (Open Access)

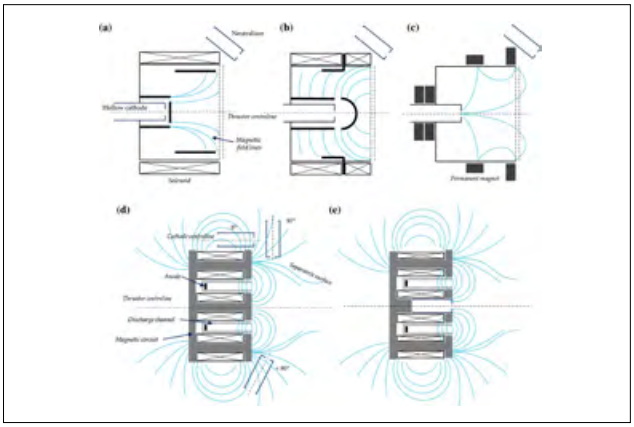


FLOW RATE IMPROVEMENTS IN ADDITIVELY MANUFACTURED FLOW CHANNELS SUITABLE FOR ROCKET ENGINE APPLICATION

M. Buchholz, S. Gruber, A. Selbmann, A. Marquardt, L. Meier, M. Müller, L. Seifert, C. Leyens, M. Tajmar & C. Bach / Published online: 27 October 2022 (Open Access)

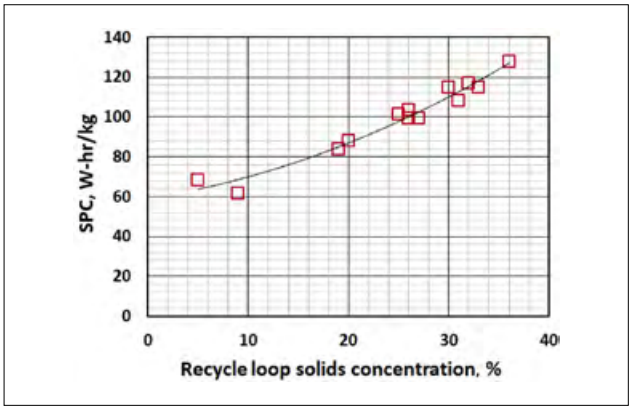
IONIZATION INSTABILITY AND TURBULENCE IN THE PLUME OF SUB-AMPERE HOLLOW CATHODES DEPENDING ON AN APPLIED MAGNETIC FIELD

