CEAS
Council of European Aerospace Societies

BULLETIN AEROSPACE EUROPE

SPACEX MADE HISTORY ON 15-18 SEPTEMBER 2021 WITH THE SUCCESSFUL PERFORMANCE OF 'INSPIRATION4' MISSION, THE WORLD'S FIRST ALL-CIVILIAN MISSION TO ORBIT WITH A TEAM OF NON-PROFESSIONAL ASTRONAUTS

• 16 SEPTEMBER 00:02:56 UTC: THE CREW DRAGON 'RESILIENCE' IS LAUNCHED FROM KSC ATOP A FALCON 9 ROCKET

• THE FLIGHT REACHED AN ORBITAL ALTITUDE OF 585 KM

• 18 SEPTEMBER 23:06:49 UTC: THE CREW DRAGON CAPSULE SPLASHED DOWN SAFELY IN THE ATLANTIC OCEAN

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:

- 12 Full Member Societies: Czech Republic (CzAeS) – France (3AF) – Germany (DGLR) – Italy (AIDAA) – Netherlands (NVvL) – Poland (PSAA) – Romania (AAAR) – Russia (TsAGI) – Spain (AIAE) – Sweden (FTF) – Switzerland (SVFW) – United Kingdom (RAeS);
- 4 Corporate Members: ESA, EASA, EUROCONTROL and EUROAVIA;
- 8 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) 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 their 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.

WHAT DOES CEAS OFFER YOU ?

KNOWLEDGE TRANSFER:
- A structure for Technical Committees

HIGH-LEVEL EUROPEAN CONFERENCES:
- Technical pan-European events dealing with specific disciplines
- The biennial AEROSPACE EUROPE Conference

PUBLICATIONS:
- CEAS Aeronautical Journal
- CEAS Space Journal
- AEROSPACE EUROPE Bulletin

RELATIONSHIPS AT EUROPEAN LEVEL:
- European Parliament
- European Commission
- ASD, EASA, EDA, ESA, EUROCONTROL, OCCAR

HONOURS AND AWARDS:
- Annual CEAS Gold Medal
- Medals in Technical Areas
- Distinguished Service Award

YOUNG PROFESSIONAL AEROSPACE FORUM SPONSORING

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: Pierre Bescond
(CEAS VP Publications and External Relations)
Committee's Members: Rafael Bureo-Dacal (ESA/ESTEC), Georges Bridel (CEAS Trustee), Jean-François Brouckaert (Clean Sky), Cornelia Hillenherms (CEAS trustee), Leonardo Lecce (AIDAA), Uwe Moeller (EREA), Thomas Vermin (EUROAVIA, IT Manager).
Design & Page Setting : Sophie Bougnon
sophie.bougnon1@sfr.fr / www.sbgraphisme.com

THE OFFICERS OF THE BOARD IN 2021:

President: Franco Bernelli
franco.bernelli@polimi.it
Vice-President, Finance: Cornelia Hillenherms
cornelia.hillenherms@dlr.de
Vice-President, Publications and External Relations: Pierre Bescond
pierre.bescond@laposte.net
Vice-President, Awards and Membership: Anders Blom
anders.blom@innovair.org
Director General: Andrea Alaimo
andrea.alaimo@unikore.it
Financial Manager: Philip Nickenig
philip.nickenig@dglr.de
Secretary: Beata Wierzbinska-Prus
bprus@meil.pw.edu.pl
Chairman of the Aeronautics Branch: Prof. Jonathan Cooper – j.e.cooper@bristol.ac.uk
Chairman of the Space Branch: Torben Henriksen
torben.henriksen@esa.int

FULL MEMBERS:

■ Czech Republic – CzAeS

Novotneho lavka 200/5
110 00 Prague, Czech Republic
www.csvts.cz
President and CEAS Trustee: Assoc. Prof. Daniel Hanus,
hanus@csvts.cz
Vice-President and CEAS Trustee: Assoc. Prof. Jan Rohac, PhD
xrohac@fel.cvut.cz

■ France – 3AF

6,rue Galilée – F-75016 Paris
Tel.: + 33 (0) 1 56 64 12 30 – www.3af.fr
President: Louis Le Portz
louisleportz@orange.fr
Director General: Michel Assouline
secr.exec@3af.fr
Secretary General: Jean-François Coutris - jfcoutris@ccint.fr
CEAS Trustees: Louis Le Portz and Pierre Bescond
Admin. assistant: Caroline Saux
gestionmembres@aaaf.asso.fr

■ Germany – DGLR

Godesberger Allee 70 –
D- 53175 Bonn – Tel.: + 49 228 30 80 50
info@dglr.de – www.dglr.de
President: Prof. Rolf Henke
CEAS Trustees: Dr Cornelia Hillenherms – cornelia.hillenherms@dlr.de and Philip Nickenig - philip.nickenig@dglr.de
Secretary General: Philip Nickenig
Executive and Team Assistant: Birgit Neuland - birgit.neuland@dglr.de
Conference Manager: Michael Geimer – michael.geimer@dglr.de

■ Italy – AIDAA

Casella Postale 227 – I-00187 Roma V.R. – Tel / Fax : +39 366 144 21 31
info@aidaa.it – www.aidaa.it
President: Prof. Erasmo Carrera
Politecnico di Torino - DIMA
Corso Duca degli Abruzzi 24 - 10129 Torino, Italy – erasmo.carrera@polito.it
Secretary General:
Prof. Cesare Cardani info@aidaa.it / cesare.cardani@polimi.it
CEAS Trustees: Prof. Sergio De Rosa sergio.derosa@unina.it and
Prof. Carlo Bettanini
carl.bettanini@unipd.it
Secretary: Daniela Vinazza
daniela@aidaa.it

■ Netherlands (The) – NVvL

c/o Netherlands Aerospace Centre
Anthony Fokkerweg 2
NL- 1059 CM Amsterdam
Tel.: + 31 88 511 3055 (secretariat)
nvvl@nlr.nl – www. nvvl.org
President: Mark van Verooij
mark.van.venrooij@nlr.nl
Secretary General: Dirk Jan Rozema
djrozema@kpnmail.nl
CEAS Trustees: Mark van Venrooij and Fred Abbink - f.j.abbink@planet.nl

■ Poland – PSAA

Nowowiejska 24 – 00-665 Warsaw – Poland – T : +48 22 234 5428
www.psaa.meil.pw.edu.pl
President: Tomasz Goetzendorf-Grabowski: tgrab@meil.pw.edu.pl
Treasurer: Jacek Szumbarski
jasz@meil.pw.edu.pl
Secretary General: Andrzej Zyluk
justyna.staniszewska@itwl.pl
BoD Members: Tomasz Rogalski, Zbigniew Koruba
CEAS Trustees: Tomasz Goetzendorf-Grabowski and Lukasz Kiszkowiak
lukasz.kiszkowiak@wat.edu.pl
Administrative Officer:
Beata Wierzbinska-Prus
bprus@meil.pw.edu.pl

■ Romania – AAAR

220D Iuliu Maniu Ave - 061126 Bucharest 6 – Romania, P.O. 76, P.O.B. 174 – www.aaar.ro
President: Prof. Virgil Stanciu
vvirgilstanciu@yahoo.com
Vice-President and CEAS Trustee: Dr Eng. Valentin Silivestru
valentin.silivestru@comoti.ro
CEAS Trustee: Prof. Ion Fuiorea
ifuiorea@yahoo.com

■ Russia – TsAGI

1, Zhukovsky St. – Zhukovsky, Moskow region, 140 180, Russian Federation
Chief Scientific Officer: Sergey L. Chernyshev, D.Sc.
slc@tsagi.ru – www.tsagi.com
CEAS Trustee: Evgeni Andreev – andreev@tsagi.ru

■ Spain – AIAE

COIAE. Francisco Silvela 71, Entreplanta - 28250 Madrid (Spain) – Tel.: + 34 91 745 30 30
info@coiae.es - www.coiae.es
President: Mrs Estefanía Matesanz Romero - ematesanz@coiae.es
CEAS Trustees: Arturo de Vicente Hurtado – arturodvh@coiae.es
Mrs Estefanía Matesanz Romero
Secretary: info@coiae.es

■ Sweden – FTF

Swedish Society of Aeronautics and Astronautics – Bengt Moberg – Box 357 - SE-101 27 Stockholm
bengt.moberg@vernamack.se
President: Dr Roland Karlsson
Häradshammars Prästgård 1
SE-61029 Vikbolandet
T: +46 (0) 705 385 06
rkrolandk@gmail.com
CEAS Trustees: Prof. Anders Blom
anders.blom@innovair.org
Prof. Petter Krus : Linköping University SE - 58183 Linköping
petter.krus@liu.se
Secretary: Björn Jonsson – Aeronautical Dept Swedish Defence Material Adm.(FMV) – SE-115 88 Stockholm Sweden
bjorn.jonsson@fmv.se

■ Switzerland – SVFW

ETH Zurich – Institute of Fluid Dynamics – Ms Anna Kubic

CH 8092 Zurich – www.svfw.ch
President and CEAS Trustee:
Dr Jürg Wildi: juerg.wildi@bluewin.ch
CEAS Trustee: Dr Georges Bridel
c/o ALR, Gotthardstrasse 52,
CH 8002 Zurich
georges.bridel@alr-aerospace.ch
Secretary: Anna Kubik -
akubik@ethz.ch

■ United Kingdom – RAeS
No.4 Hamilton Place – London
W1 J 7 BQ – United Kingdom
Tel.:+ 44 (0)20 76 70 4300
raes@aerosociety.com
www.aerosociety.com
President: Howard Nye FRAeS
CEAS Trustees: Emma Bossom
emma.bossom@aerosociety.com
Prof Jonathan Cooper CEng FRAeS
J.E.Cooper@bristol.ac.uk
Chief Executive:
David Edwards FRAeS
Head of External Affairs:
Richard Toomer
press@aerosociety.com

CORPORATE MEMBERS:

■ ESA
8-10, rue Mario Nikis - F-75015 Paris
www.esa.int
CEAS Representative:
Torben Henriksen
torben.henriksen@esa.int

■ EASA
Konrad - Adenauer - Ufer 3
D-50542 Cologne (Germany)
Tel.: +49 (221) 8999 0000
www.easa.europa.eu
CEAS Representative:
Erick Ferrandez
erick.ferrandez@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 and CEAS Representative: Jure Zubak
jure.zubak@euroavia.eu
CEAS Representative:
João Bernardo Amaral
joao.amaral@euroavia.eu

SOCIETIES HAVING SIGNED AN MOU WITH CEAS:

■ Académie de l'Air et de l'Espace (AAE)
1, avenue Camille Flammarion –
F-31500 Toulouse
www.academie-air-espace.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 – htpps://www.easn.net
President: Prof. Dr Andreas
Strohmayer University of Stuttgart

■ Association of European Research Establishments in Aeronautics (EREA)
Chairman: Michel Peters, NLR
EREA Secretary: Anne-Laure Delot –
ONERA, anne-laure.delot@onera.fr

■ International Council of the Aeronautical Sciences (ICAS)
President: Shinji Suzuki
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

■ Society of Flight Test Engineers (SFTE-EC)
www.sfte-ec.org/

SIX SOCIETIES IN EUROPEAN AEROSPACE SCIENCE AND TECHNOLOGY RESEARCH CLOSELY LINKED WITH CEAS (ECAERO-2):

■ EASN: European Aeronautics Science Network
Chairman: Prof. Dr Andreas
Strohmayer (University of Stuttgart)
Strohmayer@ifb.uni-stuttgart.de
Vice Chairman: Zdobyslaw Goraj
(Warsaw University of Technology)
goraj@meil.pw.edu.pl

■ ECCOMAS: European Community on Computational Methods in Applied Sciences
Edificio C-1, Campus Norte UPC
c/Gran Capitan s/n
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:
Prof. Alain Merlen- Lille University of Science and Technology –
alain.merlin@univ-lille.fr

■ EUROMECH: European Mechanics Society
https://euromech.org
President: Prof. Marc Geers -
m.g.d.geers@tue.nll

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

EDITORIAL

Jean-Pierre Sanfourche
Editor-in-Chief

GRADATIM FEROCIFER

During these summer holidays, I have watched in live the three amazing space tourism missions: successively on 11 July the suborbital flight of **Virgin Galactic** with full crew in the cabin including Sir Richard Branson, on 20 July **Blue Origin**, the first fully automated flight into suborbital space with civilian passengers including Jeff Bezos, and on 15-18 September SpaceX's **Inspiration4**, the historical successful first world's all-civilian mission to orbit with a team of non-professional astronauts.

My merit for having paid so great attention to those missions is all the more remarkable that until recent years, I was proud to be part of the people convinced that the time of space tourism had not come yet. In fact my opinion was closer to the one expressed some days ago by British Royal Prince William: "We need some of the greatest brains and minds fixed on trying to repair the planet, not trying to find the next place to go and live."

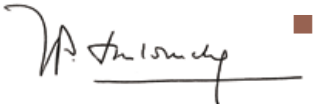
I have to say that my point of view on this subject is evolving, why?

First I realise the extraordinary high level of technology and safety & mission assurance it has been necessary to reach to dare sending civilian non-astronauts to space. This birth of space tourism is not simply a stunt but a giant leap to the entry into the 'New Space' era.

Second the fantastic courage of all managers, engineers and technicians who are participating in those feats are praiseworthy, giving a new lesson of leadership spirit, entrepreneurial audacity and tenacity in the engagement.

So, I like very much the Latin motto Jeff Bezos gave to Blue Origin: *Gradatim Ferociter*. It perfectly captures Amazon founder's unique approach to success and in particular to spaceflight great performances. It means that it is not possible to skip steps and that is on the contrary mandatory to put one foot in front of the other, to never short cut for bypassing obstacles, and to always accomplish those steps ferociously, i.e. with strong determination and passion.

Today's aerospace students destined to tackle the numerous challenges in front of us will have to be educated in science, technology, engineering and mathematics (STEM), but will have also to acquire inventiveness, strong inclination for innovation and last but not least, to acquire the entrepreneurial spirit. The exceptional lessons given by Virgin Galactic, Blue Origin and Inspiration4 should inspire the aerospace schools and universities.



CONTENTS

INTERVIEW WITH PROF. FRANCO BERNELLI, PRESIDENT OF THE CEAS

By Jean-Pierre Sanfourche, Editor-in-Chief

Franco Bernelli Zazzera
CEAS President 2021-2022

Jean-Pierre Sanfourche - In your latest editorial you have announced the evolution of the CEAS Statutes and Bylaws which will now allow significantly strengthen co-operation between CEAS member societies and current corporate members: ESA, EASA, EUROCONTROL and EUROAVIA. This is an important step forward. Could you tell us how you intend to initiate and develop these new working relationships?

Franco Bernelli - The evolution of the CEAS Statutes and Bylaws represents the end of a long process that actually started many years ago, rather than the beginning of a new phase. In fact, when in 2020 the European Space Agency ESA, CEAS Corporate Member, requested to get a more visible and formal role within CEAS to be able to execute powers in areas of their interest, the Board of Trustees unanimously agreed to define how this could be implemented. The discussion within CEAS has then been on how to generalize the request to better incorporate all European aviation agencies. This has been seen by the CEAS Trustees as the recognition of entities with significant contributions to and support of the association, including national societies as well as European agencies, since it is CEAS's ambition to become the obvious European focal point fostering knowledge dissemination and provide a platform for all European individuals and organizations engaged in aerospace activities. The final decision unanimously approved by the CEAS General Assembly has then been to grant voting rights within CEAS in most matters to the European Aerospace Agencies,that are by nature transnational, devoted to merging the national interests of the European countries and thus providing a unified European perspective. CEAS is proud to have found the right balance between preserving its identity and recognizing entities with significant contributions to and support of the association. I must also say that the vast majority of decisions have always been taken by consensus, including the opinion of the CEAS Corporate Members, and without the need to resort to vote, therefore I am not expecting that CEAS will now change its working relationships. However, this change gives a clear indication of the CEAS ambition for the future.

JPS – Could you briefly introduce Prof. Jonathan Cooper who will as of now manager the Aeronautics Branch.

FB - Professor Jonathan Cooper has an international reputation in aircraft design and his research is focussed on the design and development of new efficient future aircraft. He currently holds the Royal Academy of Engineering Airbus Sir George White Chair in Aerospace Engineering at the University of Bristol. He has been President of the Royal Aeronautical Society and participates in the activities of the CEAS Technical Committee on Aeroelasticity and Structural Dynamics. For these reasons the CEAS Board of Trustees nominated him unanimously as the Chair of the CEAS Aeronautical Branch and I am sure he will give a great contribution to the CEAS activities.

JPS - Education and training being priority number one to prepare for the future, it would be opportune in my opinion to make enter PEGASUS into the group of corporate members. What do you think?

FB - Education and training are the core of my professional experience since I have always been working in Academia. I share the opinion that education and training are one priority to prepare for the future and PEGASUS has been created precisely with the main objective to keep the highest level of aerospace education in Europe. However, due to the nature and organisation of CEAS and PEGASUS, I think that the best connection between the two entities would be via a cooperation agreement with clear objectives that can include several themes. I remark that there is already a consistent overlap between CEAS and PEGASUS, since most of the professors and researchers active in the PEGASUS institutions are also members of their respective national societies, therefore automatically also CEAS members. I think I can be one good example, being the PEGASUS representative for Politecnico di Milano but at the same time one of the CEAS Trustees indicated by AIDAA. Therefore, it is straightforward to assume that CEAS and PEGASUS can reinforce each other in their respective core objectives. Just to mention one example, CEAS is continuously looking for experts in the aerospace sector for many activities (managing its Aeronautical and Space Journals, conference Programme Committee, webinars and seminars, …) and for sure the PEGASUS Universities can provide a great contribution to this. On the other side, CEAS can offer to Academia the right means to promote and disseminate the results of research and education, still exploiting its Journals and Conferences. All in all, I see a lot of potential in the cooperation CEAS and PEGASUS.

