CEAS
Council of European Aerospace Societies

BULLETIN

AEROSPACE EUROPE

PEGASUS

PARTNERSHIP IN EUROPE OF A GROUP OF AEROSPACE AND SPACE UNIVERSITIES
CONNECTING AEROSPACE ENGINEERING UNIVERSITIES IN EUROPE

PEGASUS IS THE ONLY ASSOCIATION OF AERONAUTICS AND SPACE UNIVERSITIES IN EUROPE. REPRESENTING THE VOICE OF THE ACADEMIA.

INTERVIEW WITH PROF. GUSTAVO ALONSO RODRIGO,

CHAIRMAN OF PEGASUS

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: 3AF (France), AIAE (Spain), AIDAA (Italy), AAAR (Romania), CzAeS (Czech Republic), DGLR (Germany), FTF (Sweden), NVvL (The Netherlands), PSAA (Poland), RAeS (United Kingdom), SVFW (Switzerland) and TsAGI (Russia);
- 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).

The 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

Besides, 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 so-called '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 a strong 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
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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).
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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
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anders.blom@innovair.org
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andrea.alaimo@unikore.it
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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
carlo.bettanini@uinpd.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 Venrooij mark.van.venrooij@nlr.nl
Secretary General and CEAS Trustees: Fred Abbink & Mark van Venrooij - 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 for Aeronautics and Astronautics – Bengt Moberg – Box 357 - SE-101 27 Stockholm
bengt.moberg@vernamack.se
President: Dr Roland Karlsson
Häradschammars 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
Air Cdre Peter Round FRAeS
Chief Executive:
Sir Brian Burridge FRAeS
Head of External Affairs:
In course of designation

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
csa_zhangyao@sina.en
wangyr@spacechina.com
www.csaspace.org.cn/

■ European Aeronautics Science Network (EASN)
EASN - Rue du Trône 98 –
1050 Brussels,
Belgium – 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: Michal Kleiber
mkleiber@ippt.pan.pl

■ ERCOFTAC: European Research Community on Flow Turbulence Air Combustion
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.merlen@univ.lille1.fr

■ EUROMECH: European Mechanics Society
www.euromech.org
President: Prof. Gert Jan van Heijst
G.J.F.v.Heijst@tue.nl

■ EUROTURBO: European Turbomachinery Society
www.euroturbo.eu/
Chairman: Prof. Francesco Martelli
francesco.martelli@unifi.it

EDITORIAL

Jean-Pierre Sanfourche
Editor-in-Chief

ABOUT PEGASUS

I wish to thank very much Prof. Gustavo Alonso for the interview he accepted to give me, as chairman of PEGASUS.
PEGASUS was founded in 1998 with the triple objective to encourage collaboration between universities in the field of aerospace engineering, improve the quality of the service they provide to students and industry, and to facilitate student exchanges.
At a time when aviation and space sectors are facing quite difficult challenges and when competition for talents is going to intensify, with the competition for the best STEM –(Science, technology, Engineering and Mathematics), PEGASUS should play a major role. "*The current crisis provides an opportunity to make the sector more resilient, more sustainable and more competitive*", recently declared Henry Holelei, Director-General for mobility and Transport at the European Commission.

Destination digital and artificial intelligence (AI)

To take up all challenges the aerospace sector is facing, the keynote is: acceleration of the digital transformation everywhere. Having embarked on a new era of exponential transformation, all companies have to place digital, artificial intelligence (AI) and automation at the core of their business.

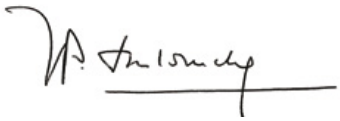
Driven by the need to reach climate neutrality in 2050, which implies to dramatically reduce CO_2 emissions, designing the next generation aircraft will require innovative technologies and new engineering, manufacturing and testing processes.
Not only next generation air vehicles rely on digital and AI transformation, but also air traffic management (ATM), maintenance and repair overhaul (MRO), and airports.

New Space

As regards the space sector, Europe is naturally pulled higher and higher by the ambitious objectives of its programmes, but in addition by the extraordinary feats being realised by NASA and Space X with Mars 2020 (*Perseverance and Ingenuity*) and Crew Dragon missions, as well as the imminent commencement of the Moon Human and Robotised Village Programme.

The Pact for Skills for Aerospace and Defence

The European Commission has launched in October 2020 a 'Pact for Skills', for up-skilling and re-skilling the workforce in Europe for the period 2021-2027. For aerospace and defence, a High-Level Roundtable was held, in which ASD-Europe and senior industry leaders expressed their views and plans. A five-year 'European Skill Agenda' is going to help develop more and better skills.
PEGASUS has joined the Pact for Skills and its universities are destined to bring an important contribution to the success of this process.



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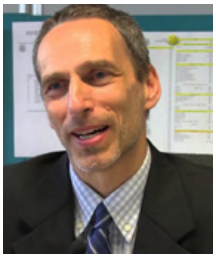

Franco Bernelli Zazzera
CEAS President 2021-2022

I am glad to start this message by pointing out that, despite the continuous need of online meetings, CEAS has managed to achieve a series of positive results and actions that should contribute to a quick resumption of activities as soon as possible.

The first notable achievement is the completion of the process of amending the CEAS Statutes and Bylaws, now ready for official registration on the Belgian Gazette. In its revised form, the Statutes and Bylaws reflect the evolution of the European aerospace context in recent years and strengthen the relation between the initial CEAS Founding Members, essentially the national aerospace societies, and the current Corporate Members. 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, are now granted voting rights within CEAS in most matters. 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.

In the past months, CEAS has worked hard to identify its new Chair of the Aeronautical Branch. We are now getting really close to the final decision and in the near future the position will be assigned, obviously to a great personality that will give impulse and a personal contribution to the life of CEAS.