G. C. Potrivitu @ S. Xu / Published online: 21. November 2022



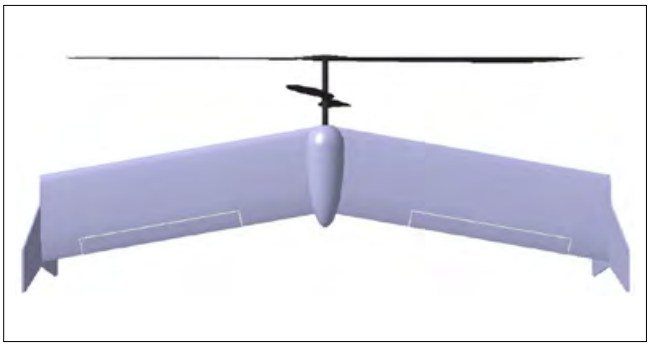
CENTRIFUGAL MULTIPLE EFFECT DISTILLER FOR WATER RECOVERY FOR SPACE APPLICATIONS

V. Rifert, A. Solomakha, P. Barabash, O. Sniehovskyi & V. Petrenko / Published online: 2 December 2022



EVALUATION OF AERIAL VEHICLE CONFIGURATIONS FOR HIGH-RANGE MARS MISSIONS

V. Zappek, M. Rinker, L. Daxer & M. Hajek / Published online: 3 January 2023 (Open Access)

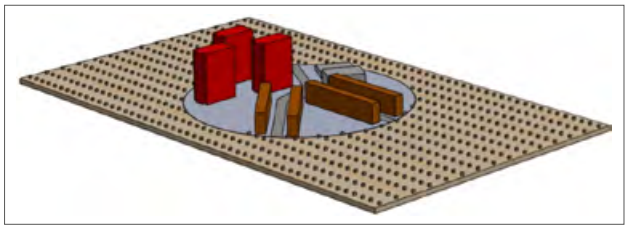


CEAS AERONAUTICAL JOURNAL

Volume 14, Issue 3, March 2023

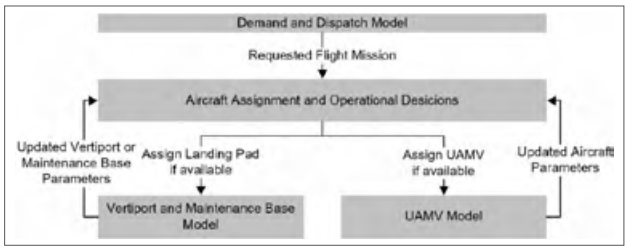
ENERGY OPTIMAL 3D FLIGHT PATH PLANNING FOR UNMANNED AERIAL VEHICLE IN URBAN ENVIRONMENTS

Hannes Rienecker, Veit Hildebrand & Harald Pfifer / Published: 15 June 2023 (Open Access)



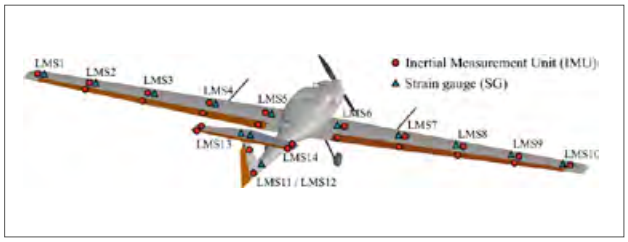
IDENTIFYING CHALLENGES IN MAINTENANCE PLANNING FOR ON-DEMAND UAM FLEETS USING AGENT-BASED SIMULATIONS

Patrick Sieb, Johannes Michelmann, Felix Flöter & Kai Wicke / Published: 27 June 2023 (Open Access)



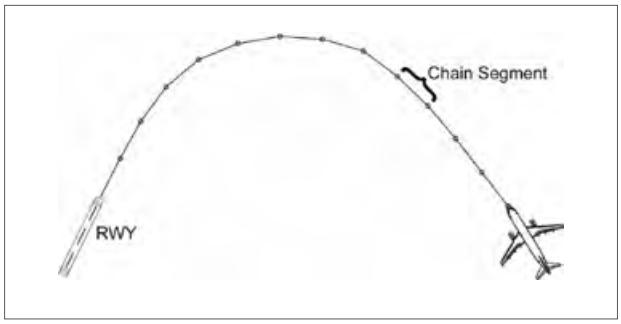
NONLINEAR SYSTEM IDENTIFICATION OF A UAV MODEL WITH DISTRIBUTED AERODYNAMICS AND FLEXIBLE STRUCTURE

Benjamin Herrmann, Julian Theis & Frank Thielecke / Published: 25 July 2023 (Open Access)



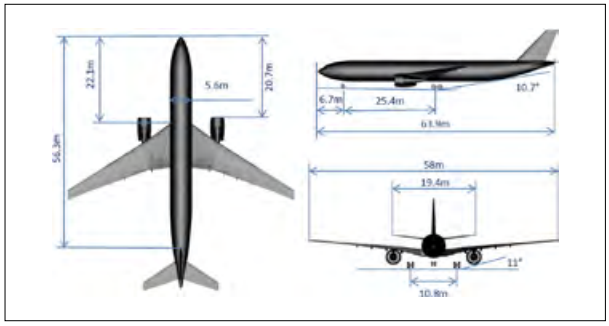
MODELLING OF AIRCRAFT TRAJECTORIES FOR EMERGENCY LANDING USING KINEMATOID CHAINS