JPS - The working relations you recently engaged with the Air and Space Academy ('AAE') open new very

promising perspectives. How do you see the different aspects of this upcoming co-operation, their definition and their development process?
FB - I truly believe that CEAS and AAE are two complementary organisations, therefore I am confident that, with time, the working relations will be excellent and beneficial for both. We have already established a dialogue regarding possible interaction between CEAS and AAE in the context of the forthcoming European Rotorcraft Forum and I plan to do the same for the Aerospace Europe 2021 conference. I think that the dossiers prepared by AAE can find a good audience and wide distribution within CEAS. Since AAE membership is based on a nomination process and election, whereas CEAS membership is open to any scientist in the aerospace domain, there is no conflict between the two organisations and CEAS members can be nominated as AAE members.

JPS - The reinforcement of the mutual working relationships between CEAS member societies themselves is also essential. The CEAS Women in Aerospace Conference, strongly supported by AIAE, which was held on 25 June, was very successful (see report pp. ...). It is the perfect example of what we should organise in various aerospace domains and with the support of our different member societies. Would you have some projects to propose for the coming months?
FB - The CEAS Women in Aerospace Conference is a good example of activity proposed by one of the CEAS member societies, in this case the Spanish AIAE, and brought to European level with the contribution of the entire CEAS community. By organising the event we showed that CEAS has the capacity to leverage on and stimulate the European aerospace community. In a relatively short time span the event has been planned with all speakers identified. Incidentally the event has been a great success, strongly appreciated by the speakers and participants, and a report on the event is published in this issue of the Aerospace Europe bulletin. This success can trigger a positive effect and pave the way to a series of different events with the same conceptual organisation. I am sure that, even without such a full involvement of CEAS, the member societies have much to offer to the European aerospace community and CEAS should play the role of facilitator, sharing the information across its members. Of course, this would mean that national events would need to be held mostly in English to be shared, but nowadays I must assume this would not be a great problem.

JPS - Concerning the CEAS Aeronautical and Space Journals, would you see initiatives to be taken with the aim of their development by soliciting a higher number of science and technology organisations so allowing getting more and more numerous high-standard papers?
FB- The CEAS Aeronautical and Space Journals face a fierce competition in the sector of specialised scientific publications, and it is extremely important to keep the quality of the published papers at the highest level. If you look at the content of published papers, their number, and the bibliometric indexes, you notice that the Journals are slowly progressing in the right direction. What CEAS can and should do is to stimulate more its member societies to better connect their members to the CEAS Journals. It is not uncommon to see that some scientist, member of a CEAS organisation, is proposing and leading special issues on relevant topics on other "competing" journals, this is something that we would not like to see in the future. I think we need to find a way to connect the editorial boards with the CEAS Board to define a clear roadmap for the development of the journals. The CEAS journals have great editorial boards therefore I am confident that the journals will continue to improve in terms of quality and attractiveness.

JPS - So far CEAS does not deal with defence and security matters. Don't you think we should do?
FB - It is true that CEAS does not directly deal with defence and security, and I sincerely think that it will be extremely difficult to include these topics. In most circumstances these matters are classified and subject to severe restrictions in the dissemination, whereas CEAS is typically devoted to open discussions and knowledge sharing. However, CEAS members might individually be interested in research on defence and security, therefore some action in this direction should be identified. One idea could be to start disseminating within CEAS some activity done by other similar organisations, such as AAE that has recently published its Opinion No 12 on European secure connectivity. This could be proposed for instance as a plenary presentation at the next AEC2021, to create awareness and stimulate the audience.

JPS - The AEC2021 event is approaching. What are your recommendations and what are your main expectations?
FB - CEAS has decided to go forward in the organisation of AEC2021 despite the yet uncertain sanitary situation, wishing to offer to scientists the opportunity to restart meeting in person. Hopefully this will be one of the first live events to be organised since spring 2020 and it will mark a discontinuity, even if I am not expecting the massive participation we had in the latest editions of AEC. The conference is planned in hybrid mode, with the possibility for participants to attend and give presentations online. However, I sincerely hope that the majority of participants will opt for the on-site participation to get the most out of the conference. The main theme of the conference "Restore, Rethink, Redesign" should stimulate reflection on how to make aerospace activities even more sustainable, understanding the role of aerospace in the modern society. I look forward to the event and I am sure it will be an important milestone for CEAS members and for the aerospace community.

INTERVIEW WITH PROF. JONATHAN COOPER, SIR GEORGE WHITE CHAIR OF AEROSPACE ENGINEERING AT THE UNIVERSITY OF BRISTOL

By Jean-Pierre Sanfourche, Editor-in-Chief

Upon completing his PhD in aeronautical engineering from Queen Mary College, Jonathan Cooper has been working as teacher and researcher successively at the Royal Aerospace Establishment Farnborough, the University of Manchester, the University of Liverpool before in January 2012 he took becoming the Sir George White Professor of Aerospace Engineering at the University of Bristol.
The Airbus Sir White Chair is a joint Bristol University and Airbus position, playing a key role in linking Airbus into academia, which benefits the aerospace industry and also the University, with a strong industrial input into the University research programme.
Over the past 30 years, Prof. Jonathan Cooper has worked closely with industry in the UK, Europe and worldwide to develop solutions enabling aircraft designs to be more fuel efficient and environmentally friendly through exploitation of the interactions between the airflow and aircraft structures.

Prof. Cooper has acted as Principal Investigator on over 50 projects sponsored by the UK Government, EU and industry. He has supervised 55 PhD students and 28 Research Associates, and given 14 invited keynote presentations to top international conferences.

Elected to the Council of the RAeS in 2013, he was RAeS President from 2019 to 2021. He has been and is still involved in a wide range of RAeS activities.
Prof. Jonathan Cooper is Fellow of the RAeS, the Royal Academy of Engineering and the AIAA. He has been a Chartered Engineer for over 25 years.

Jean-Pierre Sanfourche **– Could you provide our readers with some information about the Sir George White Chair at the University of Bristol: its origin, its present general organisational structure and the management of the Aerospace Engineering programme? What are the main strategic orientations you are giving to this programme?**

Jonathan COOPER - Sir George White was a businessman in the late 18th and early 19th centuries who developed the electric tramway system across the city of Bristol, and elsewhere in the UK. Other activities included the introduction of motor taxis to Bristol in 1908 and he was instrumental in the funding and building of the main hospital (Bristol Royal Infirmary) in the centre of Bristol in 1912. Sir George saw Wilbur Wright fly in France in 1909 and early the next year founded a series of companies which eventually became the Bristol Aeroplane Company and these started to manufacture aircraft on a commercial scale. The location at Filton in Bristol, the site of the world's first "air-station", is the oldest centre of continuous aircraft manufacture world-wide and has become the current Airbus UK site for engineering, design and some manufacture.

At the end of the Second World War, the Bristol Aeroplane Company decided to endow a Chair in Aeronautical Engineering, to be named after the founder of the Company, Sir George White. The Company agreed to pay the University the sum of £6000 per annum for ten years "so that there shall be available for the British Aircraft Industry in general and the Company in particular a flow of apprentices and others who will have received specialised University education in a highly scientific and technical industry". The first holder was Roderick Collar (aeroelasticians will know him through his aeroelastic triangle) and he started the Aeronautical (nowadays Aerospace) Engineering Department. Jonathan Cooper is the 5th holder of the Sir George White Chair and undertakes his research with support from Airbus UK and the Royal Academy of Engineering, running a team of PhD and post doc researchers in collaboration with Airbus engineers working on technologies to reduce the environmental impact of aircraft. Most of his research is funded by the EU (H2020 and CS2) and the Aerospace Technology Institute in the UK.

J-P. S. **– Is Sir White Chair directly involved in the PEGASUS association?**

J. C. - No. Bristol University has withdrawn from this scheme some years ago I'm afraid

J-P. S. **– How do you plan to conduct the management of the Aeronautical Branch: organisation, continuation of previous activities and new initiatives?**

J. C. - Firstly, I would like to pay tribute to my predecessor Christophe Hermans who sadly died last January. He devoted a tremendous amount of time and energy to the CEAS as the President for two years and also as the Chair

of the Aeronautical Branch. His hard work and coordination strongly fostered the international collaboration that is the foundation of the CEAS. As we start to move out of the effects of COVID, and also to address the challenge of moving towards net-zero aviation, the Aeronautical Branch is in a great shape to build further activities and interactions thanks to Christophe's efforts.

We have 7 highly expert and relevant technical committees within the Aeronautical Branch and it will be my initial task will be to talk to each of them to assess their current status and aspirations before defining the way forward. I don't propose to make any radical changes to the structure and management. We organise some fantastic conferences and other activities, and need to build upon them to foster more collaboration between industry, research establishments and academia to tackle the very pressing environmental issues facing the aerospace community. Aircraft design is inherently multi-disciplinary, so there will be times when the technical committees will need to work together. Also, I would not be adverse to exploring the formation of other technical committees if there is the appetite: for instance, the fundamental elements of aircraft design for structures and propulsion are not represented at the moment and these are both currently undergoing radical changes via new technologies.

Finally, I would hope that the Aeronautical Branch could devote some energy towards highlighting the fantastic career opportunities that are available across the aeronautics domain throughout Europe so that we can attract and enthuse a wide and diverse element of the next generation of engineers.

***J-P. S.* – What are the proposals you would suggest with a view to increasing CEAS Aeronautical Journal's reputation?**

J. C. - For a journal to thrive in an area where there is a great deal of competition (there are over 30 "aerospace" focused journals), the key element is to publish high quality, relevant and timely articles that the readership across Europe wants to access. This goal in itself is not "rocket science"; however, how to achieve it is not so straightforward. I am not so focussed on the various statistics and citation indices that a lot of people obsess about as they will be a bi-product of publishing good articles. The key thing is to get leading authors to choose to submit their articles to the CEAS Aeronautical Journal, and this is where the Aeronautical Branch can help, through the various technical committees encouraging researchers and engineers in their disciplines to publish in this journal.

***J-P. S.* – More generally, what is your global judgement about the CEAS? its trumps, its weak points, and the domains in which significant improvements could be in your opinion rapidly initiated?**

J. C. - The CEAS is an incredible organisation whose major strength comes from its roots in the twelve aerospace focussed professional membership organisations across Europe, and four highly relevant corporate members. The main activities are focussed around the various technical conferences for which it has a strong reputation; as I write these notes the latest edition of the European Rotorcraft Conference is just starting, and I have been involved for many years in the organisation of the International Forum on Aeroelasticity and Structural Dynamics. It is pleasing to note the first CEAS Women in Aerospace Conference that was held in June and I hope that this will continue and expand. The CEAS Aeronautical Journal is also a strong vehicle for the European aerospace community to share the latest developments in a fast-changing world.

We need to be very careful that the CEAS is not simply a set of boards and committees, based upon 16 organisations with their own boards and committees, that organises the occasional conference. In order to thrive we need to build upon our strengths to make the CEAS more relevant across the European Aerospace industry, research establishments and academia. There could be a better interaction with the other two major international aeronautical organisations (ICAS and AIAA) to work together in some areas for mutual benefit. Similarly for EASN and equivalent organisations.

Other suggestions:

- There could be more interactions with the various technical committees in each of the member organisations and also the various funding bodies (not sure whether CEAS has any input into H2020 and Clean Sky?).
- There could be more emphasis on increasing diversity across the industry.
- Publicising the importance of aerospace and new technologies to the general public via an increased social media presence.

FIRST CEAS 'WOMEN IN AEROSPACE' CONFERENCE

By Andrea Alaimo, DG of CEAS

The first CEAS Women in Aerospace virtual conference was successfully held on June 25th,2021. More than 100 participants attended the event, promoted by COIAE/ AIAE (Spanish Association of Aerospace Engineers) and organised together with CEAS. The conference aimed to give more visibility to women in aerospace, to attract all talents in aerospace and to promote diversity in aerospace. For these reasons it was divided into four round tables with excellent speakers from public institutions and associations, universities and the industry who shared their career experience in aerospace and gave advice on how to attract women talents, how to give them more visibility in aerospace and how to overcome one or the other obstacle.

As the conference was mainly aimed at a young female audience, a contest project for students on "How to promote STEM[1] careers among the youngest generation" was integrated into the conference programme. Among the eight proposals received, those of Valerie Dosch – Aerospace Engineering student at the University of Stuttgart – and Alicia López Sánchez – Aerospace Engineering student at Rey Juan Carlos University in Madrid – ranked first and second receiving the offered prizes of € 1000 and € 500 respectively.

At the end of the Conference, the Organising Committee has received very positive feedback from the audience that can be summarised with the words of prof. Franco Bernelli – CEAS President.

With the words of prof. Franco Bernelli, CEAS President:

" I already look forward to the second edition of the conference, where hopefully we will be able to highlight the progress in gender equality in aerospace. The first conference has been a truly European event, with speakers from 9 different countries and having extremely different career profile. This allowed to share very different experiences and highlight the different policies and achievements across Europe. The attention and interest to the subject goes even beyond the European borders and is testified by the wide extra-European audience and the participation of students from India to the associated contest. In particular, the number of students attending and participating in the contest is encouraging. All this shows that CEAS can provide the right forum for discussing relevant aerospace issues".

1. STEM : Science, Technology, Engineering and Mathematics

1ST CEAS WOMEN IN AEROSPACE CONFERENCE VIRTUAL CONFERENCE

DATE: 25TH OF JUNE, 2021 FROM 9:00 – 13:20 / CEST ANCHOR WOMAN: ESTEFANÍA MATESANZ, PRESIDENT OF ASOCIACIÓN DE INGENIEROS AERONÁUTICOS DE ESPAÑA (AIAE).

AGENDA

09:00 – 09:05. Welcome by Franco BERNELLI, President of CEAS.

09:05 – 09:15. Opening speech. Ersilia VAUDO, Chief Diversity Officer at ESA.

09:15 – 10.05. First round table. The importance of women networks and public institutions.

- Ellas Vuelan Alto / Women Fly High. Isabel MAESTRE, Executive Director from Agencia Estatal de Seguridad Aérea (AESA) & Vice-president of Ellas Vuelan Alto.
- Women in Aerospace (WiA). Luisella GIULICCHI, President of WiA Europe & System Manager, ESA.
- Royal Aeronautical Society Alta Mentoring. Sarah MINETT, FRAeS, Chair of the Women in Aviation and Aerospace Committee, and Managing Director, Mission

Systems, COLLINS AEROSPACE.

- Eurocontrol. Milena BOWMAN, Executive Manager Airspace, Systems & Procedures, EUROC./MUAC.

Moderator Cornelia HILLENHERMS, CEAS Vice-President.

10:10 – 11.00. Second round table. Education and careers in STEM.

- Euroavia. Inês PASSINHAS RODRIGUES, master student, Instituto Superior Técnico in Lisbon.
- TU Delft. Jeannette HEILIGERS, Assistant Professor, Faculty of Aerospace Engineering.
- ISAE-Supaero. Stéphanie LIZY-DESTREZ, Associate Professor, DCAS - Space Advanced Concepts Laboratory.
- Universidad Politécnica de Madrid. Cristina CUERNO, Director of Escuela Técnica Superior de Ingeniería Aeronáutica y del Espacio.

Moderator: Franco BERNELLI. President of CEAS.

11:00 – 11.10. **Break**

11:10 – 12.00. Third round table. Women in the aerospace industry.

- Airbus. Penelope Jane BASSON, Senior Vice President, Chief of Staff to the COO and HO People Empowerment in Operations.
- Safran Aircraft Engines. Séverine CHARRIE, Head of Rotating Parts Center of Excellence.
- Leonardo. Katia GIGLIOTTI, Head of Electrical Design Department, Leonardo Aircraft Division.
- GIFAS & Safran Group. Solenne TERRAL, President of GIFAS Quality Committee & VP Quality & Progress.

Moderator: Estefanía MATESANZ. President of AIAE, member of CEAS.

12:05 – 12.55. Fourth round table. Women in aviation.

- Vueling. Ana FERNÁNDEZ, Chief Communication and Political Affairs Office.
- Lufthansa. Sina RATHGEBER, Head of Strategic System Partnership Management Group Airlines.
- IATA. Jane HOSKISSON, Director, Talent, Learning Engagement and Diversity.
- EASA. María ALGAR-RUIZ, Drones Programme Manager.

Moderator: Andrea ALAIMO. Director General of CEAS.

12:55 – 13:10. Awards ceremony. "How to promote STEM careers among the youngest generation".

13:10– 13:20. Closure. Patricia REVERDY, Executive Secretary at ECAC.

AEC 2021 WARSAW

HOME PAGE

The Aerospace Europe Conference 2021 will be held in Warsaw, 23-26 November 2021. The conference will be organized by CEAS together with Polish Society of Aeronautics and Astronautics , Łukasiewicz Research Network – Institute of Aviation & Warsaw University of Technology. Due to the uncertainty related to the COVID-19 pandemic, two forms of conference are considered – traditional (face-to-face) and on-line. Maybe the hybrid form that will combine classical sessions for limited number of participants with on-line connection will be the best solution.