Along the line of strengthening of its relations with similar organisations in Europe, CEAS had a first extremely interesting meeting with the Académie de l'Air et de l'Espace (AAE, also known as Air and Space Academy). The previous edition of this bulletin includes an interesting interview with the President of AAE, and finally a meeting between the AAE President and the CEAS President took place, with active participation of additional members of the Board of both associations. The two associations are complementary in many aspects, in terms of membership and activities, the essential workforce of CEAS is its societies and that of AAE is its people. AAE is using a more strategic top-down process and CEAS a bottom up one by collecting the actions and position of its Member Societies. It appears that both might be stronger when AAE and CEAS work together. It was then agreed to find ways to set up more concrete cooperation, eventually starting already in the current year with joint initiatives in the CEAS Rotorcraft Forum and in the CEAS Aerospace Europe Conference. It is my hope to be able to improve relations also with other European associations that share the vision of CEAS of defending European positions and activities in all areas of aerospace.

Thanks to the engagement of its Member Societies, CEAS is continuously proposing interesting events. On June 25, a new initiative strongly supported by AIAE – Asociación de Ingenieros Aeronáuticos de España – will be held virtually: the first CEAS Women in Aerospace Conference. This interesting event is organised with very dynamic round tables and excellent speakers from across Europe, including students. The widest representation of the aerospace sector is ensured with panellists from different entities: industry, national authorities, international organizations, and academia. The conference is associated to a contest on "How to promote STEM careers among the youngest generation" proposed to university students.

Finally, let me point out that preparation for the Aerospace Europe Conference planned for November 2021 in Warsaw is well under way. The Programme Committee is established, and abstract submissions deadline is fast approaching. CEAS looks forward to welcoming the European aerospace community on site and is eager to propose, as usual, interesting plenary lectures and networking opportunities for scientists. Keeping in mind the objectives of CEAS, I would be happy to personally welcome in Warsaw the Presidents of all CEAS Member Societies as well as the representatives of European research establishments and partner associations.

AEC 2021 – "RESTORE, RETHINK, REDESIGN"

POLISH SOCIETY OF AERONAUTICS AND ASTRONAUTICS (PSAA) TOGETHER WITH COUNCIL OF EUROPEAN AERONAUTICAL SOCIETIES (CEAS) TO ANNOUNCE:

AEROSPACE EUROPEAN CONFERENCE 2021 / WARSAW, POLAND / NOVEMBER 23TH -26TH, 2021

Due to the pandemic situation, keeping in mind safety of our participants we are ready to go along with the Conference either on-line or hybrid.
It is with great pleasure to invite you to participate and we are pleased to invite all prospective authors to submit their abstracts.

CALLS FOR PAPERS - NEW KEY DATES https://aec2021.meil.pw.edu.pl/

KEY DATES

1 Jan 2021	First Announcement and call for papers, website open
15 Mar 2021	Abstract uploading open
15 July 2021	Abstract uploading deadline
30 August 2021	Acceptance of papers finished
30 Sept. 2021	Deadline for full length papers submission

ORGANIZING COMMITTEE

- Prof. Tomasz Goetzendorf-Grabowski – **tgrab@meil.pw.edu.pl**
- Ms Beata Wierzbinska-Prus – **bprus@meil.pw.edu.pl**
- Dr Maciej Zasuwa – **Maciej.Zasuwa@pw.edu.pl**
- Dr Jacek Mieloszyk – **jmieloszyk@meil.pw.edu.pl**
- Dr Marcin Figat – **mfigat@meil.pw.edu.pl**

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- **Skills for the aerospace sector**

TECHNICAL COMMITTEE

- Prof. Franco Bernelli Zazerra – **franco.bernelli@polimi.it**
- Prof. Tomasz Goetzendorf-Grabowski – **tgrab@meil.pw.edu.pl**
- Mr Torben Henriksen – **Torben.Henriksen@esa.int**
- Prof. Andrea Alaimo – **andrea.alaimo@unikore.it**
- Dr Cornelia Hillenherms – **Cornelia.Hillenherms@dlr.de**
- Mr Jean Pierre Sanfourche – **sanfourche.jean-pierre@orange.fr**
- Ms Beata Wierzbinska-Prus – **bprus@meil.pw.edu.pl**

Contact:
Email: psaa@meil.pw.edu.pl
Conference Website: https://aec2021.meil.pw.edu.pl/

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.

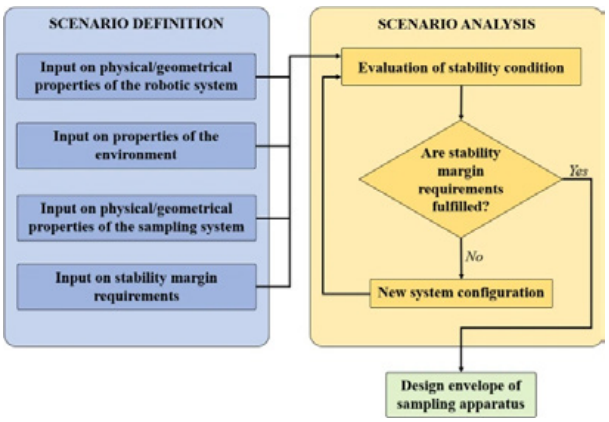
The Managing Editors:
– Rafael Bureo Dacal
– Andrea Dieball
– Cornelia Hillenherms
– Wilhelm Kordulla
– Stefan Leuko

CEAS SPACE JOURNAL

Volume 13, Issue 2, March 2021

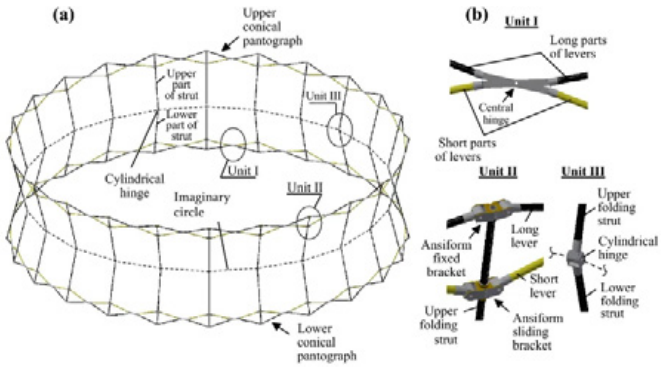
A MULTIDISCIPLINARY DESIGN TOOL FOR ROBOTIC SYSTEMS INVOLVED IN SAMPLING OPERATIONS ON PLANETARY BODIES