Steffen Flämig, Matthias Graefenhan & Wolfram Schiffmann / Published: 16 June 2023 (Open Access)



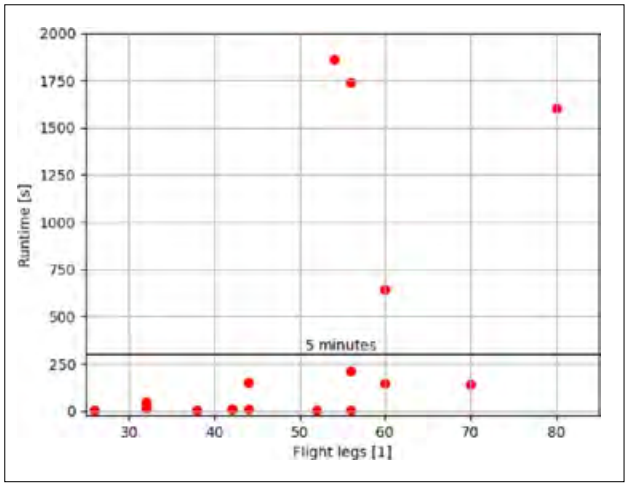
DEVELOPMENT OF A MEDIUM/LONG-HAUL REFERENCE AIRCRAFT

Benjamin M. H. J. Fröhler, Jannik Häßy & Mohammad Abu-Zurayk / Published: 18 May 2023 (Open Access)



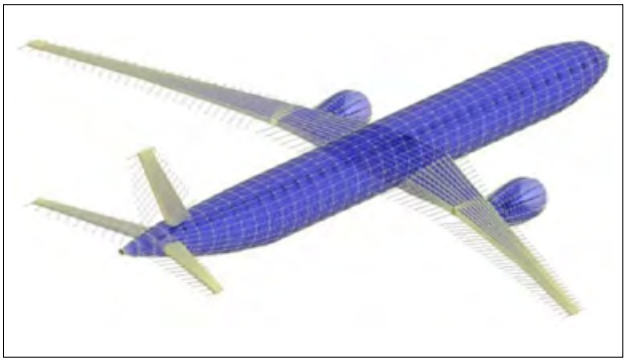
A STOCHASTIC OPTIMIZATION APPROACH FOR OPTIMAL TAIL ASSIGNMENT WITH KNOWLEDGE-BASED PREDICTIVE MAINTENANCE

Lukas Glomb, Frauke Liers & Florian Rösel / Published: 13 May 2023 (Open Access)



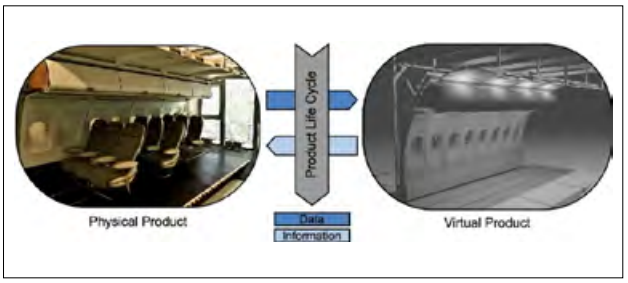
ADJOINT HIGH-DIMENSIONAL AIRCRAFT SHAPE OPTIMIZATION USING A CAD-ROM PARAMETERIZATION