The main motto for the conference is 3R triptych "Restore, Rethink, Redesign". It contains the following topics:

- digitalization
- artificial intelligence
- more electrical aircraft
- hybrid propulsion
- alternative fuels
- H_2 propulsion
- design of the future aircraft

However the conference will also cover the typical topics for aerospace conference:

- General Aviation
- Aircraft Design
- Aerodynamics (incl. CFD)
- Flight Dynamics
- Helicopter Dynamics
- Control and Flight Tests
- UAVs
- Green Aviation

- Materials and Structures
- Space Mission Analysis and Design
- Spacecraft Design
- Space Robotics
- Space Propulsion
- Spacecraft Subsystems
- Satellite Dynamics and Control
- Airports
- Maintenance and Repair and Overhaul (MRO)
- Recovery and re-launch of air transport
- SESAR and EUROCONTROL (ATM) challenges
- Skills for the aerospace sector
- Clean Sky: status & reports

AEC-21 will be held in promises of Łukasiewicz Research Network – Institute of Aviation – one of the largest scientific and research institution in Europe, with over 90 years

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 calibre 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:
– Rafael Bureo Dacal
– Andrea Dieball
– Cornelia Hillenherms
– Wilhelm Kordulla
– Stefan Leuko

CEAS SPACE JOURNAL

Volume 13, Issue 3, July 2021

MATERIALS' PHYSICS AND CHEMISTRY FOR SPACE APPLICATION: IN MEMORIAM OF CHRISTOPHER SEMPRIMOSCHNIG

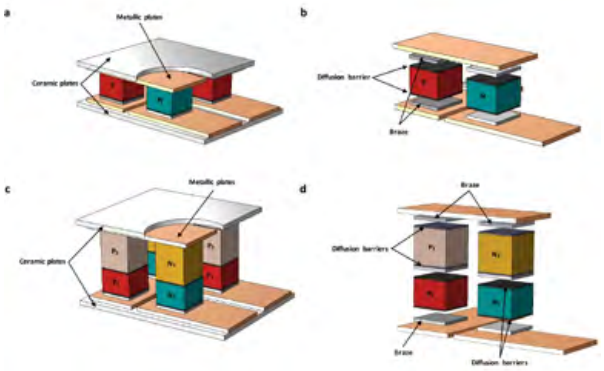
U. Lafont, A.Tighe, R. Rampini & M. Nikulainen / Published online: 15 July 2021

MATERIALS' PHYSICS AND CHEMISTRY FOR SPACE APPLICATION

U. Lafont & A. Tighe / Published online: 29 June 2021 (Open Access)

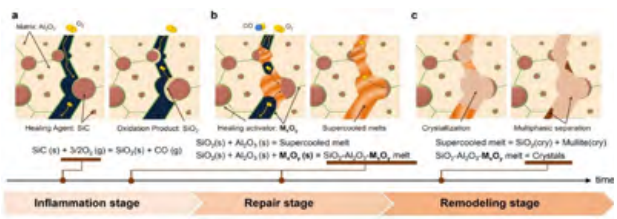
THERMOELECTRIC MATERIALS FOR SPACE APPLICATIONS

C. Candolfi, S. El Oualid, D. Ibrahim, S. Misra, O. El Hamouli, A. Léon, A. Dauscher, P. Masschelein, P. Gall, P. Gougeon, C. Semprimoschnig & B. Lenoir/ Published online: 10 March 2021



SELF-HEALING MATERIALS FOR SPACE APPLICATIONS: OVERVIEW OF PRESENT DEVELOPMENT AND MAJOR LIMITATIONS

L. Pernigoni, U. Lafont & A. Mattia Grande / Published online: 21 April 2021 (Open Access)

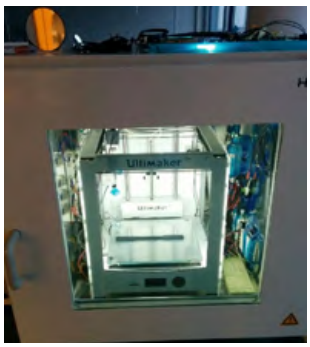


SMALL-DIAMETER OPTICAL FIBRE SENSOR EMBEDMENT FOR AMBIENT TEMPERATURE CURE MONITORING AND RESIDUAL STRAIN EVALUATION OF CFRP COMPOSITE LAMINATES PRODUCED BY VACUUM-ASSISTED RESIN INFUSION

H. Rocha, C. Semprimoschnig & J. P. Nunes / Published online: 10 March 2021

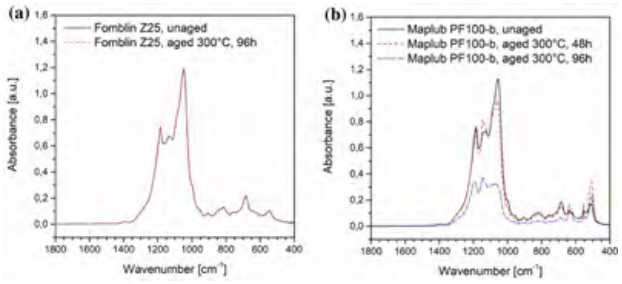
EFFECT OF LOW VACUUM ENVIRONMENT ON THE FUSED FILAMENT FABRICATION PROCESS

M. Quinn, U. Lafont, J. Versteegh & J. Guo / Published online: 16 April 2021



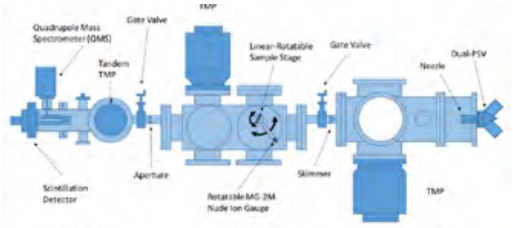
ASSESSMENT OF THE CHEMICAL DEGRADATION OF PFPE LUBRICANTS AND GREASES FOR SPACE APPLICATIONS: IMPLICATIONS FOR LONG-TERM ON-GROUND STORAGE

A. Wolfberger, A. Hausberger, S. Schlögl & M. Hołyńska / Published online: 18 Februar 2021



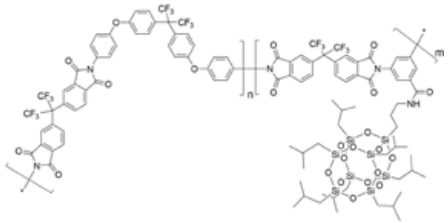
EFFECT OF SIMULTANEOUS N2 COLLISIONS ON ATOMIC OXYGEN-INDUCED POLYIMIDE EROSION IN SUB-LOW EARTH ORBIT: COMPARISON OF LABORATORY AND SLATS DATA

K. Yokota, M. Tagawa, Y. Fujimoto, W. Ide, Y. Kimoto, Y. Tsuchiya, A. Goto, K. Yukumatsu, E. Miyazaki & S. Imamura / Published online: 7 April 2021 (Open Access)



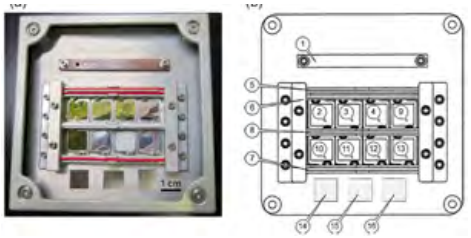
POSS-ENHANCED COLORLESS ORGANIC/INORGANIC NANOCOMPOSITE (CORIN®) FOR ATOMIC OXYGEN RESISTANCE IN LOW EARTH ORBIT

J. S. Wright, A. Jones, B. Farmer, D. L. Rodman & T. K. Minton / Published online: 8 February 2021



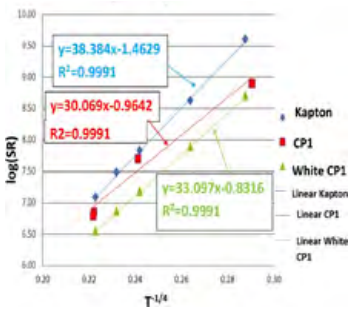
PROPERTY CHANGES IN MATERIALS DUE TO ATOMIC OXYGEN IN THE LOW EARTH ORBIT

A. Goto, K. Umeda, K. Yukumatsu & Y. Kimoto / Published online: 28 June 2021 (Open Access)



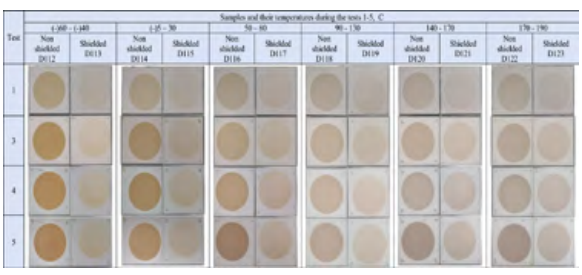
ION BEAM-TREATED SPACE POLYMERS: LONG-TERM STABILITY IN GEO-SIMULATED ENVIRONMENTS

J. Kleiman, Z. Iskanderova, L. Krishtein, J. R. Dennison, B. Wood, A. Grigorievsky & C. Best / Published online: 19 April 2021



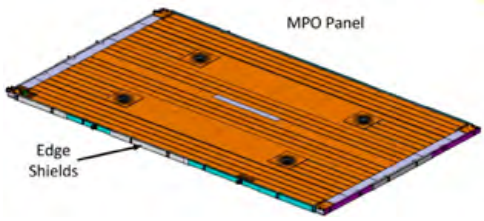
EFFECT OF SPACE ENVIRONMENT ON NV14 CERAMIC WHITE COATING OF HIGH GAIN ANTENNA OF BEPI-COLOMBO SPACECRAFT: LONG DURATION TEST

Y. V. Butenko, B. Bras, R. Martins, N. Dias, A. Polsak, A. Suliga, A. Tighe, R. Rampini, M. Falcolini, B. Guillaume, L. D'Arcio, C. Semprimoschnig, F. Meyer & Stefan Faber / Published online: 16 July 2021



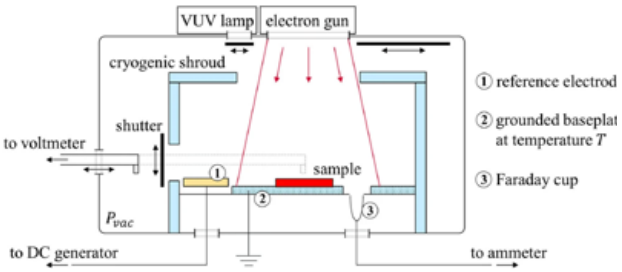
HIGH-INTENSITY HIGH-TEMPERATURE TESTING OF MATERIALS FOR THE BEPI COLOMBO MPO AND MTM SOLAR ARRAYS

A. Tighe, B. Bras, M. Hołyńska, C. Noemayr & C. Zimmermann / Published online: 15 April 2021



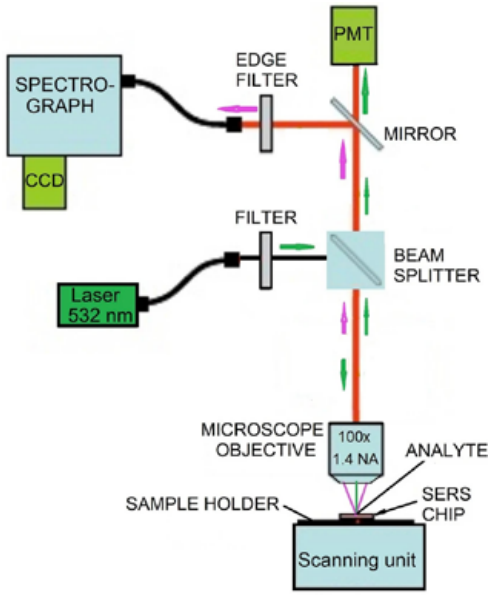
MATERIALS CHARGING INVESTIGATIONS FOR JUICE

B. Delacourt, N. Dias, A. W. Polsak, G. Milassin, A. Tighe, M. Lanuti, E. Bongers & R. Rampini / Published online: 7 July 2021



SURFACE-ENHANCED RAMAN SCATTERING SENSORS FOR BIOMEDICAL AND MOLECULAR DETECTION APPLICATIONS IN SPACE

V. Snitka, D. Batiuskaite, I. Bruzaite, U. Lafont, Y. Butenko & C. Semprimoschnig / Published online: 8 March 20211

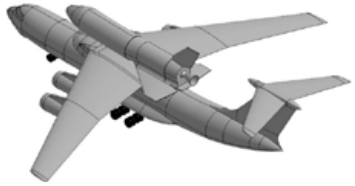


CEAS AERONAUTICAL JOURNAL

Volume 12, issue 3, August 2021

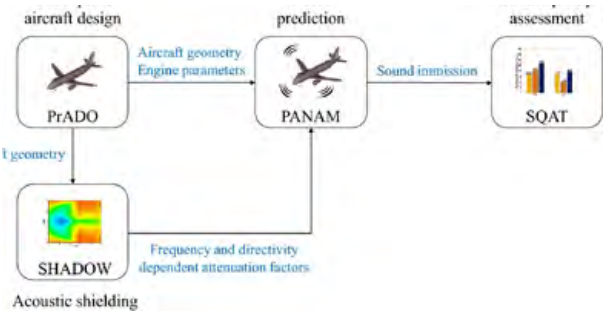
A COMPLETELY REUSABLE AEROSPACE SYSTEM BASED ON SUBSONIC CARRIER WITH THE RETURN OF THE FIRST STAGES TO THE STARTING POINT

V. I. Buzuluk & S. M. Mikhalyov / Published: 23 February 2021



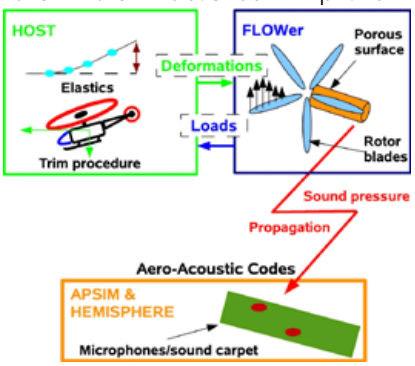
SOUND QUALITY ASSESSMENT OF A MEDIUM-RANGE AIRCRAFT WITH ENHANCED FAN-NOISE SHIELDING DESIGN

Gil Felix Greco, Lothar Bertsch, Tobias P. Ring & Sabine C. Langer / Published: 21 April 2021



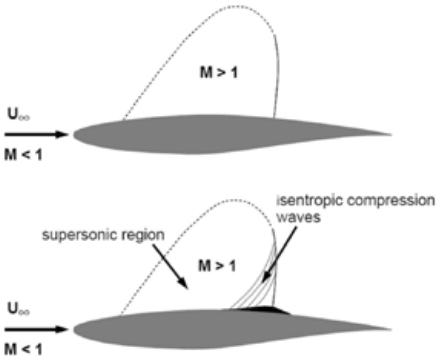
QUIETER AND GREENER ROTORCRAFT: CONCURRENT AERODYNAMIC AND ACOUSTIC OPTIMIZATION

Gunther Wilke / Published: 21 April 2021



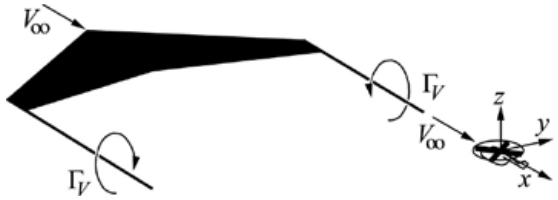
STRUCTURAL CONCEPT OF AN ADAPTIVE SHOCK CONTROL BUMP SPOILER

Markus Kintscher, Johannes Riemenschneider, Hans-Peter Monner & Martin Wiedemann / Published: 21 April 2021



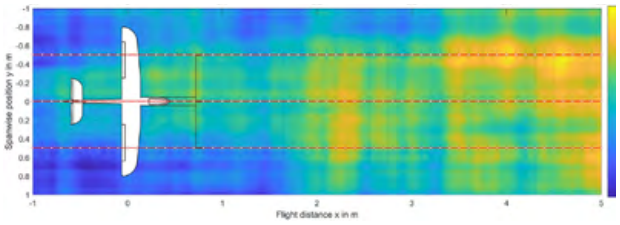
ANALYTIC SOLUTION OF IN-PLANE VORTEX–ROTOR INTERACTIONS WITH ARBITRARY ORIENTATION AND ITS IMPACT ON ROTOR TRIM

Berend G. van der Wall & Lennert B. van der Wall / Published: 27 April 2021



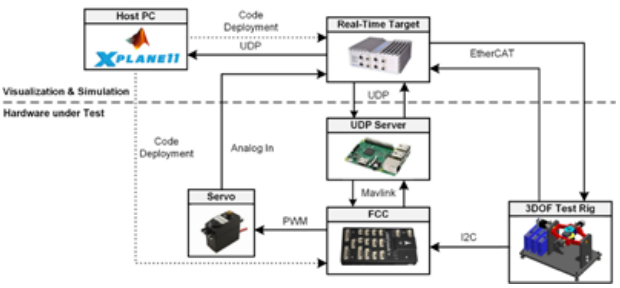
TURBULENCE LOAD PREDICTION FOR MANNED AND UNMANNED AIRCRAFT BY MEANS OF ANTICIPATING DIFFERENTIAL PRESSURE MEASUREMENTS

Andras Galffy, Rainer Gaggl, Robert Mühlbacher, Daniel Frank, Johannes Schlarp & Georg Schitter / Published: 30 April 2021



DEVELOPMENT OF A HARDWARE-IN-THE-LOOP DEMONSTRATOR FOR THE VALIDATION OF FAULT-TOLERANT CONTROL METHODS FOR A HYBRID UAV

F. Prochazka, S. Krüger, G. Stomberg & M. Bauer / Published: 05 May 2021

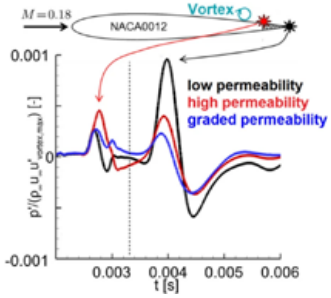


EXPERIMENTAL AND NUMERICAL STUDIES ON SMALL CONTRA-ROTATING ELECTRICAL DUCTED FAN ENGINES

Tobias Ebus, Markus Dietz & Andreas Hupfer / Published: 29 May 2021

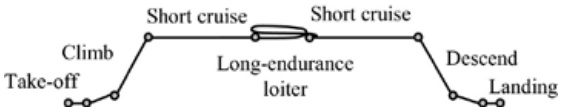
PRODUCTION AND CHARACTERIZATION OF EXPERIMENTAL LOW NOISE TRAILING EDGES MADE OF COLD ROLLED POROUS ALUMINUM WITH SPECIAL ATTENTION TO THE INFLUENCE OF COLD ROLLING ON THE MECHANICAL STABILITY OF THE INVESTIGATED MATERIALS