D. Riccobono, G. Genta, S. Moreland & P. Backes / Published online: 17 August 2020



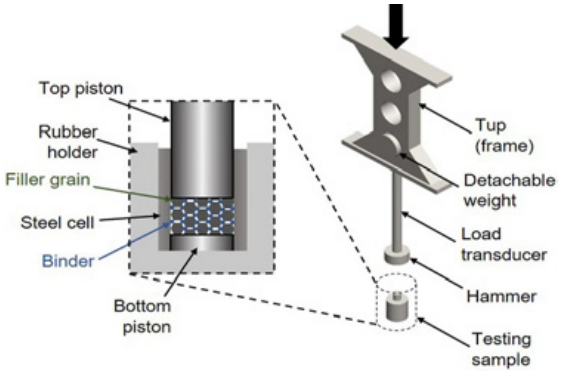
NEW DESIGN MODIFICATIONS OF THE SUPPORTING RING FOR A LARGE DEPLOYABLE SPACE REFLECTOR

S. Tserodze, E. Medzmariashvili, C. G. M.van't Kloos-ter, K. Chkhikvadze, M. Muchaidze, M. Nikoladze, A. Chapodze, I. Sigua & M. Sanikidze / Published online: 27 August 2020



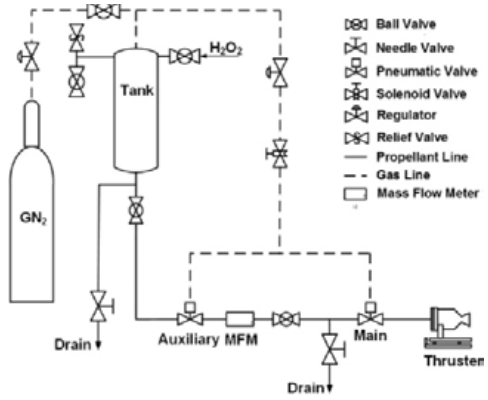
IMPACT FORMATION OF ULTRALOW-BINDER-CONTENT COMPOSITE "LUNAR CEMENT"

K. Oh, H. Yi, T. Chen, B. J. Chow, R. Kou & Y. Qiao/ Published online : 01 September 2020



MANGANESE OXIDE LANTHANUM-DOPED ALUMINA CATALYST FOR APPLICATION IN 95 WT.% HYDROGEN PEROXIDE THRUSTER

S. Kang, D. Lee & S. Kwon / Published online: 10 September 2020



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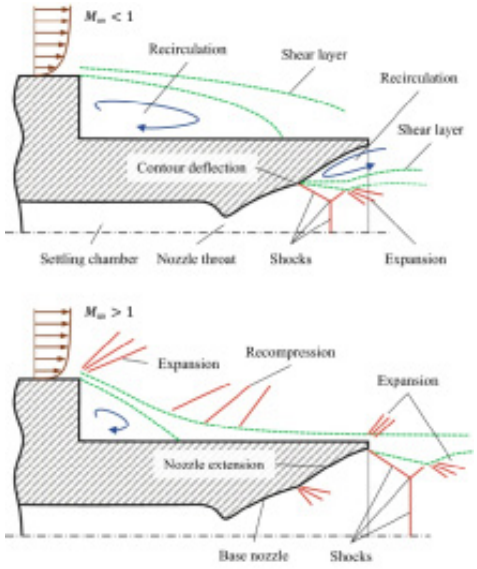

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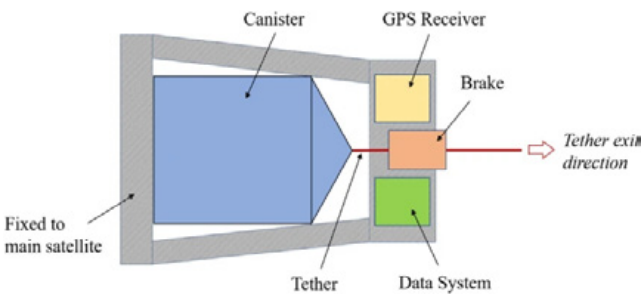

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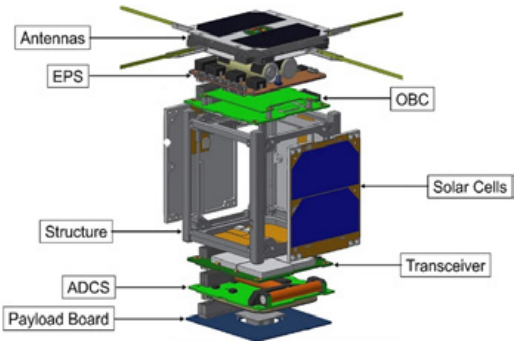

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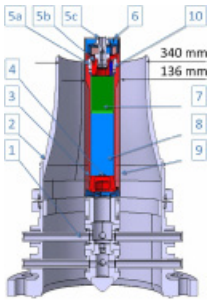

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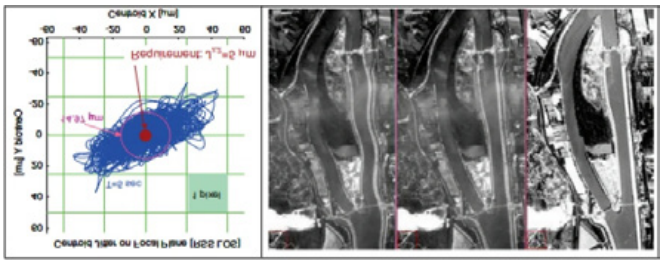

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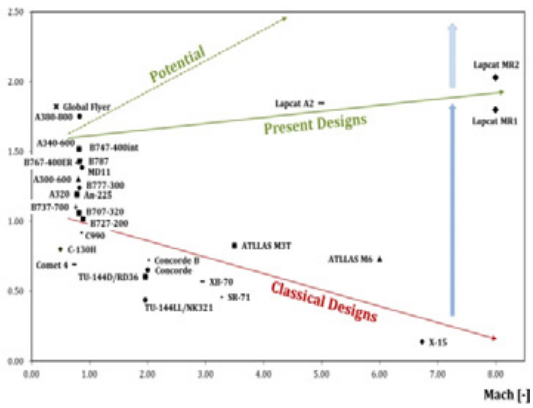

OBITUARY: IN MEMORIAM CHRISTOPHE HERMANS

EDITORIAL BOARD TEAM

We are deeply saddened to hear about the sudden death of Christophe Hermans on 24 January 2021. He was a supportive and truly valued member of the Editorial Board of the CEAS Aeronautical Journal from the very beginning in 2010.