A. Merle, P. Bekemeyer, S. Görtz, S. Keye & L. Reimer / Published: 24 April 2023 (Open Access)



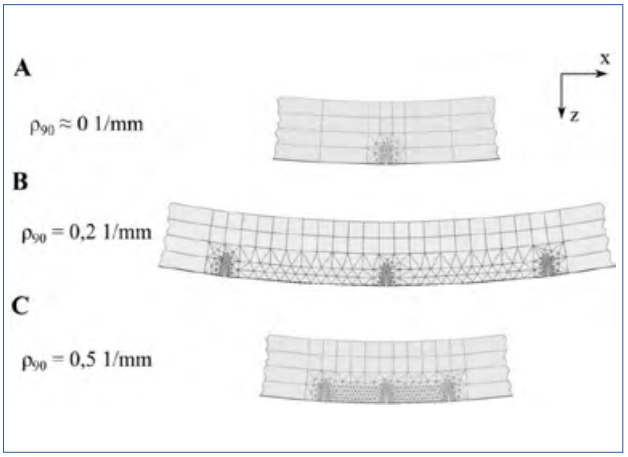
PERMANENTLY UPDATED 3D-MODEL OF ACTUAL GEOMETRIES OF RESEARCH ENVIRONMENTS

Fiete Rauscher, Mara Fuchs, Yassin Ghanjaoui, Nastasija Markusheska, Jörn Biedermann, Frank Meller & Björn Nagel / Published 9 May 2023 (Open Access)



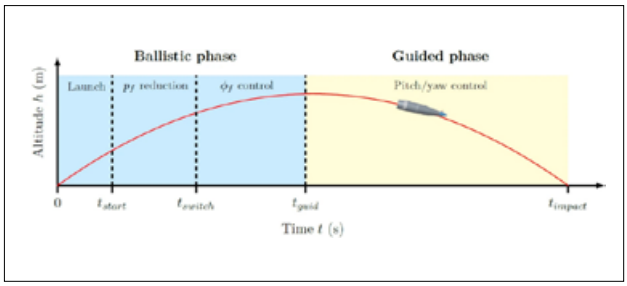
EFFECTS OF AN ENHANCED FIBRE–MATRIX ADHESION ON THE FATIGUE BEHAVIOUR OF COMPOSITE MATERIALS UNDER VERY HIGH CYCLE FATIGUE

M. Bartelt, P. Horst & S. Heimbs / Published: 7 July 2023 (Open Access)



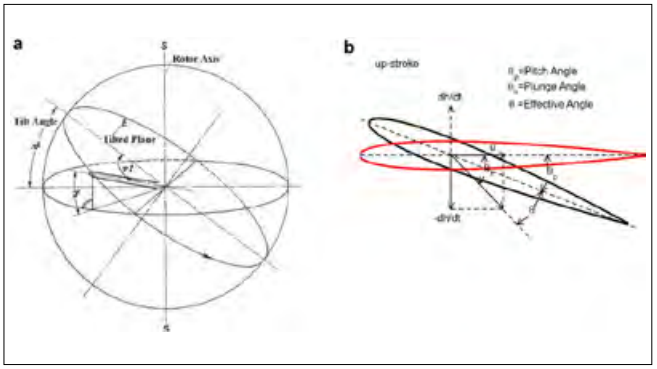
ROBUST GAIN-SCHEDULED AUTOPILOT DESIGN WITH ANTI-WINDUP COMPENSATION FOR A GUIDED PROJECTILE

Sovanna Thai, Spilios Theodoulis, Clément Roos & Jean-Marc Biannic / Published: 05 July 2023



THE SINGLE FLAPPING ROTOR: DETAILED PHYSICAL EXPLANATIONS

W. Geißler / Published: 15 June 2023 (Open Access)



THE 55TH CEAS BOARD OF TRUSTEES MEETING

By Andrea Alaimo, Director General of CEAS

The 55th CEAS Board of Trustees was held in Lausanne the 13th of July 2023 at the end of the Aerospace Europe Conference 2023, the joined conference organised by CEAS and EUCASS. The meeting was characterized by important news for the life of CEAS, first of all the admission of Von Karman Institute for Fluid Dynamics as a new CEAS Corporate Member. The Von Karman Institute has already been a member of CEAS in the past and today intends to actively participate in the life of CEAS by proposing himself as a possible organizer of the AIAA/CEAS Aeroacoustic conference for 2026.