Jörn Tychsen & Joachim Rösler / Published: 31 May 2021



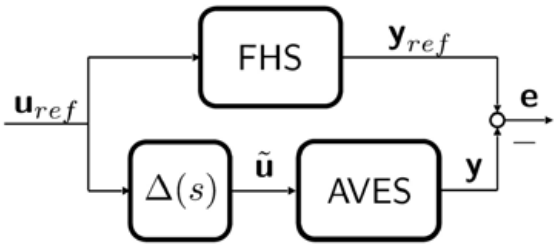
FULL CONFIGURATION DRAG ESTIMATION OF SHORT-TO-MEDIUM RANGE FIXED-WING UAVS AND ITS IMPACT ON INITIAL SIZING OPTIMIZATION

F. Götten, D. F. Finger, M. Havermann, C. Braun, M. Marino & C. Bil / Published: 10 June 2021



IMPROVING A REAL-TIME HELICOPTER SIMULATOR MODEL WITH LINEAR INPUT FILTERS

Pavle Šćepanović & Frederik A. Döring / Published: 15 June 2021

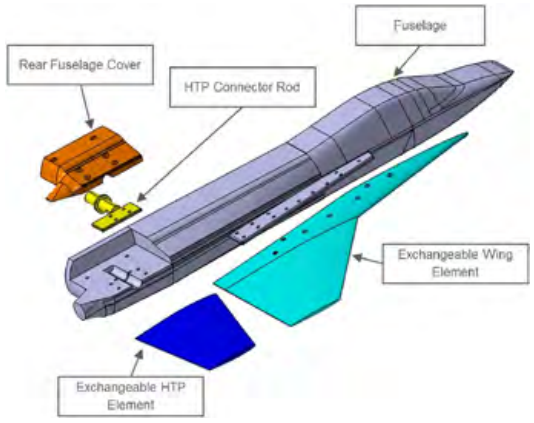


T-TAIL FLUTTER SIMULATIONS WITH REGARD TO QUADRATIC MODE SHAPE COMPONENTS

Dominik Schäfer / Published: 18 June 2021

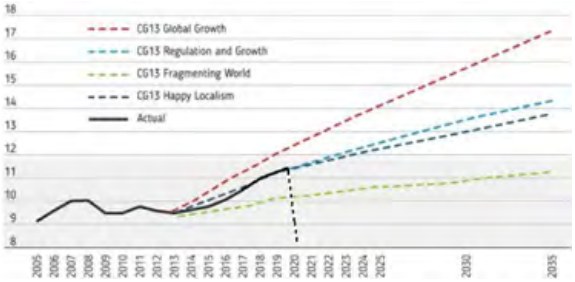
AEROELASTIC WIND TUNNEL MODEL FOR TAIL BUFFETING ANALYSIS USING RAPID PROTOTYPING TECHNOLOGIES

Lukas Katzenmeier, Cyrille Vidy, Alexander Kolb & Christian Breitsamter / Published: 21 June 2021



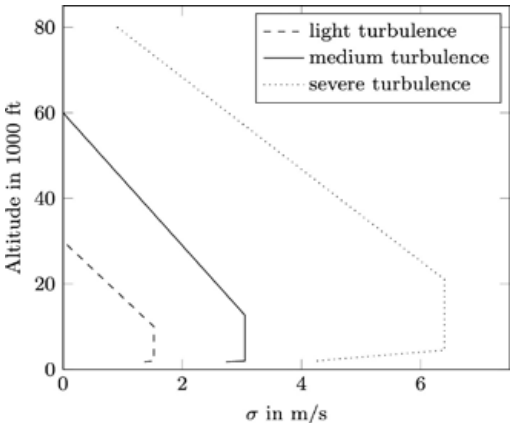
PARE PRELIMINARY ANALYSIS OF ACARE FLIGHTPATH 2050 ENVIRONMENTAL IMPACT GOALS

Oleksandr Zaporozhets, Volodymyr Isaienko & Kateryna Synylo / Published: 05 July 2021



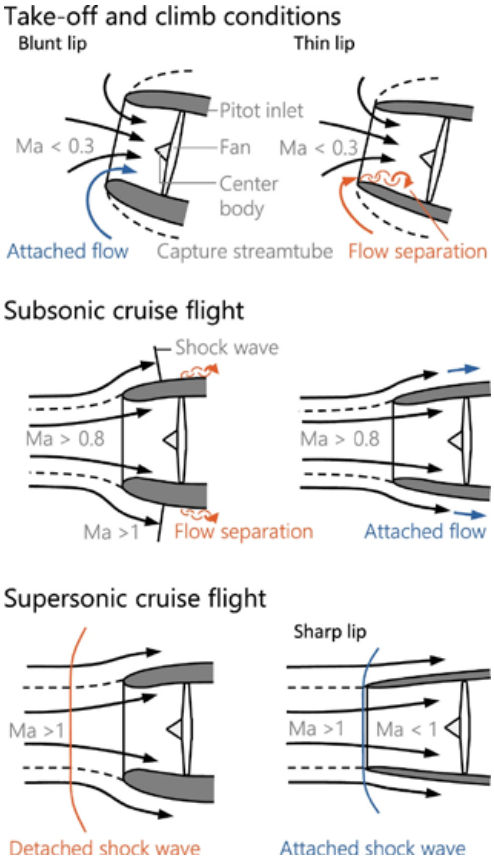
EVALUATION OF THE AIRCRAFT FUEL ECONOMY USING ADVANCED STATISTICS AND MACHINE LEARNING

S. Baumann, T. Neidhardt & U. Klingauf / Published: 19 June 2021



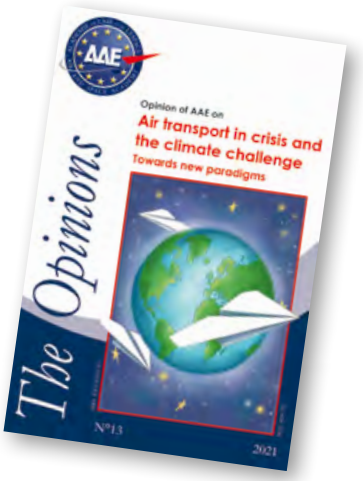
REVIEW OF VARIABLE LEADING-EDGE PATENTS FOR AIRCRAFT WINGS AND ENGINE INLETS AND THEIR RELEVANCE FOR VARIABLE PITOT INLETS IN FUTURE SUPERSONIC TRANSPORT

Tim Effing, Florian Schültke & Eike Stumpf / Published: 18 April 2021



AIR TRANSPORT IN CRISIS AND THE CLIMATE CHANGE – TOWARDS NEW PARADIGMS

By Michel Wachenheim, President of the Air and Space Academy



Following the Conference it organised on 11 and 12 March 2021, the Air and Space Academy (AAE Académie de l'Air et de l'Espace) has published in July Opinion n° 13, the document reporting on this event. Here below is reproduced the Foreword written by its President Michel Wachenheim

On 11 and 12 March 2021, the Air and Space Academy (Académie de l'air et de l'espace – AAE) organised a conference entitled "Air transport in crisis and the climate challenge – towards new paradigms", under the chairmanship of Violeta Bulç, former Transport commissioner at the European Commission. This opinion results directly from discussions that took place at this conference and subsequent work carried out internally by AAE.

We wished this conference to stand out from the numerous symposia and forums focusing on the energy transition of air transport in three respects, by:

- addressing the issue of decarbonisation of air transport without taboos or concessions, involving stakeholders from outside the aviation world;
- giving a voice to the younger generation, with a particular emphasison cooperation with training organisations (live broadcast to a dozen schools and training institutes), a cooperation which will be pursued in the future;
- hearing the views expressed by representatives of continents other than Europe, sometimes reflecting very different priorities and thus underlining the importance of the international dimension in this debate.

For the presentation of this opinion, we have retained the structure of the conference and made recommendations as follows:

1. CLIMATE ISSUES FOR AIR TRANSPORT

Debate is needed on effort-sharing for decarbonising the air transport sector, both with regards to other sectors of activity and within the sector itself, with any changes implemented at the global level. AAE recommends that public and private players join forces **to create an to create an observatory, a body for monitoring global efforts to reduce the carbon emissions generated by air transport**, in order to work on the basis of universally recognised, credible and transparent premises (Rec.1).

2. TECHNOLOGICAL CHOICES ON A LEVEL WITH ECOLOGICAL AMBITIONS

AAE considers that technological innovation will be the preferred means of reducing greenhouse gas emissions from aviation. Taking into consideration the different technical constraints – in particular those related to flight safety – the need to develop interoperable solutions at international level, the complexity of fuel distribution infrastructure deployment, the need for continuity in transitional solutions and the urgency of initiating new processes, AAE recommends that the States henceforth provide **massive support for a European industrial synthetic alternative fuel sector** (PtL – power to liquid), bearing in mind that a number of industrial projects are already in the pipeline (Rec.2).

Whilst placing the necessary emphasis on the PtL option, which seems promising for air transport as a whole, the AAE suggests that the industry and the States concerned support the exploration of other solutions in a balanced way, taking full account of their feasibility at the global level (Rec.3).

Finally, it is recommended that both industry and the supporting States **maintain and increase their efforts to introduce innovations into current technologies** with the goal of reducing fuel consumption (Rec.4).

3. INCENTIVES AT THE LEVEL OF CARRIERS AND INFRASTRUCTURE MANAGERS

Leaving aside authoritarian solutions aimed at decreasing air transport (an admission of failure before other solutions have even been tried), it is undoubtedly possible to set up more fuel-efficient air transport policy incentives. Airlines have already implemented fuel-saving strategies in their own interest, but they could be further encouraged to adopt operational practices, service strategies or commercial policies that prioritise reducing consumption. Although sometimes referred to as re-regulation, it is not a question of reverting to the regulations of 50 years ago, but of establishing a number of rules or incentives to encourage lower emissions. This is why AAE recommends that States and the International Civil Aviation Organization **convene a new Air Transport Conference** (Rec.5) in Montreal charged with defining this new policy at the global level. Effective measures in the short term would include notably that of States **implementing an ambitious policy to incorporate sustainable aviation fuels** (Rec.6) without waiting for the ideal PtL.

In the field of air navigation, AAE suggests that service providers raise staff awareness as to the climate issues involved in their jobs (Rec.7). It makes no recommendations regarding air traffic management (ATM), but is aware of the emissions issues involved in this branch of activity. An in-depth study of the evolution of air traffic control in Europe is underway and will be the subject of further recommendations.

AAE encourages airports to pursue their policy of reducing emissions and to prepare resolutely for future technological developments (Rec.8). It also recommends that land transport authorities develop quality city-airport links to reduce the proportion of private vehicles used for this purpose (Rec.9).

4. THE NEED FOR EFFECTIVE INTERNATIONAL HARMONISATION

As the current health crisis shows, there are sectors where international coordination is necessary in order for steps to be effective. Air transport, naturally focused on long distances, is one such sector. Technical interoperability is necessary for obvious safety reasons, but so is a certain degree of political harmonisation in a globalised economy. This is the role of the International Civil Aviation Organization (ICAO), created by the Chicago Convention (1944). The ICAO was also given the task of defining a global policy to combat climate change by the Kyoto Protocol (1997). The difficult compromise between the Chicago principle of non-discrimination and the Kyoto principle of common but differentiated responsibility, incorporated into the Paris Agreement, is slowing down progress and reducing its scope. AAE recommends that States – and in particular France which will take over the presidency of the European Union in the first half of 2022 – forge a strong political initiative ahead of the 41st ICAO Assembly (September 2022) **in order to integrate the fight against climate change into the basic principles of ICAO** (Rec.10). Without a strong, urgent political impetus, there is a risk this Assembly will come to only limited decisions.

Among the decisions expected from the 41st ICAO Assembly is the adoption of a long-term target for emissions from international aviation. ICAO must also adapt its working structures and decisionmaking processes to meet the need for rapid adoption of standards and recommendations for the implementation of new technologies that will reduce emissions. The Academy therefore recommends that **European States and institutions lobby the ICAO Assembly and Council for a thorough reform of the organisation** (Rec. 11).

5. WHAT AIR TRANSPORT FOR THE FUTURE: A NECESSARY DIALOGUE BETWEEN CITIZENS

Air transport is the only economic sector that has taken the decision to regulate its emissions at the global level. It is determined to go much further and approach "net zero emissions". The technological innovations that will be developed by aviation will benefit other sectors too. Just as international air transport has risen to the challenge of safety (fewer than 1,000 deaths per year), there is every reason to believe that it will rise to the challenge of combating climate change. However, it is having difficulty convincing the various stakeholders of its technological projects; some attribute to it a share of emissions far in excess of reality, others see only one solution: to force it into negative growth.

In this context, the Air and Space Academy considers that the question of the social utility of air transport should be addressed directly and in a balanced way. It is true that 1% of the world's population emits 50 % of the total CO_2 from air transport. Just as 1% of the population holds half of the world's wealth. This observation relates to the functioning of our societies. The question of the climate impact of air transport deserves to be addressed calmly and rationally.

What is the purpose of air transport? What is its social utility? Could we do without it? The sociologists we asked suggest some avenues for reflection: travel is an instrument of both individual and collective development. But the perception is different depending on whether we are in developed countries with alternative means of transport or in remote areas or countries whose economy relies on air services. Reflections on the uses of air transport are necessary.

AAE recommends the **creation of a forum on the uses of aviation, which could be European** (Rec.12). This forum should bring together all stakeholders, from both inside and outside the sector, citizens and public authorities, with the broad involvement of the younger generation. This initiative could be taken by a European institution, for example the European Parliament.

The Air and Space Academy is publishing this opinion with the sole aim of defending the general interest. It is ready to pursue this work in cooperation with the various players who wish to do so.

The President of the Air and Space Academy
Michel WACHENHEIM

ACADÉMIE DE L'AIR ET DE L'ESPACE
1, avenue Camille Flammarion – F-31500 TOULOUSE
contact@academie-air-espace.com
www.academieairespace.com

4D-TBO IS A NEW APPROACH TO AIRCRAFT TRAJECTORY PREDICTION

17 December 2020

HOW FOUR-DIMENSIONAL TRAJECTORY DATA COULD CONTRIBUTE TO AVIATION DECARBONISATION TARGETS

The real-time transmission of 4-dimensional trajectory data has the incredible potential to greatly improve an aircraft's trajectory. By reducing the inaccuracy of current air traffic management (ATM) prediction models by approximately 30-40%, the Trajectory Based Operations in 4 Dimensions (4D-TBO) project is helping to pave the way to a more sustainable management of tomorrow's air traffic.

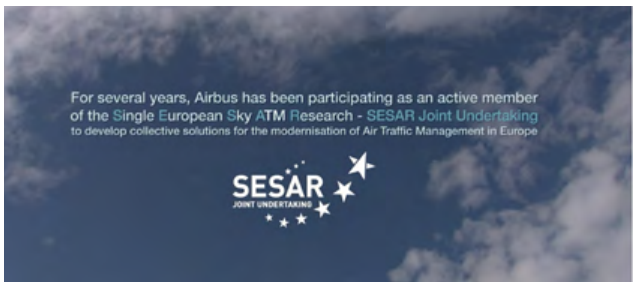
Although some uncertainty exists about the exact timeline for air traffic recovery in the short term, **global forecasts are clear:** tomorrow's air traffic will be increasingly dense. In fact, this outlook raises vital questions about the aviation industry's future environmental footprint. As a result, air traffic management (ATM) is becoming an increasingly important—and complex—focus area.

But a small revolution in ATM has just taken place: after two years of experimental entry-into-service programmes and more than 20,000 flights carried out by about 90 A320 aircraft from six airlines (Air France, British Airways, EasyJet, Iberia, Novair and Wizzair), the 4D-TBO* project led by Airbus alongside more than 15 partners in the frame of the Single European Sky Air Traffic Management Research (SESAR) programme is coming to an end. The project focused on analysing the real-time transmission of four-dimensional trajectory data (Latitude, Longitude, Altitude, Time) as a solution to better inform ATM operations. And initial findings are very encouraging.

"High stakes are behind this project," explains Jean-Brice Dumont, Airbus Executive Vice-President, Engineering. "Thanks to the transmission of four-dimensional trajectory data, ATM will be able to improve, optimise and better predict an aircraft's trajectory, thereby enabling us to immediately and concretely reduce our environmental footprint. It will also help us design the ATM system of the future, an endeavour that Airbus has undertaken alongside our other stakeholders in the SESAR programme."

TRAJECTORY PREDICTION FOR IMPROVED ATM OPERATIONS

Two modern-day air traffic control scenarios illustrate how improved trajectory prediction could make a positive impact on an aircraft's environmental footprint. For example, during periods of heavy airport traffic, such as summer holidays, air traffic controllers often divert some aircraft to holding patterns (i.e. an oval course flown by aircraft awaiting further landing clearance) to better organise arrivals queuing in the terminal area. In another example, ground control often requests an aircraft begin its descent before its optimum Top of Descent (TOD)—or the point at which the planned descent to approach is initiated—due to a lack of accurate visibility of an aircraft's optimum trajectory.



> Click to see the video

In these scenarios, the aircraft must either fly additional time or must withdraw from its optimal trajectory, which requires more fuel consumption and consequently, increases CO2 emissions. In fact, if flying in a holding

pattern at 10,000 feet and at 220 knots, an A320 Neo consumes 25 kg of fuel per minute, or 100 kg for a four-minute holding. In addition, these scenarios could result in delayed arrivals, disrupt the departure flow, and increase workload for both controllers and pilots.