Christophe Hermans was Director of the German-Dutch Wind Tunnels DNW, and Chief Technology Advisor of the Royal Netherlands Aerospace Centre NLR.

He started his career at NLR in 1986, becoming department head in 2000. From 2004 until 2012, he was head of NLR's Helicopters & Aeroacoustics department and responsible for different flight test and evaluation services and procedures. In 2012, he joined the Management Team at DNW as Deputy Director.

Christophe strongly fostered and supported international collaboration. He actively contributed to numerous aeronautical bodies such as NVvL, CEAS, ERF and ICAS, among others.

Between 2006 and 2016, he was Secretary of the Netherlands Association of Aeronautical Engineers NVvL, and since 2016, Christophe was President of the NVvL.

He was also a member of the Board of the Council of European Aerospace Societies CEAS since 2007 and up until now Chairman of the CEAS Aeronautical Branch. He was CEAS President for two consecutive years in 2017 and 2018.

Christophe always excelled with his fresh impetus, extensive expertise, mediation talent and friendly demeanour at meetings and panel discussions. He was highly dedicated to the aerospace community.

On behalf of the Editorial Board, we would like to send our sincere condolences to his family and his close colleagues. He will be greatly missed.

Rolf Henke – Editor in Chief
Cornelia Hillenherms - Managing Editor
Andrea Dieball - Managing Editor

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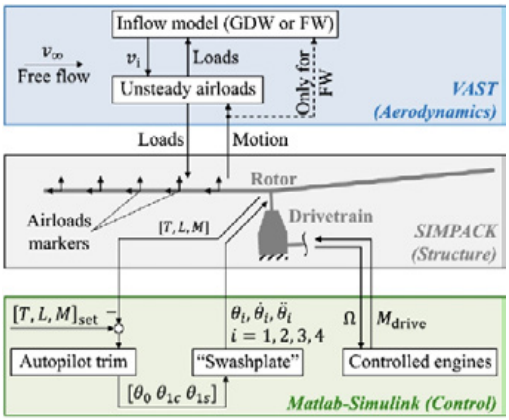

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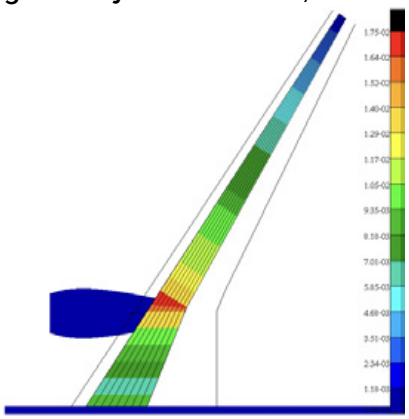

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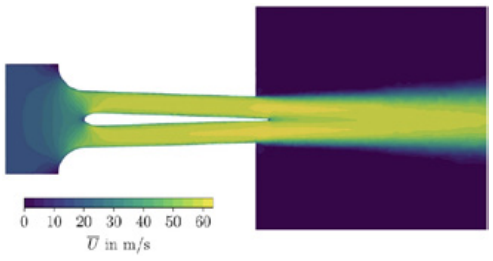

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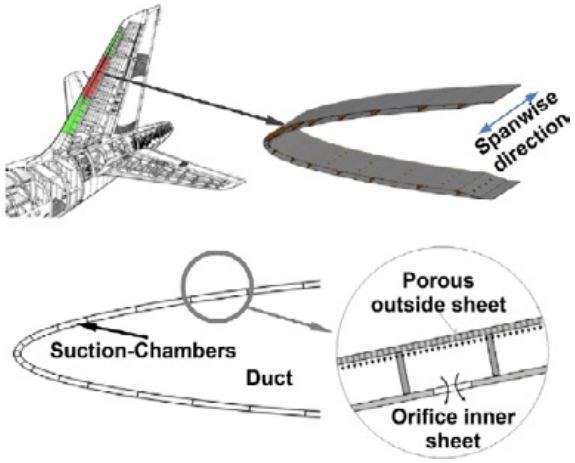

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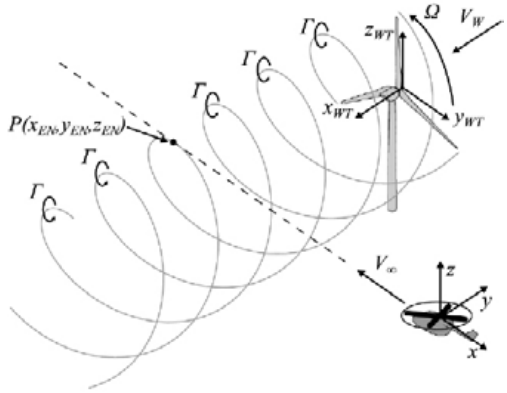

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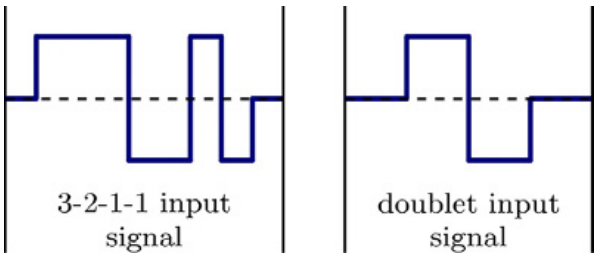

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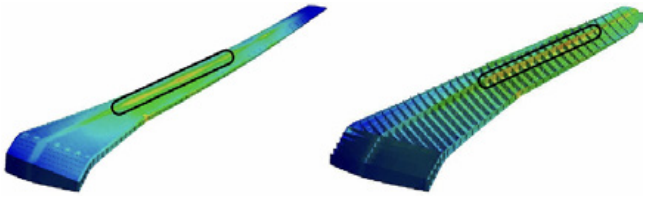