The other very important result of the meeting was the appointment of Mr Lukasz Kiszkowiak as Vice-President of External Relations & Publications. The candidature, proposed by the Polish Society of Aeronautics and Astronautics, was strongly supported by the Swiss Association of Aeronautical Sciences and by the Swedish Society of Aeronautics and Astronautics and was unanimously accepted by the board. Mr Lukasz Kiszkowiak is involved in CEAS since 2020 when he was appointed CEAS Trustee for the Polish Society of Aeronautics and Astronautics. He works as Assistant professor in Section of Aircraft Design & Maintenance, Institute of Aviation Technology, Faculty of Mechatronics, Armament & Aerospace at the Military University of Technology in Warsaw, Poland. He is an expert in the field of numerical aerodynamic analyzes using HPC, experimental tests of aircraft scaled models in wind and water tunnels, numerical analysis of static and dynamic stability of aircraft flight and scaled models flight tests.

The 55th Board of Trustees was also the meeting of the CEAS Awards 2023. Mr Ander Bloom, Vice-President for Awards & Membership, presented to the Board the nominations received for the Awards and the results of the Award Sub-Committee's evaluation. Accordingly, the Board of Trustees unanimously awarded the CEAS Gold Medal award to Mr Franco Ongaro and the CEAS Distinguished Service Award 2023 to Mr Zdobyslaw Goraj. Mr Franco Ongaro is an example of an outstanding European career covering both aeronautics and space sectors, in private industries and public entities, with constant contact with academia and the younger generation. During is career he in fact joined ESA, Leonardo and Politecnico of Milan as a contract professor.
Mr Zdobyslaw Goraj, instead, has made many highly significant contributions in the aeronautical engineering attracting to Warsaw University of Technology lots of research grant. He also distinguished himself for being CEAS President.

Lastly but not least, the Board also granted the CEAS Journal most cited paper Awards to the following publication:

CEAS Aeronautical Journal

- Voskujil M., van Bogaert J., Rao A. G., "Analysis and design of hybrid electric regional turboprop aircraft. CEAS Aeronautical Journal 9, 15-25 (2018);
- Ploetner K.O., Al Haddad C., Antoniou C., Frank F., Fu M., Kabel S., Llorca C., Moeckel R., Moreno A.T., PukhovaA., Rothfeld R., Shamiyeh M., Straubinger A., Wagner H., Zhang Q., "Long-term application potential of urban air mobility complementing public transport: an upper Bavaria example." CEAS Aeronautical Journal 11, 991-1007 (2020);
- Ripepi M., Verveld M., Karcher N.W., Franz T., Abu-Zurayk M., Görtz S., Kier T. M., "Reduced-order models for aerodynamic applications, loads and MDO." CEAS Aeronautical Journal 9, 171-193 (2028).

CEAS Space Journal

- Evans S., Taber W., Drain T., Smith J., Wu H., Guevara M., Sunseri R., Evans J., "MONTE: the next generation of mission design and navigation software." CEAS Space Journal 2018 vol.10 (1) pp.79-86;
- Lazaro F., Raulefs R., Wang W., Clazzer F., Plass S., "VHF Data Exchange System (VDES): an enabling technology for martime communications." CEAS Space Journal 2019, vol. 11 (1) pp. 55-63;
- Schleicher A., Ziegler T., Schubert R., Brandt N., Bergner P., Johann U., Fichter W., Grzymisch J. "In-orbit performance of the USA Pathfinder drag -free and attitude control system. "CEAS Space Journal 2018, vol. 10 (4) pp. 471-485.