However, by transmitting complete, up-to-date information about its trajectory, an aircraft can send air traffic control invaluable data that is essential for better decision-making. The result is more efficient and better coordinated management of optimised aircraft trajectories, which will lead to increased safety of air traffic operations in general.
Assisted by a system fed with this knowledge, the controller in the previous two scenarios will thus be able to request a precise adjustment in the aircraft's cruise speed to avoid diversion to a holding pattern in the airport terminal area and to enable optimum TOD—an action that will lead to reduced CO_2 emissions. Specifically, fuel savings could be up to 10 kg, or the equivalent of approximately 32 kg of CO_2, if an aircraft descends from its optimum TOD. When calculated over an entire year for a European jet fleet of about 5,500 aircraft, the savings could be as high as 65,000 tons of fuel.

A PHASED 4D-TBO ENTRY-INTO-SERVICE DURING THE 2020S

According to Jean-Brice, the main advantage of the 4D-TBO solution is its potential to drastically reduce the inaccuracy of the trajectory prediction models available in control centres until now. But thanks to improved calibration using accurate aircraft data, these new algorithms have proven their ability to reduce the inaccuracy of airspace prediction models by approximately 30-40%.

"Bottom line: improved accuracy of four-dimensional trajectory predictions reduces margins when detecting conflicting trajectories and results in fewer alerts to controllers," he explains. "This reduces the need for controller intervention and means we can fly as close as possible to the initially identified optimum flight trajectory. As a result, we can reap all the rewards of improved aircraft performance in relation to environment, safety and capacity."

In 2021, the 4D-TBO function is expected to be gradually entered into service across several European countries (i.e. France, Switzerland, Hungary, Bulgaria, Poland, Spain) as part of the future SESAR PJ38 ADSCENSIO* project. This will involve the development of a centralised shared trajectory data platform.

ATM is a constituent part of the Airbus "Decarbonisation" programme, designed, in particular, to reduce CO_2 emissions by 50% from now to 2050 and to develop the first zero-emission commercial aircraft by 2035.

These projects have received funding from the SESAR Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreements No 731818 (DIGITS) and No 101017626 (ADSCENSIO).
From https://www.airbus.com

ACUBED AIRBUS A³: WAYFINDER

May. 19, 2021

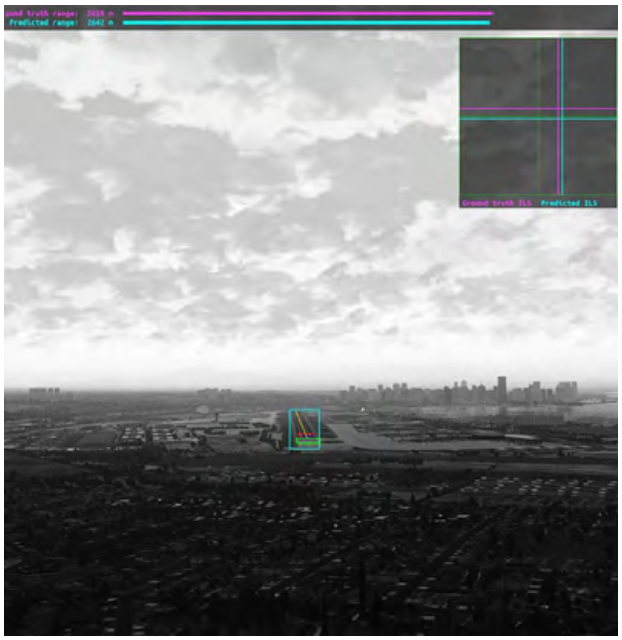
DEVELOPING AUTONOMOUS FLIGHT AND MACHINE LEARNING SOLUTIONS FOR THE NEXT GENERATION OF AIRCRAFT

400
AIRCRAFT SCALE FACTOR
Our systems have flown on a wide range of aircraft, from small air taxis (Vahana eVTOL weighing 0.8 tons) to massive commercial aircraft (Airbus A350 weighing 315 tons) - equalling a scale factor of 400

1
WORLD-FIRST
Wayfinder contributed to Airbus' Autonomous Taxi, Take-Off and Landing (ATTOL) project which achieved an aviation world-first in 2020: autonomous taxiing, takeoff and landing of a commercial aircraft through fully automatic vision-based flight tests

01
MISSION
Wayfinder is developing autonomous flight systems for the next generation of commercial aircraft
Wayfinder is building scalable, certifiable autonomy systems to bring about a significant increase in safety and efficiency in the next generation of commercial aircraft.

The team of experts is driving the maturation of core technologies to power autonomous flight. We are creating a reference architecture that includes hardware and software systems, and applying a data-driven development process to enable aircraft to perceive and react to their environment.



02

TECHNOLOGY

Autonomous technologies will drive a step change in safety and efficiency

The team is at the heart of the autonomous flight revolution. We are making rapid progress in applying machine learning to develop autonomous flight systems by:

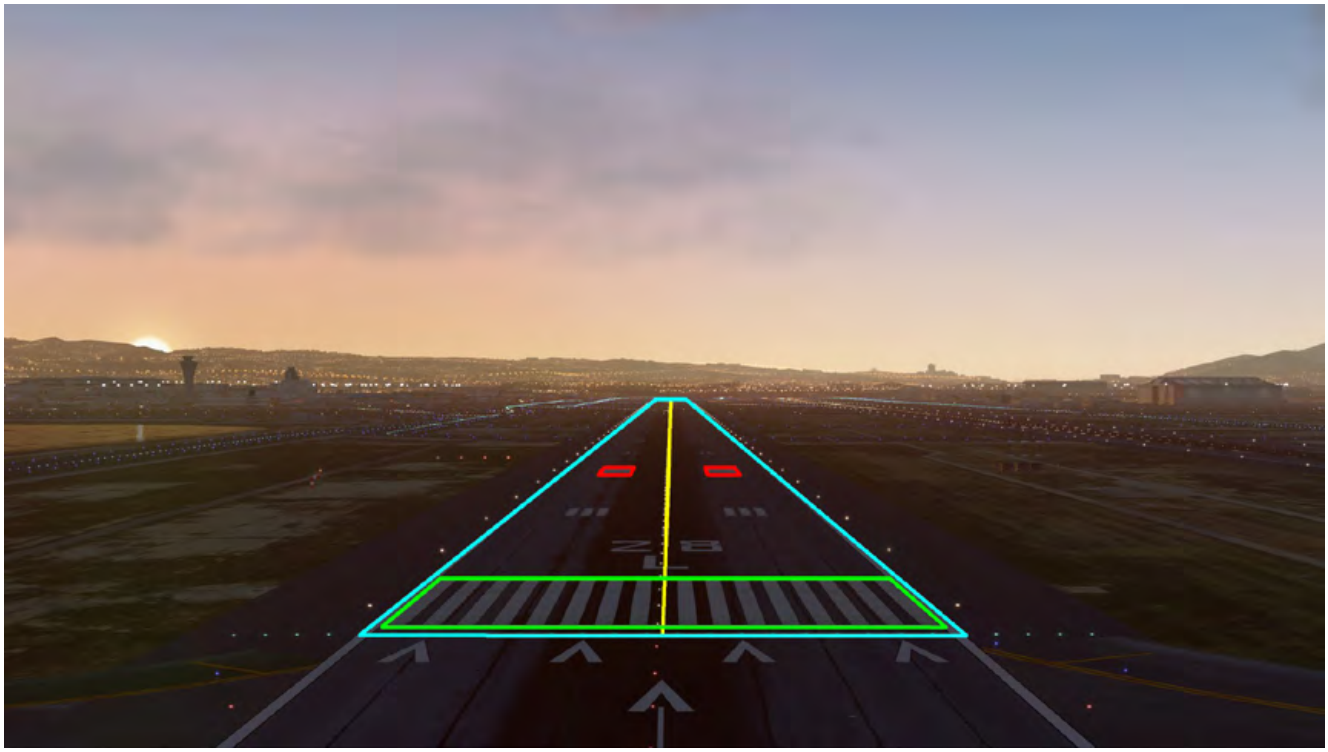
- Architecting dedicated Machine Learning models
. Creating realistic simulations
- Developing safety critical software and hardware
- Advancing flight testing systems with a flight test aircraft
- Scaling data collection capabilities and advancing the algorithm

ARNE STOSCHEK

Project Executive, Wayfinder

Arne is the Project Executive of Wayfinder, a project with the goal of building autonomous flight and machine learning solutions to enable self-piloted aircraft operation. He is passionate about robotics and autonomous electric vehicles. He has held engineering leadership positions at global companies such as Volkswagen/Audi and Infineon, and at aspiring Silicon Valley startups, namely Lucid Motors/Atieva, Knightscope

Acubed Airbus A³ is the Silicon Valley innovation centre of Airbus. Its HQ is located in Sunnyvale, CA (USA).
https://acubed.airbus.com



SESAR JU: THE 'VOICE' PROJECT: DEMONSTRATING SPACE-ENABLED AIR TRAFFIC CONTROL

June. 1, 2021

DEMONSTRATING SPACE-ENABLED AIR TRAFFIC CONTROL

Plans are underway by SESAR members and partners to demonstrate the feasibility of using low-orbit satellites to provide voice communications to manage aircraft in oceanic regions of the world. The project aims to show how space-based communications navigation and surveillance technologies can help optimise air traffic while reducing the carbon footprint and maintaining safety levels.

Aircraft flying over the ocean no longer appear on ground-based radars once they are about 350 kilometres from the coast. To monitor and stay in touch with these flights, controllers today rely on high frequency radio and data link communications, through which aircraft can also report their position. While these technologies allow controllers to maintain contact and assure safe separation, their high levels of latency mean that communications is slow and results in significanct time lapses. It also means that to ensure safety, controllers must increase separation minima between the aircraft.

This is where the SESAR JU large-scale demonstration, VOICE ("Reduced separations and improved efficiency based on Vhf cOmmunICations over LEO satEllites), comes in. Over the next two years, the partners will demonstrate how air traffic management (ATM) can benefit from low earth orbit satellites – a category of satellites which is low cost and requires the lowest amount of energy for placement, while providing high bandwidth and low communication latency. Specifically they will show that by using satellite-based VHF systems, controllers can communicate with aircraft in oceanic and remote airspace at the exact same rate of frequency as with aircraft in continental airspace. In doing so, using space-based ADS-B for surveillance, controllers will be able reduce the minimum separation between aircraft, which will help to optimise traffic and reduce CO2 emissions without compromising safety.

In addition, the VOICE consortium will perform several cross-border operations between adjacent flight information region (FIR) belonging to different countries - CANARIAS FIR and SAL FIR. The aim will be to show the feasibility of controllers communicating in real time with aircraft at distances greater than 1,500 km. The planned will demonstrate that, with the use of satellite-based VHF systems providing voice and datalink ATS, traffic in oceanic and remote airspace can be handled as in a continental one, and current separation could be reduced without compromising safety. In addition, VOICE project will perform some cross-border operations between adjacent FIR belonging to different countries. Demonstration will cover operations in CANARIAS FIR and SAL FIR with ATCOs communicating in real time with aircraft at distances bigger than 1500km. demonstration exercises will use satellite-based communications, navigation and surveillance (CNS) services to test the feasibility of the ATM data provider (ADSP) concept , in other words allowing controllers to manage traffic no matter their location and the airspace in question. The following use cases will be used in the demonstration activities:

• **Use Case 1:** Use of satellite VHF for voice/data and space-based surveillance technology called automatic dependent surveillance–Broadcast (ADS–B) without terrestrial coverage;

• **Use Case 2:** Use of satellite VHF for voice/data and ADS-B as a means of contingency/delegation;

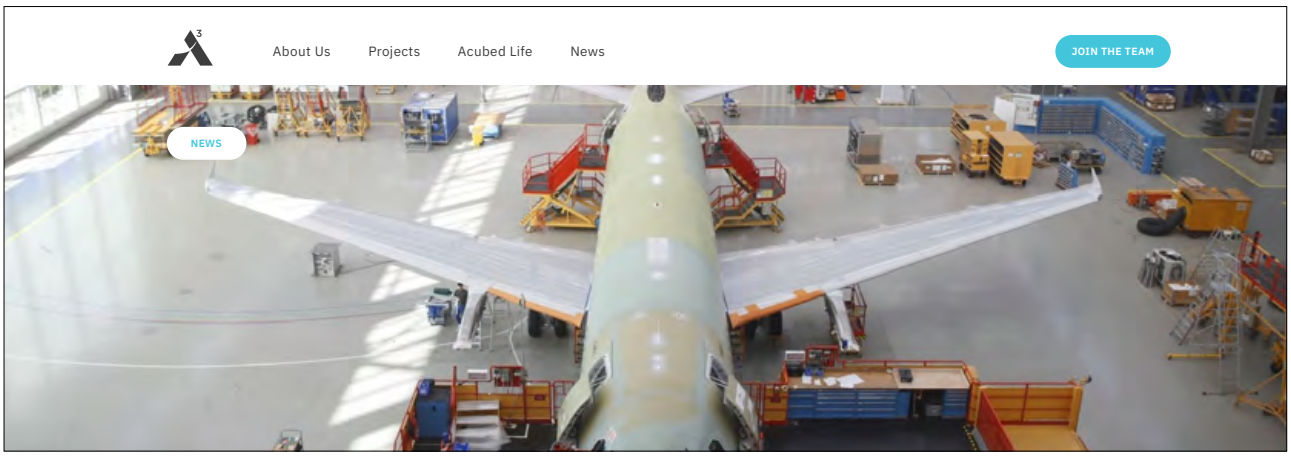
• **Use Case 3:** Use of satellite VHF for voice /data and ADS-B exchange in terrestrial airspace.

Funded within the framework of the Horizon 2020 research and innovation programme (grant agreement 101017688), the project brings together the following project partners: Indra (Coordinator), Enaire, EUROCONTROL, GOMSPACE A/S and GOMSPACE Luxembourg.

From https://www.sesarju/

NEARLY EVERYTHING IS AN INTEGRATION PROBLEM

By Guillermo Jenaro Rabadan

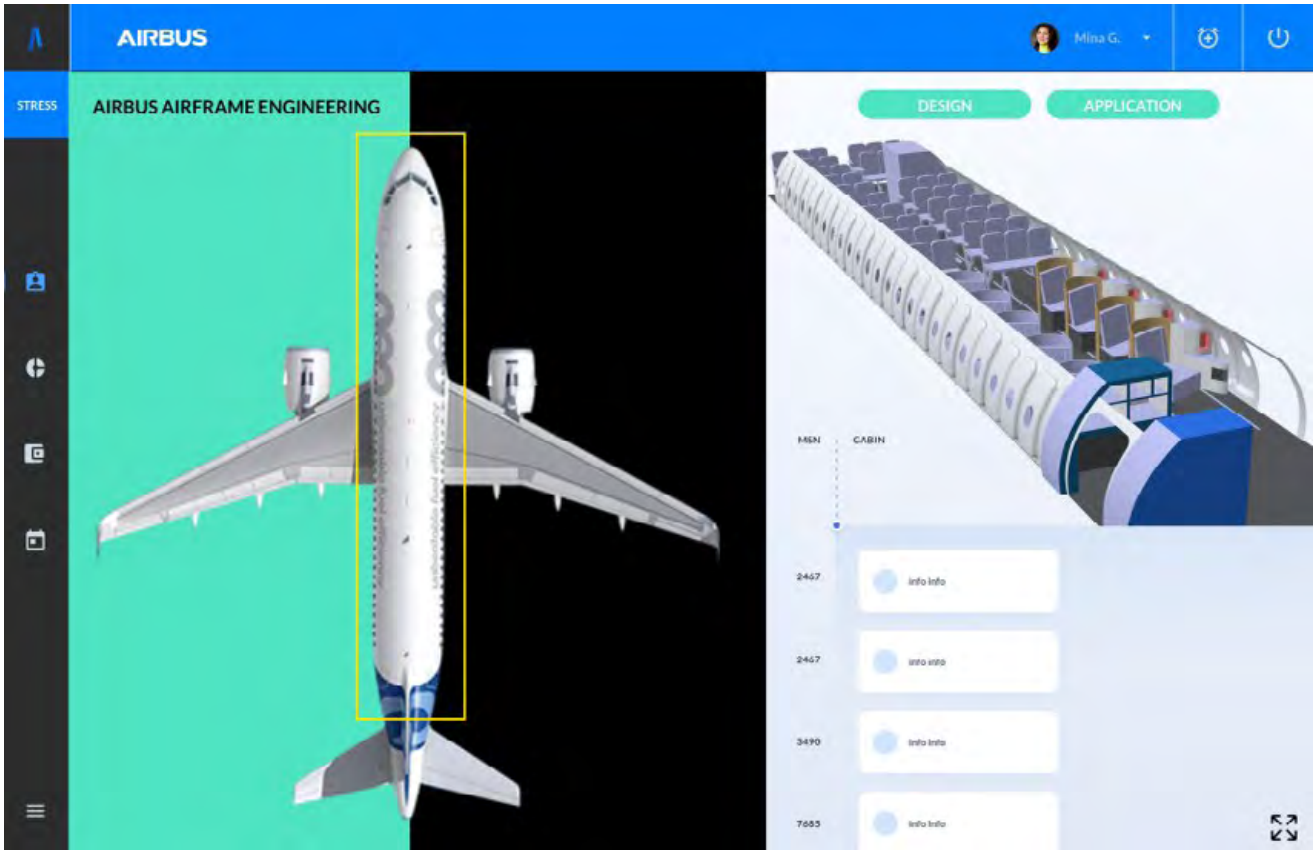


June 16, 2021

NEARLY EVERYTHING IS AN INTEGRATION PROBLEM

It's exciting times for The Advanced Digital Design and Manufacturing (ADAM) project: we're seeing our team shift as our long-time Project Executive becomes CEO of Acubed, and we double down on our work to increase the impact we have across Airbus globally. A long-term member of the team, I am thrilled to take the helm of ADAM as we continue to solve the most prevalent challenge of our time - integration.