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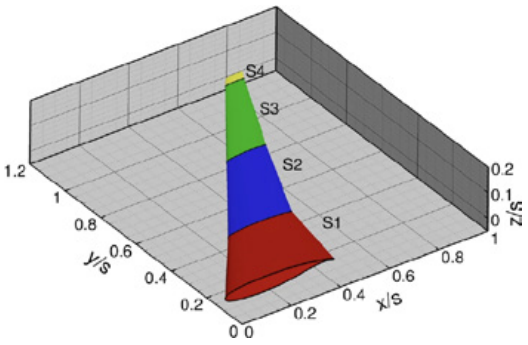

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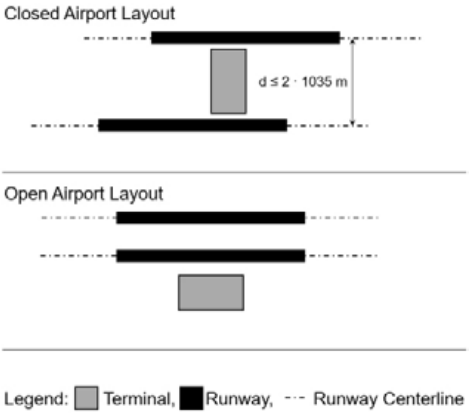

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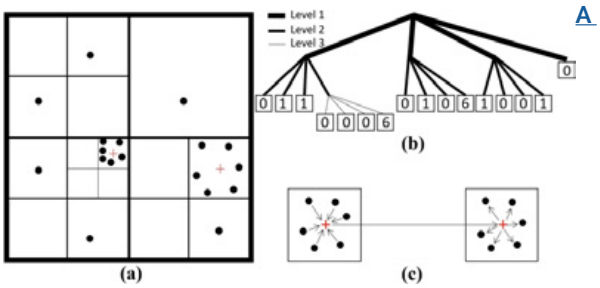

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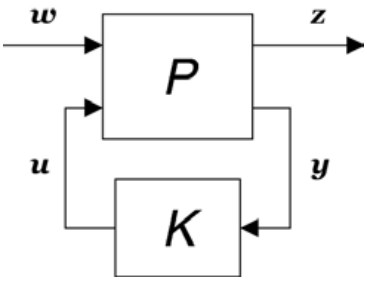

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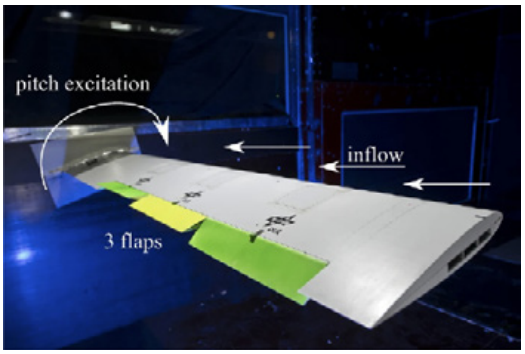

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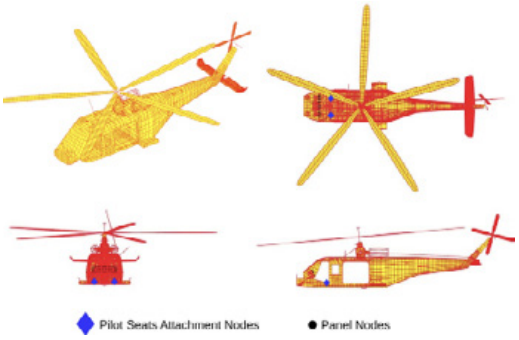

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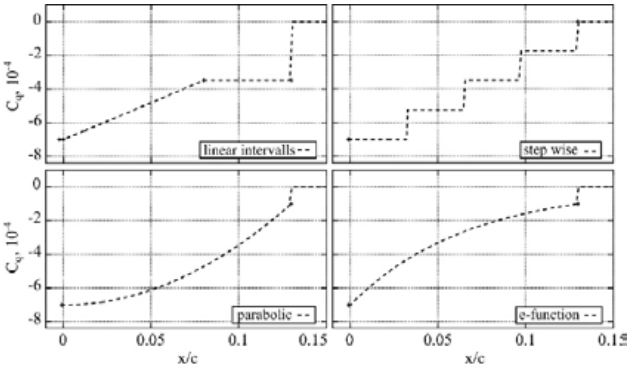

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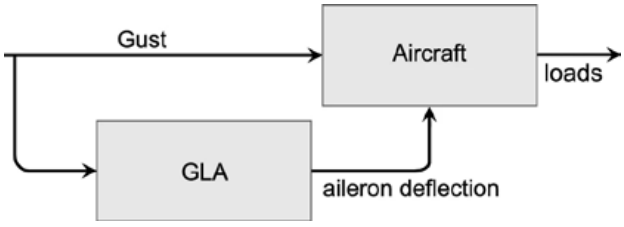


INTERVIEW WITH PROF. GUSTAVO ALONSO RODRIGO, CHAIRMAN OF PEGASUS

By Jean-Pierre Sanfourche, Editor-in-Chief

Gustavo ALONSO RODRIGO is professor at Technical University of Madrid (UPM), School of Aerospace Engineering (ETSIAE/UPM). He is Ph.D., Aeronautical Engineer and Master in Business Administration.
He is chairman of PEGASUS (Partnership of a European Group of Aeronautics and Space UniversitieS) from 2019. In addition, he actively participates in many other organisations as member of:

- *ACARE (Advisory Committee for Aviation Research and Innovation in Europe) General Assembly;*
- *EU Clean Aviation Programme preparatory group;*
- *EASPA (European Alliance for Subject specific and Professional Accreditation and quality Assurance);*
- *BRAIA (Belt and Road Aerospace Innovation Alliance);*
- *ESA Physical Sciences Working Group;*
- *ALICANTO (International Association of Aviation and Aerospace Education.*

Research fields: environmental impact of air transport – aerospace technologies – business strategy.
He gives lectures at graduate and post-graduate level in air transport and space systems engineering.
He is visiting and guest professor at several universities worldwide.