AEC2023 IN SHORT

- **Joint 10th EUCASS – 9th CEAS Conference – 9-13 July 2023 in Lausanne**
- **720 registered participants**
- **600 presentations**
- **500 papers registered in the Proceedings**
- **Photos** : https://eucass.eu/galleries
- **General video**: https://www.eucass.eu/conferences-and-publications/aerospace-europe-conference-2023

FOR ACCESS TO THE AEC2023 PROCEEDINGS
https://www.eucass.eu/index.php/conferences-and-publications/search-on-this-website?searchword=eucass2023&searchphrase=all&limit=20&areas%5B0%5D=doc_indexer

2023

AMONG UPCOMING AEROSPACE EVENTS

OCTOBER

20 October – EUROCONTROL – **Safety of Vertical Navigation of Final Approach Workshop** – Brussels (Belgium) – EUROCONTROL/HQ – https://www.eurocontrol.int/event/

23-25 October – AIAA – **2023 ASCEND – Accelerating Space Commerce Exploration and New Discoveries** – Las Vegas, Nevada (USA) – Las Vegas and ONLINE – https://aiaa.org/events

23-26 October – ASCEND/AIAA – **ASCEND Conference** – Las Vegas, NV (USA) – www.aiaa.org/events

23-27 October – ESA – **ISSO – International School on Space Optics** – Noordwijk (NL) – ESA/ESTEC – https://atpi.eventair.com/

23-27 October – ICAO – **ICAO Air Navigation Procedures for Today** – Singapore (Singapore) – https://www.icao.int/Meetings/

23-27 October – ICAO – **ICAO Security Week 2023 – AVSEC & CYBERSEC –** Will cover all aspects of aviation security including aviation cybersecurity – Montréal (Canada) – ICAO/HQ – https://www.icao.int/Meetings/

NOVEMBER

06-08 November – FSF – **International Air Safety Summit – 76th Edition** – Paris (France) – Paris Mariott CDG Airport Hotel – https://flightsafety.org/event/

06-09 November – ESA/JRC/SatCen – **BBIDS 2023 - Big Data from Space 2023** – Vienna (Austria) – https://www.eventsair.com/

06-10 November – ESA – **Innovations Technologies for Space Optics – Workshop –** Noordwijk (NL) – ESA/ESTEC – https://www.eventsair.com/

12-16 November – UAE– **Dubai Airshow 2023 – The Center of Aerospace Strategy and Inspiration** – Dubai (UAE) – Dubai World Central Al Maktoum Jebel Ali – https://www.dubaiairshow.aero

13 November – RAeS – **Light Aircraft Design Conference** – London (UK) – RAeS/HQ – https://www.aerosociety.com/events-calendar/

14-15 November – 3AF – **CAT 2035 – Combat Aéroterrestre 2035 - 2nd Edition** – Versailles (France) – https://www.3af-cat2035.com

15-16 November – ERCOFTAC – **Shock Wave Boundary Layer and Flow Control Conference** – Gdansk (Poland) – https://www.ercoftac.org/events/

16-18 November – The Scientist – **GSEAMAE 2023 – 3rd Global Summit and Exposition on Aerospace and Mechanical Engineering** – Rome (Italy) – https://www.thescientist.com/2023/aerospace-mechanical-engineering - contact: gseame2023@thescientist.com

21 November – RAeS – **RAeS Specialist Group Conference – Greener by Design: Contrail management time for action** – London (UK) – RAeS/HQ – www.aerosociety.com/events

22 November – RAeS – **RAeS Aerospace Medicine Specialist Group Annual Symposium 2023** – London (UK) – RAeS/HQ – https://www.aerosociety.com/events

27-30 November – SESARJU – **13th SESAR Innovation Days – Inspiring long-term research in the field of ATM.** Sevillia (Spain) – University of Sevilla – https://www.sesarju.eu/events

27 November**-01** December – ESA/GEWEX/CNES – **HYDROSPACE2023 – 5th Space for Hydrology Workshop** - (GEWEX Global Energy and Water Exchanges) – Lisbon (Portugal) – https://www.eventsair.com/

29 November – EREA – **EREA Annual Event –** Brussels (Belgium) – https://erea.org/event/

DECEMBER

18-20 December – ERCOFTAC – **Understanding and Predicting H2 Combustion Conference** – Barcelona (Spain) – Barcelona Supercomputing Centre – https://www.ercoftac.oeg/events/

2024

JANUARY

08-12 January– AIAA – **AIAA SciTech Forum** – Orlando, FL (USA) – https://www.aiaa.org/SciTech