As the longest tenured project at Acubed, we've spent years building an environment that works at an abstract level and can be easily utilized to integrate a variety of tools and data to save teams across our business time, money, etc. Most challenges that our industry faces today are integration problems and our methodology can



be deployed against nearly any challenge born out of systems and data not working together as best they can. Our common core allows us to go fast, leverage our existing software components repeatedly, and create future building blocks that can be reused to further increase the value of our solutions to each successive team we partner with.

For our peers in Silicon Valley who love aerospace, we are providing value to the largest OEM in the world—both in the US and abroad—that is entirely based on reconcepting how weighty tools and massive data sets speak to one another to offer learnings that impact our bottom line, but more importantly, make work even more efficient, fun and engaging for our incredibly talented colleagues. Nothing makes work less enjoyable than being unable to do one's job due to systems and data being locked up, inaccessible and untranslatable. We work with speed and have a bias towards action. We build incredible vehicle support tools and use them in the service of aerospace —our work touches the whole lifecycle of an aircraft—it's truly exciting to be a part of. If solving these sticky, but satisfying challenges sounds fun to you in the aerospace domain, check out the positions we have available!

We are excited about what's next for ADAM, although in some ways we're still determining what threads we'll pull on in the years to come. We've worked hard over the years to innovate and put solutions into production to make an impact on every team we touch. But the age-old question rings true: what's next? We know that our location in Silicon Valley will help shape that answer as new talents join our ranks and new startups provide inspiration and ideas that we can tap into.

In that way, ADAM takes a truly local-to-global approach to its work: we draw ideas and inspiration from our immediate surroundings; we work with our US manufacturing teams to deploy our technology and de-risk concepts by proving it out; we then transition those proven approaches at a global level as they're applied to Airbus' EU manufacturing work.

Coming out of the pandemic, our business is facing a ramp-up as well as challenges to achieve zero emission flight. ADAM is uniquely well-positioned to help Airbus tackle this with precision, tact and employ well-informed, data-driven decision making. If COVID taught us anything, it's that digitally-enabled efficiencies are here to stay and we help identify, derisk and leverage more of those with each passing day.

Our ways of working are quick: we create a demonstrator for a specific project in about eight weeks, and give ourselves six months to prove value. We seek to accelerate processes for our internal customers, sometimes doubling the speed at which actions are done. We want our customers to use the solutions we come up with and hear them say "wow, I can do things now I could never do before". We seek to open doors to universes they didn't know were possible.

The most meaningful results are when we survey our partners and we hear back that with ADAM they feel empowered, engaged and free in how they work and what they can achieve. We help people rediscover their passions, develop new skills and have a more sustainable work experience through training and ease of use. While we're engineers at heart, we're using our skills to change lives and help our business grow. It's incredibly gratifying and I invite you to join us on our journey.

1. About ACUBED AIRBUS A³

A³ is the Silicon Valley Innovation Centre of Airbus. It houses high-impact projects to enable the next age of aviation. It provides a lens into the future of aerospace industry, transforming risk into opportunity to build the future of flight now.

Its HQ is located in Sunnyvale, CA (USA)

https://acubed.airbus.com

ABOUT THE EUROPEAN AIR TRANSPORT COMMAND (EATC)
THE EATC: A SINGLE MULTINATIONAL COMMAND

THE EATC

The European Air Transport Command is a single multinational command. Its headquarters is located at Eindhoven air base in the Netherlands. The **fleet** is composed of over 170 assets located at the national air bases through the seven **member nations**.

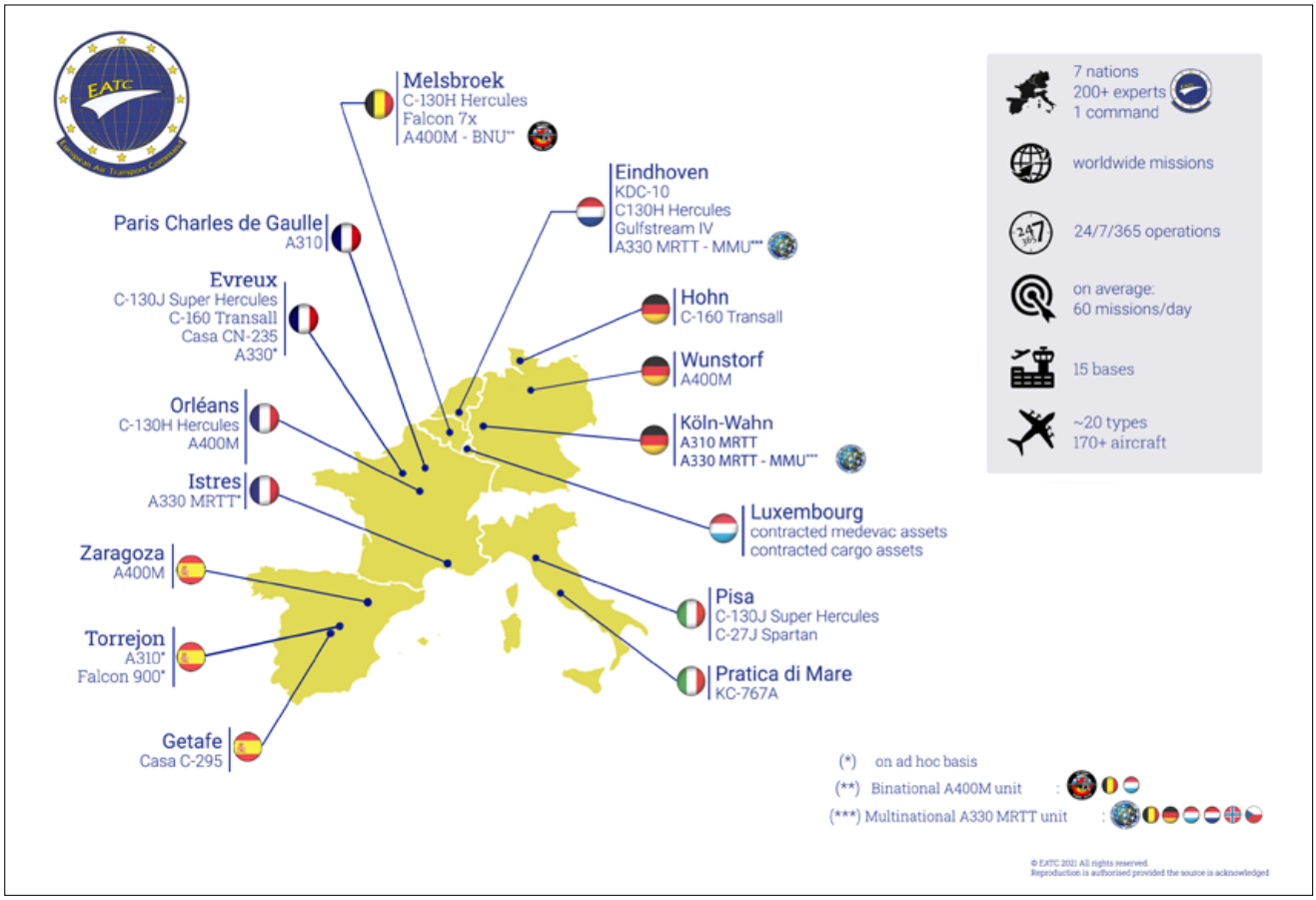
The EATC is a unique organisation for military **air mobility, including transport, air-to-air refuelling** and **aeromedical evacuation** within Europe. The overall objective is to improve the effectiveness and efficiency of the member nations military air transport efforts.

The idea of EATC was born in 1999. The driving parties were France and Germany, who looked back at a strong bilateral cooperation in the field of air transport. As NATO and the EU identified shortfalls in the domain of strategic transportation, initiatives were developed over the years, aiming at the highest degree of cooperation in a multinational command structure with an **operational** and a **functional** authority. The ground rules for EATC were set in September 2010 and EATC was inaugurated at Eindhoven air base by the four founding members, The Netherlands, Belgium, France and Germany.

THE FLEET

The diverse multinational EATC fleet comprises more than 170 assets that the seven member nations transferred under EATC's authority. These assets are stationed on national bases in the member nations. They represent approximately 20 different types of aircraft and are divided into a tactical, wide body and narrow body fleet. Moreover some are also air-to-air refuelling capable.

The diversity of this multinational fleet with approximately 20 types of aircraft gives EATC a unique flexibility and the opportunity to optimise missions and enhance the required efficiency and effectiveness. Thanks to an integrated staff, EATC handles the full process from planning and tasking to controlling both in peacetime and in times of crisis.
EATC connects the seven custom-made national fleets into one single pooled fleet to be shared among seven nations. This is the basis for EATC's planning and controlling air mobility missions. Connecting seven fleets into one multinational is for sure a challenge, but also an opportunity for common regulatory frameworks, shared lessons learned, exchange of views and, as a bottom line, joint operations.



THE MILITARY TECHNOLOGY VOL. XLV SPECIAL ISSUE 2021 IS ENTIRELY DEDICATED TO THE EATC

WE PUBLISH HERE BELOW THE INTRODUCTION BY MAJOR GENERAL ANDREAS SCHICK

Major GeneraL ANDREAS SCHICK Commander European Air Transport Command

Major General Andreas Schick was assigned to the post of EATC commander in September 2020. He joined EATC in Eindhoven as Chief of Staff in 2017.

Today, EATC is the major command for air mobility in Europe. Seven nations operate their military air mobility assets under one command with one common set of rules and regulations. The foundation idea emerged in 1999 at the Washington NATO Summit and the EU Helsinki Summit. Both summits recognized that military air transport shortfalls need to be addressed and interoperability to be enhanced if operational challenges are to be met. France and Germany took up the initiative and laid the foundations for a common command. Soon, Belgium and the Netherlands joined this forward-looking project and EATC saw the light of day on 1 September 2010 at Eindhoven Air Base. Luxembourg joined in 2012. Two years later, in 2014, it was the turn of Spain and Italy to accede the club.

EATC'S MAIN OBJECTIVES ARE …

… laid down in our mission statement: EATC enhances the combined operational capabilities of the member nations, conducts air mobility missions, always keeping in mind to improve the effectiveness and efficiency, and increases interoperability. To ensure efficient operational control, EATC integrates all transferred national responsibilities and resources.

The member nations have transferred the authority of their air mobility assets to EATC. Across the seven nations, EATC has in its portfolio approximately 170 aircraft for air transport, air-to-air refuelling and aeromedical evacuation. These assets are stationed on 15 national air bases across the seven nations.

The integrated staff of currently 200+ persons handles the full process from planning and tasking to controlling of the fleet both in peacetime and in times of crisis. At any moment, EATC chooses the asset, which best fits to the requirements of the mission at hand. The diversity of the portfolio with more than 20 types of aircraft gives EATC a unique flexibility and effectiveness.

THE KEY TO EATC'S SUCCESS …

… is first of all political willingness, which was confirmed by the seven nations joining EATC. Yet to be successful, political willingness needs to be coupled to another required resource: mutual trust and confidence at all levels. Nations are only willing to pool and share assets and other resources if this condition is fulfilled.

Trust and confidence are not a given fact. It is a sustained, long-term effort.

The fact that our member nations integrated EATC into their Air Mobility Command and control structure clearly underlines the expectations they have placed in this concept and the organisation, up to the point that some nations completely disbanded their national Air Mobility Command, solely relying on the expertise and capacity of the EATC. Thus, and as a natural consequence, I as the commander of EATC have to report annually to the Air Chiefs in the so-called MATraC. This is our high-level steering body where we receive directions and guidance on the topics and challenges to tackle.

However, the national trust and confidence towards EATC relies also on the assurance that EATC honours at all moment the specific requirements from the member nations and ultimately their national sovereignty. The business model is a well-thought-out concept that assures the transfer of authority of the member nations' air transport assets. The fact that the transfer of assets can be unilaterally revoked at any given time and without explanation, safeguards possible national caveats. From the beginning, this built-in provision resulted in the vast majority of aircraft being transferred to the EATC. And in consequence, EATC delivers high-quality service, taking into account at all moment the needs of each member nation.

The credible relationship between the air forces is an important source of resilience among the nations. They share aircraft within EATC framework offering each partner privileged access to their national assets.

To be clear: we are not talking exclusively about basic access to partner nations' assets. The cooperative efforts among EATC nations involves more than that: if one nation is in need of air mobility assets, the partners support even if this leads to cancelling their own national missions. This may happen, for example, for operational urgencies or humanitarian assistance.

Another important basis for this fruitful cooperation is shared values and concepts. EATC excelled since 2010 in fostering standardisation of doctrines and procedures. Interoperability is the indispensable prerequisite to smoothly run our daily multinational operations and is considered the main objective during our multinational air mobility training and exercises activities. Enhancing interoperability also as early as during the ramp-up of fleets, evidently leads to increased mutual support, common operations and cross-national activities.

Over time, while constantly proofing the outstanding

idea and the setup of the concept, EATC developed into a recognised centre of expertise for air mobility in Europe. EATC has always been a 'blueprint' for European military cooperation. Today, it is the evidence of cooperative and coordinated efforts by seven nations translated into a successful pooling and sharing model.

REACHING OUT TO PARTNERS...

...to strengthen European and transatlantic security and defence. EATC and the seven members have a role to play. The basis has always been to draw on strong cooperation with other stakeholders in the air mobility domain. Over the years, EATC has confirmed its willingness to multiply cooperative efforts and set up partnerships to support multinational military operations. Each partner organisation has its own objectives.

This does not hamper cooperation; on the contrary, the duality shows how we enhance one another.

Next to various cooperation agreements, we have established with EU and NATO military bodies, a distinguished example with civilian partners is the trilateral cooperation with EDA and OCCAR-EA. The three partners decided in 2018 to jointly optimise and develop the A400M capability, enhancing synergies and avoiding duplication of efforts.

Just across EATC's headquarters at Eindhoven Air Base is the Movement Coordination Centre Europe (MCCE). While EATC is a command whose core activities are air mobility missions and the strive for interoperability, the MCCE is a coordinating and brokering body encompassing the full spectrum of air, land and sea transportation. The permanent symbiotic relationship between the two entities lies among others in the ability to extend each other's actions in the effective use of the ATARES mechanism. MCCE is the pivot point of the ATARES exchanges. EATC on the other hand is an incubator of ATARES exchanges – a catalyst to boost the exchange among the nations.

The prerequisite within EATC is that only EATC member nations can directly request air transport. This narrows of course the scope for optimisation and for cooperation – two important factors for EATC.

Hence, EATC set up the "sponsor nation" concept. This concept offers that one (or more) of the EATC member nations stages as a sponsor to request a mission for the benefit of non-EATC nations or multinational entities such as NATO or the EU.

During the pandemic, the sponsor nation concept demonstrated its inestimable value in times of an unpredictable crisis and when urgency is asked for. Since January 2020, EATC member nations have staged as sponsor-nation for their EU partners, NATO and allies or countries such as Georgia, Tunisia, South Korea and Balkan states.

MY PRIORITIES FOR THE NEXT YEARS ...

...are impaired by the pandemic but offered unforeseen opportunities.

First of all, I will prepare the EATC IT for the requirements of this new decade. We have a long way in front of us, looking into cyber security and its increasing challenges. Next comes how to advance with our in-house developed and maintained command and control software application MEAT. At short term, we will establish the basis to set up modern and updated location-independent workplaces and document management capabilities.

Secondly, I intend to intensify the cross-certification acceptance between the nations as for the maintenance part and the aircrew side, thus fostering interoperability. This is the prerequisite to offer the member nations real synergy options for deploying truly combined operational detachments.

My third priority is to offer as soon as possible a reliable air network, with the special focus on increasing the efficiency of our missions, thus freeing assets for other priorities. EATC is to test the first step: the introduction of a shared inter-theatre shuttle system. Unfortunately, we had to delay our trial phase amongst others because of pandemic-induced operational constraints. We have reviewed our timelines with the longterm objective in mind: to combine the shuttle system with infrastructural and logistically improved main operating bases linked to land and/or sea transport solutions, the so-called hub-and-spoke system.

My fourth priority is a long-term project to better support the nations during the early planning and subsequent execution phase for air mobility missions in crisis situations, under short notice and high-peak demand.

We need to "multinationalise" what is still a purely national responsibility and process, and EATC could play an important role to achieve better effectiveness and efficiency.

CONCLUSION

My priorities are to direct EATC's focus in the next years, of course without losing sight of our daily tasks and missions and ongoing engagements.

I will stay in close contact with the Air Chiefs or other national representatives to lead EATC into this new decade.

EATC is proud of its achievements. We proved the success of our vision, our commitment and the trust. We are today a recognized centre of expertise for air mobility because of the outstanding cooperative effort and innovative work of all people, air forces and other partners involved in our unique project. Now, we will pick up the speed for the next decade. EATC has great potential to go beyond the basic principle to share scarce air mobility resources among seven nations. We will seize any opportunity to intensify the collaborative efforts with partners, from committing to close partnerships to enlarging our community if decided by our national authorities. The pandemic strengthened our ability to deal swiftly in a crisis situation. Together with our member nations, we will continue to demonstrate the priceless value of our commonly shared capability in Europe! ■

From https://eatc-mil.com/en/

SPACE TOURISM - WELCOME TO A NEW SPACE AGE: VIRGIN GALACTIC > BLUE ORIGIN > INSPIRATION 4

■ VIRGIN GALACTIC: 11 JULY 2021, LAUNCH WITH RICHARD BRANSON ON BOARD

On 11 July 2021, Virgin Galactic company founder Sir Richard Branson an three other employees rode on a flight as passengers, making THE FIRST TIME a space-flight company founder has travelled on his own ship into outer space.