***Jean-Pierre Sanfourche* – PEGASUS presently counts 28 members from 11 European countries. Are actions being taken with a view to developing this network and to initiate new strategic lines?**

Gustavo ALONSO RODRIGO - PEGASUS (Partnership of a European Group of Aeronautics and Space UniversitieS) is the partnership of the best European aerospace universities and yes, currently has 28 members in 11 different European countries[1]. I honestly think that PEGASUS partner Universities represent extraordinary well the aeronautics and space higher education system in Europe. Today, more than 3000 aerospace engineers graduate at Master level from the member institutions of PEGASUS each year. The aerospace sector is small compared to other sectors, and therefore the number of Universities delivering aerospace engineering education at the highest level is limited. PEGASUS partners have a reputation for high-quality research and a quality recognition in education and research. I insist, PEGASUS represents Universities, not individual professors, researchers or scientists. Consequently, the number of members has to be necessarily relatively small, compared to other associations representing individuals.
But of course, PEGASUS is always open to new members. PEGASUS is open to all European institutions providing a sufficiently qualified education in aerospace engineering. Since the foundation in 1998, new universities have joined the association. We are constantly receiving applications from Universities that want to become members of PEGAUS and we are happy to consider all those applications. Partners fulfilling the admissibility criteria are immediately accepted. Other Universities that do not meet fully all admissibility criteria are accepted as associate partners. In addition to the 28 partner universities, today we have 7 more universities as associate partners and participate in most of the activities of PEGASUS.
Our strategic lines remain the same: from an internal perspective, we want to improve the quality of our educational process and curricula to specifically serve the needs of the aerospace industry, which are changing. This means strengthen furthermore our cooperation, continuing the harmonization of our educational programmes and the exchange of students and staff. In this line, we want to contribute to the development of a quality system for the European higher education in aerospace engineering. From an external perspective, we work to increase the cooperation between the partners and the industry as well as with national and European research and technology organisations. We are open to collaborate with other related groups and networks to help fulfilling the EU policy lines not only in higher education, but also in aerospace research and development.

***J-P. S.* – From 12 to 16 April took place the 2021 edition of the PEGASUS Student Conference: could you highlight the major messages and proposals which have emerged? What are the selected papers?**

G. A. R. - Every year, coinciding with our Spring Council meeting, we organize the PEGASUS Student Conference. The Conference is reserved for Master students who have graduated from the PEGASUS Universities not more than one year before the date of the conference. It offers them a unique opportunity to get together, to exchange experiences, traditions and to create opportunities at international level.
The Conference is organized on the basis of competitive selection. The first selection is operated at local level since each University is allowed to present not more than three papers. The written papers are then evaluated by two professors from different countries to the author(s)

of the paper, recognized as experts in the covered topic. The final, combined score is obtained after the oral presentation at the conference. The best papers are then published in Aerotecnica Missili & Spazio, a Springer journal.
Thanks to this demanding selection process, the quality of the papers that are presented at the Conference is extraordinary. Every year I have the same feeling of admiration when I see the presentations of the students at the Conference, I am impressed by the quality of the works and the professionalism of the presentations. That makes me feel proud of the work we are doing, because this is the essence of our mission as Universities: to "produce" high calibre professionals for our societies.
As you can see in this list of the final selection of papers, they address a wide variety of topics of undoubted interest in the challenges that aerospace engineering currently faces. And do not forget these are "just" master thesis:

- *ModelFree Control Applied To The Longitudinal Movement Of An Aircraft*
- *Robust attitude controller for NASA Astrobee robots operating in the ISS*
- *Big data applied to predictive maintenance of aircraft tires*
- *Autonomous Taxiing for Aircraft*
- *Detailed Modelling of CorkPhenolic Ablators in Preparation to the PostFlight Analysis of the QARMAN ReEntry CubeSat*
- *Lambwaves experimentalnumerical correlation on a composite panel*
- *Development of software modules for preliminary design and structural optimization of hybridelectric aircraft*
- *Evaluation of the Biomechanical Responses during an Aircraft Emergency Landing*
- *Missions towards NearEarth Asteroids with Departure from Lagrangian Points L4 and L5*
- *Estimation of the ephemerides and gravity fields of the Galilean moons through orbit determination of the JUICE mission*
- *Performance analysis of orbit determination algorithms for Space Surveillance and Tracking in LEO*
- *A Trajectory Generation Function for a Rendezvous Guidance Expert*
- *Performance enhancement of space borne scatterometers by means of digital beamforming techniques*
- *Relativistic Modelling for Highly Precise Ranging and Time Transfer via Optical InterSatellite Links*
- *A Novel VisualBased Terrain Relative Navigation System for planetary applications based on Mask RCNN and Projective Invariants Framework*
- *Autonomous navigation of interplanetary probes by using sequential algorithm*
- *Applicability of radiation modelling for direct comparison of simulations with experiment*
- *Development of a plasma chemistry model for Helicon Plasma Thruster analysis*
- *Study of the influence of the Mars 2020 rover mast on the measurements recorded by the wind sensors*
- *A Computational Tool for the Design of Hybrid Rockets*
- *Scaling of an Aviation Hydrogen Micromix Injector Design for Industrial GT Combustion Applications*
- *Exergy Analysis of HybridElectric Turbofan Concepts*
- *Investigation Of The Effects Of Geometry Tip Devices On Turbine Tip Leakage*
- *Direct Numerical Simulation of flow and heat transfer in complex ducts.*

***J-P. S.* – What about the PEGASUS Awards?**
G. A. R. - A key element within PEGASUS is the reciprocal recognition of common quality among the partner Universities, which facilitates the cooperation and the exchange of students and staff.
A means of materializing this mutual trust are the PEGASUS labels, Certificate and Award, given to our students in recognition of the individual student's multi-national experience.
These labels are appended to the student diploma and respectively certificate (to an employer, for instance) the quality of the programme of study the student has followed (accredited by PEGASUS), and their international experience.