18-19 January– ESA – **Space for Inspiration 2024** – Noordwijk (NL) – ESA/ESTEC – https://atpi.eventsair.com/esamed/list-of-events

FEBRUARY

12-14 February– ESA – **HAPS4ESA – 4th High Altitude Pseudo Satellites Conference** – Leiden (NL) – Event & Convention Centre - https://atpi.eventsair.com/

20-25 February– Singapore – **Singapore Air Show 2024** – Singapore – Singapore Exhibition Center Singapore – https://www.singaporeairshow.com/

AMONG UPCOMING AEROSPACE EVENTS

MARCH

02-09 March – IEEE – **IEEE Aerospace Conference** – Laurel, MD (USA) – www.aeroconf.org

06-08 March – ERCOFTAC – **Machine Learning for Fluids Dynamics** – Paris (France) – Campus of Sorbonne University – https://www.ercoftac.org/events/

APRIL

10-12 April – ERCOFTAC – **DLES14 – Direct Large Eddy Simulation** – Erlangen (Germany) – https://www.ercoftac.org/events/

14-19 April – ESA – **HiSST 2024 – 3rd International Conference on High-Speed Vehicle and Technology** – Busan (South Korea) – https://www.hisst2024.org

29 April - **01** May – ASME – **ASME's 2nd Annual Aerospace Structures, Structural Dynamic and Materials Conference** – Seatle, WA (USA) – Hyatt Regency Lake Washington Renton, WA – Seatle's South Airport – https://event.asme.org/SSDM

MAY

29-31 May – EUROMECH – **EMMC19 – 19th European Mechanics of Materials Conference** – Madrid (Spain) – https://euromech.org/

JUNE

03-07 June – ECCOMAS – **ECCOMAS2024 – 9th European Congress on Computational Methods in Applied Sciences and Engineering** – Lisbon (Portugal) – https://www.eccomas.org/

04-07 June – AIAA/CEAS – **Aeroacoustics 2024 – The 30th AIAA/CEAS Aeroacoustics Conference** – Rome (Italy) – https://www.aidaa.it/2023/01/18/aiaa-ceas-aeroacoustics-conference/

05-09 June – BDLI – **ILA 2024 Berlin Air Show – Berlin ExpoCenter Airport** – Schönefelt Airport - https://www.ila-berlin.de

12-14 June – CEAS/RAeS – **EuroGNC2024** – Bristol (UK) – University of Bristol – https://eurognc.ceas.org/

JULY

22-26 July – Farnborough – **Farnborough International Air Show** – Pioneer the Future – Farnborough, Hampshire (UK) – https://farnboroughairshow/com

22-26 July – EUROMECH – **ENOC11- 11th European Nonlinear Oscillations Conference** – Delft (NL) – https://euromech.org/

29 July - **02** August – AIAA – **AIAA Aviation Forum** – Las Vegas, NV (USA) – www.aiaa.org/events

30 July - **02** August – ASCEND powered by AIAA – **ASCEND Conference** – Las Vegas, NV (USA) – www.aiaa.org/events

SEPTEMBER

09-13 September – ICAS – Hosted by AIDAA – **34th Congress of the International Council of the Aeronautical Sciences –** Florence (Italy) – www.icas2024.com

10-13 September – ERCOFTAC – **FMC2024 – XXVI Fluid Mechanics Conference –** Warsaw (Poland) – https://fmc2024.pl.edu.pl

16-20 September – EUROMECH – **EFD1 – 1st European Fluid Dynamics Conference** – Aachen (Germany) – https://euromech.org/

25-27 September – ICAS – **SESECA 2024 – 11th International Systems & Concurrent Engineering for Space Applications Conference –** Noordwijk (NL) – ESA/ESTEC – https://api.eventsair.com/

OCTOBER

14-18 October – IAF/IAC – Hosted by AIDAA – **75th International Astronautical Congress –** Milan (Italy) – www.iac2024.org