So, Virgin Galactic became the first spaceflight company to independently launch a civilian into space, having flown Richard Branson above 50-mile mark (according to NASA the definition of outer space is 50 miles above Earth).

VIRGIN GALACTIC'S SUCCESSFULLY COMPLETES FIRST FULLY CREWED SPACEFLIGHT

L-R: Collin Bennet, beth Moses, Sirishia Bandia, Sir Richard Branson

The Transportation System

VSS Unity successfully reached space, completing the company's 4th rocket-powered spaceflight but it was the first to carry a full crew of 2 pilots and 4 mission specialists. It achieved a speed of Mach 3 after being released from the mother ship, **VMS Eve.**

The suborbital spacecraft is launched from beneath a carrier VMS Eve, named White Knight Two. The latter is a special airplane built as the mother-ship and launch-platform for the spacecraft. The mother-ship is a large fixed-wing aircraft with two hulls linked together by a central wing.

A view of the VMS Eve space plane carrier

The crew

- 4 Mission Specialists:
  - Sir Richard Branson
  - Beth Moses, Virgin Galactic's chief astronaut instructor
  - Collin Bennet, lead operations engineer at the company
  - Sirisha Bandia, Virgin Galactic's VP for governmental affairs and research operations

- 2 pilots of VMS Eve:
  - Dave Mackay, chief pilot
  - Mike Masucci, pilot

To see the video:
https://www.youtube.com/watch?v=ZPrB3WvnZpE

The Virgin Galactic suborbital flight profile

On 11 July 2021 at 11:40 UTC, the Unity 22nd mission lifted off from Spaceport America with the VSS Unity space plane climbing to the altitude of 50,000 ft (15,000 km) with the help of the mother ship VMS Eve, a WhiteNight Two carrier plane. After reaching this altitude, VMS Eve let the space plane fire its rocket engine and from there accelerated to faster than mach 3 in a climb up to 282,000 ft (53, 3 miles = 86 km) above Earth's surface just above the boundary of space, where the 4 passengers and 2 pilots experienced about 4 minutes of weightlessness.

To see the video:
https://stream.mux.com/300pgsb02Tueq02TH4bpGSfHPcZdHzONgjZ.m3u8

4-1. Flight profile
4-2. Rocket ignition
4-3. Return to Earth

Debate about the boundary of outer space

There has been some debate over whether this flight officially reached space. As a matter of fact there are two official standards concerning the altitude of the outer space:

- The US Military, the Federal Aviation Administration (FAA) and NASA set the boundary of outer space at 50 miles (80 km);
- The other popularly recognized boundary of outer space is the famous Karman Line situated at 62 miles (100 km): see insert page.

So, according to the first standard, the crew on board have earned 'Astronaut Wings'.

The crew fulfilled a number of test objectives related to the cabin and customer experience, including evaluating comfort and what the cabin feels like with a full crew, the experience of being Zero G and viewing Earth from space, demonstrating how the crew might conduct research experiments and also assess the effectiveness of the 5-day pre-flight training programme which had been achieved at Spaceport America.
VSS returned to Earth through the atmosphere in smooth glide to land back on a runway not too far from where it took off at Spaceport America, New Mexico.
The entire flight lasted one hour between take-off and landing.

Virgin Galactic
Virgin Galactic is a British American spaceflight company that operates in the USA. Founded by Richard Branson, it is developing commercial spacecraft and aims to provide suborbital spaceflights to space tourists.

IATA	ICAO	Callsign
–	VGX	Galactic
Founded	2004	
Operating bases	Spaceport America, Mojave Air and Space Port	

Fleet size	Increase 3 (2021)
Destinations	1 (Space)
Parent company	Virgin Investments Limited 18%[1]
Traded as	NYSE: SPCE
Headquarters	Mojave, California, U.S
Key people	Richard Branson (founder) Michael Colglazier (CEO) Doug Ahrens (CFO) Mike Moses (President - Safety)
Revenue	Decrease $238,000 (2020)
Employees	823
Website	www.virgingalactic.com

- Founded : 2004
- Operating : Spaceport America
- Bases : Mojave Air and Space Port
- Fleet size: 3 (2021)
- Parent: Virgin Group 24%
- HQ: Mojave, California

Richard Charles Nicholas Branson
Richard Branson is an English business magnate astronaut investor. He founded the Virgin Galactic company in the 2000s and he is now controlling 400 companies in various fields.

VIRGIN GALACTIC PLANS

Virgin Galactic has been certified by FAA to provide commercial spaceflight travel, and it accounts report that over 600 commercial passengers have already signed up.
Virgin Galactic currently has regular paid passengers service flights scheduled in 2022 after two more test flights have been completed.

■ BLUE ORIGIN: 20 JULY 2021 AT 13:11 UTC, HISTORIC FIRST FLIGHT OF ASTRONAUTS INTO SUB-ORBITAL SPACE

Jeff Bezos, the founder of the spaceflight company Blue Origin, launched into sub-orbital space with three other people on 20 July 2021 on the first crewed mission of the company's New Shepard vehicle. This mission became the first fully automated flight with civilian passengers and therefore another landmark moment for the man and space tourism industry.
At a post-launch news briefing, Jeff Bezos said: "My expectations were high and they were dramatically exceeded."

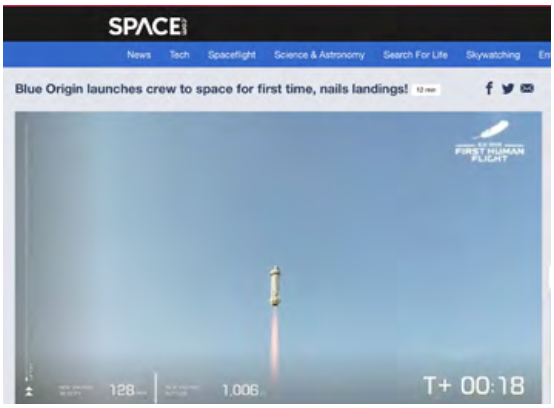
Blue Origin's New Shepard lifts-off from the launch pad carrying Jeff Bezos along with his brother Mark Bezos, 18-year-old Oliver Daemen, and 82-year-old Wally Funk on July 20, 2021 in Van Horn, Texas. (Image credit: Joe Raedle/Getty Images)

Jeff Bezos and 3 other persons launched on a sub-orbital trip aboard Blue Origin.

THE MAIN FACTS AND FIGURES OF THE FLIGHT:

- 13:11 UTC: liftoff
- End of booster's propulsion
- Capsule's separation
- t +2 min 40 s = beginning of Zero G phase – altitude 250,000 ft
- t + 4 min 15 s = MAXIMUM ALTITUDE 351,210 FT (100 km)
- t + 7 min 27 s = booster touchdown
- t + 8 min 49 s = parachute opening
- t + 11 min = successful landing.

FLIGHT PROFILE OF THE NEW SHEPARD



To see the video:
https://videos.space.com/m/uKIiPZmS/blue-origin-launches-crew-to-space-for-first-time-nails-landings?list=9wzCTV4g
Source: Blue Origin

CREW

L-R: Mark Bezos, commander, 1sr spaceflight - Jeff Bezos, tourist, 1st spaceflight – 18-year old Olivier Daemans, student, tourist, 1st spaceflight - Pioneering aviator Wally Funk (82-year-old), tourist, 1st spaceflight
Source: Blue Origin

BLUE ORIGIN

Blue Origin was founded by Jeff Bezos.
Jeff Bezos, founder of Amazon, is an internet entrepreneur. In addition he is also a successful spaceflight entrepreneur and the founder of Blue Origin, a private spaceflight company. The company is known for its work on New Shepard, a reusable suborbital space rocket that includes a crew capsule for future paying passengers.

THE BOUNDARY OF OUTER SPACE: WHAT IS THE KARMAN LINE?

The Karman line (or von Karman line) is an attempt to define a boundary between Earth's atmosphere and outer space; it was defined to be 100 km (330,000 ft) above Earth's mean sea level by the Fédération Internationale Aéronautique (FAI), an international record-keeping for aeronautics. Various countries and entities define space's boundary differently for various purposes.
International Law does not define the edge of space, or the limit of national airspace. The boundary between the atmosphere and space is nonetheless important for legal and regulatory purposes: aircraft and spacecraft fall under different jurisdictions and are subject to different treaties.
The Karman line is named Theodore von Karman (1881-1963), a Hungarian American engineer and physicist who was active in aeronautics and astronautics. In 1957, he was the first person to attempt to derive such an altitude limit, which Karman calculated as 275,000 ft (84 km).
The K line is also close to the upper boundary of the mesosphere, which is estimated to end at approximately 80-90 km.
Coincidently 100 km is approximately the altitude of the turbopause: below it atmospheric gases (O2, N2, ...) are well-mixed and above it heavier molecules tend to occupy lower part of the atmosphere, due to gravitational separation

The Karman line lies within the lower atmosphere

Karman comments
"Where space begins can actually be determined by the speed of the space vehicle and its altitude above the Earth. Consider for instance, the record-flight of Captain Kincheloe Jr. In an X-2 rocket plane. Kincheloe flew 2,000 miles/h (3,200 km/h) at 126,000 ft (38,500 km) or 24 miles up. At this altitude and speed, aerodynamic lift still carries 98% of the weight of the plane, and only 2% is carried by inertia, a Kepler force. But at 330,000 ft (91,400 km), this relationship is reversed because there is no longer any air to contribute, lift and inertia prevails. This is certainly a physical boundary, where aerodynamics stops and astronautics begins and so I thought why should it not be a jurisdictional boundary? Haley has kindly called it the Karman Jurisdictional Line. Below this line, space belongs to each country. Above this level, there would be free space.

INSPIRATION 4

SpaceX made history 15-18 September 2021 with the successful world's first all-aviation mission to orbit with a team of non-professional astronauts.

On 16 September 2021 at 00:02:56 UTC, SpaceX launched its Inspirational Mission 'Inspiration 4' from KSC successfully bringing its all-civilian crew into orbit. This mission is the first private crew launched to orbit by Elon Musk's company and the first time a crew was made up entirely of non-professional astronauts.

SpaceX Falcon 9 rocket lifts off to bring Inspiration 4's all-civilian crew into orbit. Launch mass was 12,519 kg.
Inspiration 4 included:

- Commander Jared Isaacman
- Pilot Sian Proctor
- Medical officer Hayley Arceneaux
- Mission Specialist Chris Sembroski

The Inspiration 4 crew successfully reached orbit after launching.

A look inside Crew Dragon capsule after reaching orbit

Three days in space

The crew orbited the Earth at an altitude as high as 590 km. During their 3-day journey in orbit, the crew participated in a first-of-its-kind health research initiative to increase humanity's knowledge of the impact of spaceflight on the human body. The crew performed carefully selected research experiments on human health and performance, which will have potential applications for human health on Erath and during future spaceflights.

Splash down

https://www.cnbc.com/2021/09/18/watch-spacex-livestream-inspiration4-splashdown-crew-dragon-returns.html

On 18 September 2021 at 23:06 UTC, Inspiration 4 mission went through, the Crew Dragon capsule 'Resilience' splashing down safely off the coast of Cape Canaveral. Landing mass was 9,616 kg.

Four milestones:

- **First entirely non-professional crew to become astronauts**
- **First woman pilot of spacecraft**
- **Youngest American citizen to fly in space**
- **First private SpaceX spaceflight**

ABOUT GALILEO

GALILEO: GROUND SEGMENT BEING UPDATED IN PREPARATION OF THE NEXT LAUNCH

The Galileo infrastructure is constantly under improvement. Currently, 26 satellites are in orbit. A set of new satellites will soon complement the constellation.

Furthermore, the overall system needs new and additional features to meet the requirements of the "Full Operational Capability" (FOC). This implies modifications to both the Ground Segment and the Space Segment.

As part of this planned evolution to meet the Full Operational Capability, the Galileo Ground Control Segment (GCS) will undergo significant changes in the coming months.

The new updated version of the GCS will enable the Galileo Control Centre (GCC) to directly perform the LEOP ('Launch and Early Orbit Phase') activities1.

In the previous launches, the Galileo Programme has relied on external control centres (CNES and ESOC) for the initial phase of the LEOP activities.

After this upgrade, the LEOP activities will be conducted directly from the operational Ground Control Segment deployed in the GCCs, taking advantage of associated operational synergies and integrated infrastructure.

The upgrade of the GCS also includes evolutions to increase system capabilities, virtualisation, obsolescence resolution and operational improvements. It represents a major step forward towards the Galileo FOC and includes the capacity for the segment to manage up to 38 satellites.

The updated Ground Control Segment has been developed by GMV under a dedicated contract with the European Space Agency (ESA).

ESA has been responsible for its qualification at the Segment and System level, while Spaceopal, in its quality of Galileo Service Operator, has been responsible for its operational validation.

The GCS upgrade activities have been coordinated and managed by the European Union Agency for the Space Programme (EUSPA, formerly GSA), as entrusted by its European Commission (EC) mandate.

---

[1] The LEOP (Launch and Early Orbit Phase) starts just after the satellite separates from the launch vehicle. Spacecraft operations engineers then take control of the satellite, and will be in charge until it is safely positioned in its final orbit. The LEOP phase for a Galileo launch takes 14 days. It is a critical phase of a Space vehicle launch.

EUSPA website: http://www.euspa.europa.eu

ARIANESPACE: THREE SUCCESSFUL LAUNCHES FROM TWO CONTINENTS IN 23 DAYS WITH THREE DIFERENT LAUNCHERS, ARIANE 5, VEGA AND SOYUZ

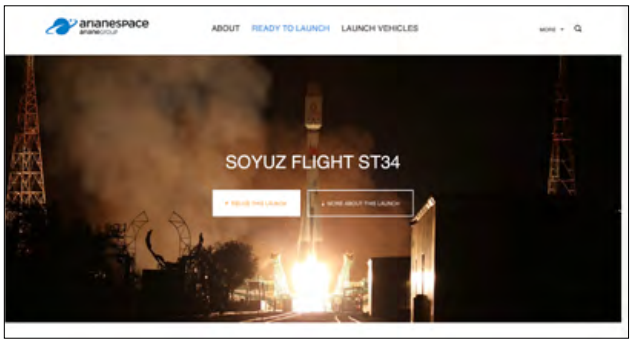
21 AUGUST: ONEWEB MISSION – SOYUZ FLIGHT 34

On 21 August 2021 at 10:13 p.m. UTC, Soyuz Flight 34 lifted off from Baïkonour Cosmodrome (Kazakhstan) with 34 OneWeb satellites onboard, bringing after the successful deployment the size of the OneWeb fleet in orbit to 288. This Soyuz mission lasted 3 hours 45 minutes. The 34 satellites were separated during 9 separation sequences at 450 km altitude.

The launch of the satellites was operated by Arianespace and its Euro-Russian affiliate Starsem, under contract with Glavkosmos (subsidiary of Roscosmos). Arianespace is responsible for the overall mission and flight worthiness, with the support of Starsem for launch campaign activities.
To date, Arianespace has launched 288 OneWeb satellites with 9 Soyuz launches. It will perform 10 more Soyuz launches until the end of 2022 in order to complete the deployment of the full OneWeb constellation of 648 LEO satellites.

ONEWEB

The OneWeb constellation (648 satellites when complete – Polar LEO orbit 1200 km altitude, Ku band antennas) will provide global satellite internet broadband services to people everywhere. It will deliver high-speed, low-latence connectivity to a wide range of customer sectors: Aviation, Maritime, Enterprises and Governments.
OneWeb seeks to bring connectivity to the hardest to reach places where fibre cannot reach.
The satellite Prime Contractor is OneWeb Satellites, a Joint Venture of OneWeb and Airbus Defence and Space. The satellites are produced in Florida (USA).



> to see the video
https://youtu.be/9j_mw7EHn1A

16 AUGUST: 19TH VEGA MISSION – VV19 – PLEIADE NEO 4

On 17 August 2021 at 01:47 UTC, a Vega launcher lifted-off from the European Space Port of Kourou (French Guiana) placed on SSO (Sun Synchronized Orbit) the satellite 'Pleiades Neo 4', the very-high resolution satellite of Airbus Defence and Space's Earth Observation satellite constellation. In addition to it, Vega also brought to orbit 4 scientific auxiliary spacecraft.

Pleiades Neo 4 is the second satellite of the Pleiades Neo Earth observation constellation (the first one 'Pleiades Neo 4' was launched on 29 April 2021). It was released very close to its final 640 km Sun Synchronized Polar orbit. It is phased 180° with Pleiades Neo 3 on the same orbit to start forming a constellation. This will enable daily imaging of any place on Earth at 30 cm native resolution, and between 2 and 4 times when the 4-satellite constellation is complete.

https://www.intelligence-airbusds.com

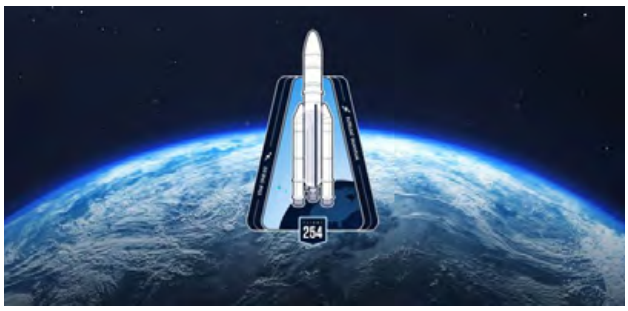
Applications trusted intelligence for Defence, Urban applications, Mapping, Agriculture. sequences at 450 km altitude.