***J-P. S.* – Three Working Groups are today in action: Education – Academic Aerospace Research – Communication. What are for each of them the most important achievements?**
G. A. R. - PEGASUS has a very democratic organisational structure: all partners and associate partners participate in the Council meetings, at least twice a year. But in addition, in order to perform the association activities, all PEGASUS member Universities participate in Working Groups, which are non-permanent bodies, being modified periodically according to the needs at the time.
Working Group members meet regularly, discuss and exchange ideas, and present their conclusions to the rest of the members at the Council meetings, where decisions are taken on the proposals made by the different Working Groups, and new actions can be assigned to them.

All PEGASUS achievements are the result of the activity of the current and past Working Groups: the already mentioned reciprocal recognition of common quality, implemented in the PEGASUS Labels (Certificate and Award) in recognition of an individual student's multi-national experience; the PEGASUS Course Catalogue, collecting the specific curriculum description format that all partners have agreed on, and enabling an immediate understanding of the level of education provided by the partners; the Students conference; the ever-Increased mobility among the PEGASUS partners; the cross breeding of curricula and new "crossed" engineering profiles generated by the EU student mobility; the strong connection with research organizations to support the internship availabi-

lity on top of industrial placements; the reinforced collaborations between the partners and the industry.
Just to mention an example of the adaptation of the activity of the Working Groups to the current needs is the work that the Working Group on Education is performing. For the last months, this Working Group is trying to accommodate the cooperation among partners, for instance the exchange of students and staff, to a situation of reduced mobility caused by the global sanitary situation, exploring and opening new ways based on distant learning and other blended or hybrid methods.

***J-P. S.* – What is your appreciation as regards the quality of coordination and exchanges between education units and students impulsed by PEGASUS?**
G. A. R. - There is a very intense flow of students' mobility among the PEGASUS members, which is facilitated by the mutual recognition among the partners of the quality of their educational programmes.
PEGASUS, as the only European network of excellence in Aerospace Engineering education, has established an entity for developing a quality/excellence label, called Promoting Excellence & Recognition Seal of European Aerospace Universities (PERSEUS). Led by PEGASUS, the EC H2020 programme financed the project PERSEUS. This project has identified a possible roadmap for the definition of a European quality label for aerospace related higher-education degrees, involving a great portion of the European stakeholders in aerospace: Universities, research centres, industries (both small and large) networks and associations, together with accreditation agencies.
The core concept established by the project is that it is possible to establish a sector-specific quality system, which can complement the existing national or European accreditation systems, providing added value to the internal and/or external quality assurance processes that are in place in most European Universities.
The proposed method relies on the definition of a set of core skills and abilities both technical and personal, specific for the aerospace domain and expressed in the form of learning outcomes. These skills are identified by all the stakeholders of the higher education process. Once the sector-specific skills are defined, these form the basis for the evaluation of the fitness-for-purpose of the curricula offered at the European Universities. Each University will be asked to identify the level of achievement of the identified skills, whereas the employers have been asked to rank the importance of each skill for their specific needs. A comparison of the levels offered by the curricula and the needs of the employers would define the employability of the graduates, hence the sector-specific quality of the curricula.

***J-P. S.* – Is it your intention to create new Working Groups?**
G. A. R. - Working Groups evolve and they are created or modified according to the topics that the association thinks need to be addressed at each moment in time. It is not in any case my decision, as a Chair. In fact, in PEGASUS decisions are taken by the Council, which in reality is an assembly where all partners are present and vote. We try to meet regularly and spend time discussing and reflecting together, this facilitates that decisions are normally taken by consensus. The role of the Chair is basically to organize and animate these discussions, in addition to represent PEGASUS to external bodies. Even the strategy of PEGASUS emerges from the discussions and decisions at the Council meetings.

Three Working Groups are active today: Education, Academic Aerospace Research, and Communication. This structure corresponds to the current focus of PEGASUS: to continue promoting the cooperation among partners, both in education and research, and to reinforce the links with the rest of stakeholders in the aeronautics and space ecosystems.

***J-P. S.* – Are you in relation with EUROAVIA?**
G. A. R. - Yes, we are in contact with EUROAVIA, in particular in relation to the participation of students proposed by them in the PEGASUS Student Conference. Also the presence of the President of EUROAVIA in the 2020 Conference was foreseen. Unfortunately, the difficulties brought by the Covid-19 pandemics have delayed these plans, but I hope we will resume them at the 2022 Conference.

***J-P. S.* – In November 2018, PEGASUS had published a Blue Paper on Future Innovation in Aerospace: is an actualisation of this document being under preparation?**
G. A. R. - Yes, PEGASUS is very active supporting the European policies related to innovation in aerospace, which are needed to achieve the EU's self-imposed goal: the so-called "Route to net zero European aviation", made explicit in the document "Destination 2050".

We are preparing a document to support this initiative, as the rest of the stakeholders are doing.

To achieve such and extremely ambitious objective, a huge effort in terms of research and innovation has to be carried out. Universities, as an integral part of the sector, play a fundamental role to support that effort, complementing with our lower TRL research, the higher TRL research of the industry.

***J-P. S.* – In October 2020, the European Commission organised a high-Level Roundtable to think about the competences Aerospace Industry will need in the near future. It was the official launch of the "Pact for Skills" which will address before the end of this year the urgent need for up-skilling and re-skilling the aerospace and defence workforce in Europe for the period 2021-2027. How is PEGASUS participating?**
G. A. R. - PEGASUS has joined the Pact for Skills and we are following closely this initiative to see how Universities

can contribute in the best possible way to the up-skilling and re-skilling of the aerospace and defence workforce, which we agree is absolutely necessary.

***J-P. S.* – Is PEGASUS in relation with European Aerospace institutions?**

G. A. R. - Since its foundation, PEGASUS aims to offer itself as the European portal for higher education and university-based research in aerospace, being recognised as the most efficient channel to get university inputs at the integrated EU level. As an association of Universities, PEGASUS represents the voice of the academia, understanding academia, as "the part of society, especially universities, that is connected with studying and thinking, or the activity or job of studying", following the definition of the Cambridge Dictionary.

PEGASUS is in close relation with industries and research centres, and from the institutional point of view PEGASUS is an active member of ACARE, in the General Assembly and also co-chairing Working Group 5 and the Strategic and Implementation Board. PEGASUS is also participating in the group of stakeholders which is preparing the new Clean Aviation European partnership, the research and innovation programme funded by the EC, in the frame of Horizon Europe, and private partners to help achieving the ambitious targets that the EU has established for aviation in 2050.