30 JULY: ARIANE 5 – STAR ONE D2 – EUTELSAT QUANTUM

On 30 July 2021 between 09:00 and 10:30 p.m. UTC, an Ariane 5 launcher lifted-off from Guiana Space Centre, the European Spaceport, with onboard two telecommunication satellites: Star One D2, built by Maxer Technologies for Brazilian operator Embratel, and EUTELSAT QUANTUM, developed by Airbus DS and ESA. It was the flight Ariane 5 VA254.

The two satellites were placed on GEO (Geostationary Transfer Orbit (GEO).

STAR ONE D2



Star One D2 is a high-capacity multi-mission satellite with Ku-, Ka-, C- and X-band transponders.

EUTELSAT QUANTUM

Eutelsat Quantum is the world's first commercial fully flexible software-defined satellite. It can be reprogrammed in orbit, it can respond to changing demands during its lifetime.
Its beams can be redirected to move in near-real-time to provide information to passengers on board moving ships or planes.

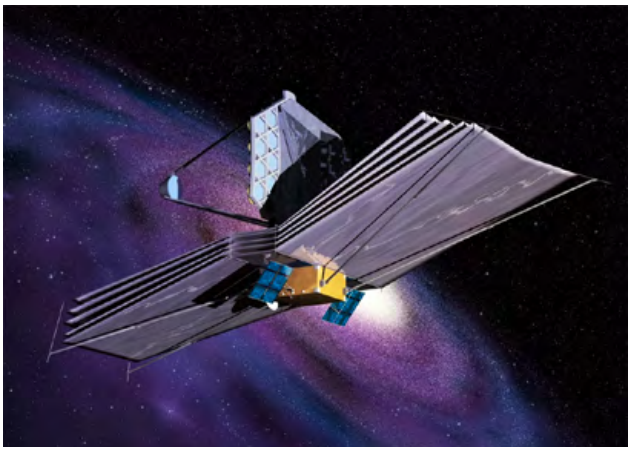
Using a software-based design, Eutelsat Quantum is the first universal satellite to repeatedly adjust to business requirements. It is a revolutionary step forward for commercial satellites, offering very high customisation and flexibility, supplying services with unprecedented in-orbit reconfiguration possibility in coverage, frequency and power, allowing complete mission rehaul, at any orbital position.

Synthesis written by J.-P. S. from information available on https://www.esa.int

NASA'S JAMES WEBB SPACE TELESCOPE ARRIVES AT GUIANA SPACE CENTRE IN KOUROU AHEAD OF DECEMBER 18 LAUNCH WITH AN ARIANE 5 ROCKET

WEBB IS AN INTERNATIONAL PARTNERSHIP BETWEEN NASA, ESA AND CSA

A cargo ship carrying NASA's James Webb Space Telescope arrived in French Guiana on Oct. 12, 2021, after a 16-day sea voyage. Webb is scheduled to launch from Europe's Spaceport in Kourou, French Guiana, on Dec. 18. (Image credit: NASA/Chris Gunn)



The James Webb Space Telescope, a successor to the Hubble Space Telescope, is a stated priority of Canadian government astronomy funding. (Image credit: ESA)

A cargo ship carrying the $10 billion James Webb Space Telescope arrived in French Guiana on Tuesday (Oct. 12), wrapping up a 16-day ocean voyage that covered 5,800 miles (9,300 kilometers), NASA officials said.

The ship, known as the MN Colibri, departed from Seal Beach in Southern California's Orange County on Sept. 26. It entered the Panama Canal on Oct. 5, moving from the Pacific Ocean to the Caribbean Sea, and then made its way to Guiana Space Centre, the Spaceport of Europe.

NASA'S JAMES WEBB SPACE TELESCOPE: HUBBLE'S COSMIC SUCCESSOR

NASA's James Webb Space Telescope, scheduled for launch on December 18, 2021, will probe the cosmos to uncover the history of the universe from the Big Bang to alien planet formation and beyond. It will focus on four main areas: first light in the universe, assembly of galaxies in the early universe, birth of stars and protoplanetary systems, and planets (including the origins of life.)

The James Webb Space Telescope (JWST) will launch on an Ariane 5 rocket from French Guiana, then take 30 days to fly a million miles to its permanent home: a Lagrange point, or a gravitationally stable location in space. It will orbit around L2, a spot in space near Earth that lies opposite from the sun. This has been a popular spot for several other space telescopes, including the Herschel Space Telescope and the Planck Space Observatory.

The powerful $8.8 billion spacecraft is also expected to take amazing photos of celestial objects like its predecessor, the Hubble Space Telescope. Luckily for astronomers, the Hubble Space Telescope remains in good health and it's probable that the two telescopes will work together for JWST's first years. JWST will also look at exoplanets that the Kepler Space Telescope found, or follow up on real-time observations from ground space telescopes.

EASN2021: UNIVERSITIES ARE HOME TO THE GENERATION OF YOUNG INNOVATORS

01 SEPTEMBER 2021

At the 11th EASN Virtual International Conference on Innovation in Aviation and Space to the Satisfaction of the European Citizens, Axel Krein, Executive Director of the Clean Sky 2 Joint Undertaking, underlined how important universities are in fostering a future populated with sustainable aircraft.

"Today's young students are tomorrow's aviation engineers, and we want to ensure that we can work together to solve the most pressing environmental challenges for aviation," he said. "Universities are the birthplace of ideas."

Axel then went on to speak about Clean Sky 2's technological success stories to date, including the Tech TP demonstrator and the MultiFunctional Fuselage Demonstrator.
He also outlined the new European Partnership for Clean Aviation, due to launch later this year.
The new programme will be based on three thrusts: hybrid electric and full electric concepts, ultra-efficient aircraft architectures, and disruptive technologies to enable hydrogen-powered aircraft.

"The three thrusts will culminate in a new breed of regional, short haul and short/medium haul airliners which we anticipate will be ready for a commercial launch by 2030 for an entry into service by 2035," said Axel.

"These new aircraft are likely to constitute 75% of the world's commercial airline fleet by 2050 and thus will have a major impact on aviation emissions and climate impact."

Axel stressed that fast, fearless investment is needed to make climate-neutral aviation a reality.

"The time for a slow, gradual move towards carbon-neutral aviation is past. The time for action is NOW!" he said.

"We need to propel climate-neutral aircraft into the airline fleet by 2035, which means that we have time between now and the end of this decade to develop, mature and demonstrate the most essential technologies. We urge you to support us in exploring the most promising research avenues, and quickly. Work with us on this challenge which I believe is also a huge opportunity!"

Clean Sky 2 was well-represented throughout the EASN conference, including in-depth special sessions on the Technology Evaluator (with 17 individual project presentations) and the Thematic Topics (24 presentations) – more than 10% of the total 377 technical presentations throughout the three days!

Read more about the EASN Virtual International Conference

Follow Axel on LinkedIn and read his blog here

The 33rd Congress of the International Council of the Aeronautical Sciences
Stockholm, Sweden, 4-9 september 2022

ICAS 2022 SWEDEN

It is with great pleasure that we would like to invite you to the 33rd Congress of the International Council of the Aeronautical Sciences (ICAS). ICAS was established in 1957 under the leadership of Professor Theodore von Kármán. Today ICAS continues to support the work of aerospace professional Member Societies around the world. Through Associate Memberships, ICAS brings together aerospace companies, national laboratories and educational institutions.

The 2022 ICAS Congress will be held in Stockholm, Sweden, from 4 to 9 September 2022. The ICAS Congress is returning to Stockholm after 32 years. Our Swedish colleagues are striving to uphold the ICAS tradition of bringing together a global array of topics and participants as the only true international forum that *covers the world of aeronautics*. The scientific portion of the congress will take place at the Stockholm Waterfront Congress Centre, which is a world-class facility, extremely conveniently located and that affords beautiful views of the Stockholm waterfront.

We would like the 33rd ICAS Congress to be a celebration of the resilience of our industry as we, the global aeronautical community, are finding ways to continue to deliver the systems and the value that our customers expect despite the considerably shrunk market, at least for commercial aviation. We hope that the moment of pause, which was necessarily inflicted upon us by this pandemic, will serve as a way of focusing our objectives, improving the technical quality of our work and reminding us that we are part of a global system that requires cooperation and understanding.

The Congress theme for ICAS 2022 is "Aeronautics Research and Innovation for Future Generations". Presentations at the Congress, from oral paper reports to interactive discussions, cover all aspects of aeronautical science and technology including civil and military aviation applications. Leading engineers, scientists, technologists and managers in aeronautics from around the world will be there to:

- present their work to an informed and truly global audience
- hear the latest developments from internationally recognized experts
- exchange information and opinions with colleagues from around the world
- initiate and further develop collaborative relationships
- build long lasting networks with colleagues in other countries and cultures
- see and understand the implications of technical advances throughout aviation

As it is usual with the ICAS Congress technical program, we are planning to cover the core aeronautical disciplines such as Aircraft Design, Aerodynamics, Propulsion, Materials and Structures, Systems and Subsystems, and Controls. Moreover, as ICAS has been doing for the last congresses, current topics that address emerging technologies that lead to improved performance, a cleaner or quieter environment, or more agile development processes are also planned for the technical program. However, consistent with the unprecedent times that we are living through, the program will also address technical aspects associated with healthier and safer air circulation conditions inside airplanes, airport procedures and other issues that became relevant throughout the current pandemic. Therefore, you should expect the same usual breadth in the technical program as in all ICAS Congresses, but with some special sessions to address Covid-19 consequences to our aeronautical industry. The full list of ICAS 2022 topic areas is attached.

We hope to see you in Stockholm in 2022, we encourage you to submit your work for a technical presentation at the congress and we are looking forward to the opportunity of, once again, welcoming our ICAS friends and colleagues to our biennial gathering of the aeronautical sciences, technology and industry.

Joao Azevedo
President

Dimitri Mavris
Chair Programme Committee

Authors are invited to provide an abstract for a potential paper before 10.02.2022

2

AMONG UPCOMING AEROSPACE EVENTS

2021

NOVEMBER

10 November – EASA – **2021 EASA Annual Safety Conference** – Safety in ATM – VIRTUAL ONE-DAY EVENT – In cooperation with Slovenian Presidency of EU and in partnership with EUROCONTROL – https://www.easa.europa.eu/

14-18 November – DUBAI Airshow – **Landmark EVENT – Emerging technologies – Startsups – Future transports** – Dubai (UAE) – DWC, Dubai Airshow Site – https://www.dubaiairshow.aero

15-17 November – AIAA – **ASCEND2021** – Accelerating Space Commerce, exploration and New Discovery – The universe of opportunities to build, work and live in space is expanding: ASCEND is accelerating humanity(s progress towards our off-world future. HYBRID multi-day event in Las Vegas, Nevada (USA) and online everywhere – https://www.ascend.events

15-17 November – AIAA – **ISPHSTC – 24th AIAA International Space Planes and Hypersonic Systems and Technologies Conference** – As part of ASCEND2021 – Leading-edge research and development activities associated with space planes and hypersonic atmospheric flight vehicles – https://www.aiaa.org/events

23-24 November – RAeS – **RAeS Conference Integrated ATM** – Towards full digitized airspace management - London (UK) – RAeS/HQ – www.aerosociety/events/

23-25 November – ESA – **5th Quantum Technology Conference** – Quantum information processing – Quantum sensing – Quantum metrology – Quantum cryptography – https://atpi.eventsair.com/5th-quantum-technology-conference

23-26 November – CEAS/PSAA – **AEC2021 – AEROSPACE EUROPE CONFERENCE 2021** – Warsaw (Poland) – Luksiewiez Research Network – Institute of Aviation – www.psaa.meil.pw.edu.pl

DECEMBER

01-02 December – RAeS – **RAeS Conference Alternative propulsion Systems** – Challenges and Opportunities for aircraft design – London (UK) – RAeS/HQ + Virtual (tbc) – www.aerosociety.com/events/

06-07 December – ESA – **World Space Summit 2021** – Driving the Space Ecosystem – VITUAL EDITION – https://worldspacecongress.com/

07-09 December – SESARJU – **11th SESAR INNOVATION DAYS** – SIDs – Inspiring Long-Term Research in the field of ATM – VIRTUAL FORMAT – Will take place ONLINE – SIDs will host the annual Young Scientist Award – https://www.sesarju.eu

2022

JANUARY

03-07 January – AIAA – **SCI TECH Forum** – AIAA Science and Technology Forum and Exposition – Objective: to explore the economic, social and environmental impact of sustainability enabled by aerospace technology - San Diego, CA (USA) Manchester Grand Hyatt, San Diego. Also ONLINE. https://www.aiaa.org/Sci/Tech/

FEBRUARY

07-09 February – ATCA – **ATCA Annual Conference & Exposition – Washington, D.C.(USA)** – AWalter E. Washington Convention Center – https://www.atca.org/annual/

15-20 February – Singapore – **Singapore Air Show** – Asia Largest Aerospace and Defense Event – Singapore 498760 – Changi Exhibition Centre – 9, Aviation Park Road – https://www.singaporeairshow.com

MARCH

02-04 March – AIDAA – **9th International Symposium on Scale Modelling** – Napoli (Italy) – https://issm9.sciencesconf.org

05-12 March – IEEE – **2022 IEEE Aerospace Conference** – International Conference for Aerospace Experts, Academics, Military personnel and Industry leaders – Big Sky, Montana (USA) – Yellow Stone Conference Center – https://www.aeroconf.org

APRIL

04-06 April – ICSSA – **3rd International Academy of Astronautics Conference on Space Situational Awareness** – This event initially scheduled on 13-15 September 2021 has been postponed to 04-06 April 2022 due to Covid-19. Madrid (Spain) – Parque Tecnologico de Madrid (PTM),C/Santiago Grisolia, n° 4 – https://reg.conferences.dce.ufl.edu/ICSSA

11-14 April – IERCOFTAC – **EDRFCM – European Drag Reduction and Flow Control** – Paris (France) – CNAM – https://www.ercoftac.org/events/

27-30 April – AERO Friedrichshafen – **The leading show**

AMONG UPCOMING AEROSPACE EVENTS

for General Aviation – Friedrichshafen (Germany) – https://www.aero-expo.com

MAY

11-12 May – FSF – **BASS2022** – Business Aviation Safety Summit 2022 – Savannah, GA (USA) – Convention Center – https://flightsafety.org/event/

12-17 May – BLDI – **ILA Berlin Air Show 2022** – Innovation and Leadership in Aerospace – Berlin – Berlin ExpoCentre Airport, Schönefeld, Berlin – https://www.tesbl.com

16-19 May – CEAS/ESA – **HiSST2022 – 2nd international Conference on High-Speed Vehicle Science and Technology** – Bruges (Belgium) – Oud Sint-Jan – https://ceas.org/2nd-international-conference-on-high-speed-vehicle-science-and-technology/

23-25 May – NBAA/EBAA – **EBACE 2022 – 2022 European Business Aviation Convention & Exhibition** – Geneva's Palexpo – geneva International Airport – https://ebace.aero/2022/about

30 May- 01 June – Elektropribor – **ICINS 2022 – 29th Saint Petersburg International Conference on Integrated Navigation Systems** – Hold by the State Research Center of the Russian Federation – Saint Petersburg (Russia) – 30, Malaya Posadskaya UL – www.elektropribor.spb.ru/en/conferences/1520

JUNE

02-03 June – SAE International– **AEROCON2022** – Organised by SAEINDIA - Autonomous Airborne Systems – Trends, Challenges and Opportunities - Bangalore (India) – https://saeindia.org/aerocon2022/

05-09 June – ECCOMAS – **ECCOMAS Congress 2022 – 8th European Congress on Computational Methods in Applied Sciences and Engineering** – Oslo (Norway) – https://www.eccomas.org/

21-24 June – AIAA – **ICNPAA2022 –** Mathematical Problems in Engineering Aerospace and Sciences – Prague (Czech Republic) – www.icnpaa.com/index-php/icnpaa/ICNPAA2020

21-27 June – AIAA – **AIAA Aviation Forum –** AIAA Aviation and Aeronautics Forum and Exposition – Chicago, IL (USA) – Hilton Chicago – https://www.aiaa.org/aviation/

24-26 June – ICCIA – **ICCIA2022 –** 7th International Conference on Computational Intelligence and Applications – Nanjing (China) – Nanjing Tech University – www.iccia.org contact: iccia@zhconf.ac.cn

JULY

03-08 July – EUCASS/3AF – **EUCASS Conference** – Lille (France) – https://www.eucass.eu

16-24 July – COSPAR – **44th Assembly of the Committee on Space Research (COSPAR) and Associate Events –** ATHENS (Greece) – Megaron International Congress Centre – MAICC – www.//maicc.gr.en https://www.cospar-assembly.org

18-22 July – FIA2022 – **Farnborough International Air Show –** Farnborough (UK) – https://www.farnboroughairshow.com/fia2022/

AUGUST

31 August **- 02** September – DGLR – **German Aerospace Congress –** Bremen (Germany) + Online – www.drlk2021.dglr.de

SEPTEMBER

04-09 September – ICAS/FTF/Innovair – **ICAS2022 – 33rd Congress of ICAS (International Council of the Aeronautical Sciences** – Hosted by FTF and Innovair – Stockholm (Sweden) – www.icas2022.com – www.ftfsweden.se – www.innovair.org

18-22 September – IAF – **Hosted by CNES – IAC 2022 – 73rd International Astronautical Congress** – Space for @ll – Special attention will be paid to students and young people – Paris (France) – Paris Convention Centre – https://iac2022.org

NOVEMBER

02-05 November – Indoaerospace – **Indo Aerospace Expo and Forum** – Jakarta (Indonesia) – Jakarta International Expo Kemayoran – http://indoaerospace.com

CEAS
Council of European Aerospace Societies

BULLETIN
AEROSPACE
EUROPE

AerospaceEurope Conference2021

WARSAW, POLAND | 23 -26 NOVEMBER 2021

PSAA

CEAS
Council of European
Aerospace Societies