***J-P. S.* – Is PEGASUS maintaining close relationships with aerospace industry?**

G. A. R. - Yes, in addition to the many relationships established by our partner Universities, PEGASUS includes a mechanism to facilitate the interaction with the aerospace industry, the PEGASUS Industry Alliance. This is a forum where the partner Universities meet with representatives of the aerospace industry and exchange ideas on how to improve the cooperation, both in educational and research activities: adaptation of the curricula to the industry changing needs, identification of internship opportunities for the students, joint research projects, etc.

***J-P. S.* – In conclusion, what are your top level priorities for PEGASUS?**

G. A. R. - The objective of PEGASUS is to offer highly relevant educational and research programs and thereby attract the best students and scientists. Coordinated developments, exchange of staff and students and innovation are the basis on which these objectives are achieved. Today we need to adapt our cooperation activities to the situation brought by the pandemics in terms of mobility restrictions that will become permanent: a new educational environment is emerging, where distant learning will co-exist with traditional on site teaching, in a variable perimeter blended model. This is, as is often the case, a problem that can be turned into an opportunity, thanks to the digital transition in which education is also immerged. et Universities are an essential element in the European aeronautics (aviation in general) and space ecosystems, together with the industry, research and technology organisations, and of course the European institutions. PEGASUS is the only association of aeronautics and space universities in Europe. PEGASUS represents the Universities (it is the Rector or the equivalent authority who signs the Partnership Agreement), not individual professors or researchers, like other networks of aerospace scientists. Therefore, I think PEGASUS genuinely represents the voice of the academia and can add much value and contribute with the institutions and the rest of the stakeholders to the scientific and technological advancements that are needed to build a world-leading European aerospace sector.

https://www.pegasus-europe.org

1. ***Czech Republic*** *(Technical University in Prague) –* ***France*** *(Ecole de l'air – Ecole Nationale de l'Aviation Civile – Ecole Nationale Supérieure de Mécanique et d'Aérotechnique – ISAE-SUPAERO Ecole Nationale Supérieure de l'Aéronautique et de l'Espace – Ecole Supérieure de Techniques Aéronautiques et de Construction Automobile) –* ***Germany*** *(RWTH Aachen University – Berlin Institute of Technology – Braunschweig University of Technology – Dresden University of Technology – University of Stuttgart) –* ***Italy*** *(Polytechnic University of Milan – Polytechnic University of Turin – University of Naples Frederico II - University of Pisa) –* ***Netherlands*** *(Delft University of Technology) –* ***Poland*** *(Warsaw University of Technology) –* ***Portugal*** *(Institute Superior Técnico) –* ***Spain*** *(Technical University of Madrid – Technical University of Valencia – University of Seville) –* ***Sweden*** *(Royal Institute of Technology) –* ***United Kingdom*** *(Cranfield University – University of Bristol – University of Glasgow)*

EUROPE'S AVIATION SECTOR LAUNCHES AMBITIOUS PLAN TO REACH NET ZERO CO_2 EMISSIONS BY 2050

DESTINATION 2050

- **Opportunity to reach net zero CO_2 emissions through a combination of measures, making flying more sustainable for the long term.**
- **Sector calls for decisive action from both governments and industry to achieve this net zero vision by 2050, while upholding international competitiveness and aviation's benefits to society.**

Brussels, 11 February 2021 – Europe's aviation sector today unveiled its flagship sustainability initiative, Destination 2050 – A Route to Net Zero European Aviation. Driven by a new, independent report, it provides a vision and path for meaningful CO_2 emission reduction efforts in Europe and globally. This follows recent climate commitments announced by the sector last November in the Round Table Report on the Recovery of European Aviation which called upon institutional stakeholders to join the sector in an EU Pact for Sustainable Aviation by the end of 2021 – a call reiterated today.

Building on the Paris Agreement and the European Green Deal, Destination 2050 sees all flights within and departing the EU, UK and EFTA realising net zero CO_2 emissions by 2050. The ambitious plan and related commitments laid out by Europe's airlines, airports, aerospace manufacturers and air navigation service providers shows collective leadership of the European aviation sector to reduce CO_2 emissions, with the goal of making leisure and business air travel in Europe, and globally, more sustainable in the long term.

According to the report, there is an opportunity to reach net zero CO_2 emissions by 2050 through a combination of four key measures, aligning European aviation with EU climate goals – subject to securing the required supporting policy and financing framework at EU and national level. These four measures include:

- Improvements in aircraft and engine technologies could achieve emission reductions of 37%
- Using sustainable aviation fuels (SAFs) could achieve emission reductions of 34%
- Implementing economic measures could achieve emission reductions of 8%
- Improvements in air traffic management (ATM) and aircraft operations could achieve emission reductions of 6%

The Destination 2050 report further assumes an impact on demand due to the above measures, resulting in the net zero CO_2 goal. Nevertheless, European air passenger numbers are projected to grow on average by approximately 1.4% per year between 2018 and 2050 without compromising the sector's ability to reach net zero CO_2 emissions by this point.

Destination 2050 highlights that to make the net zero vision for European aviation by 2050 a reality, while maintaining international competitiveness and aviation's benefits to society - quick, decisive joint actions by governments and industry will be needed. Industry will need to continue to substantially invest in decarbonisation and innovation and make the necessary operational transitions, while governments will need to ensure a level playing field and facilitate the transition through incentives and by reducing investment risks with consistent and stable policy frameworks.

This is the first pan-European, industry-wide, long-term vision that comes with concrete solutions to the complex challenge of reducing CO_2 emissions from commercial flights within and departing the EU, UK and EFTA. The initiative is led by five European aviation associations – Airports Council International Europe (ACI EUROPE), AeroSpace and Defence Industries Association of Europe (ASD Europe), Airlines for Europe (A4E), Civil Air Navigation Services Organisation (CANSO) and European Regions Airline Association (ERA). The report was made possible thanks to the work of the Royal Netherlands Aerospace Centre (NLR) and SEO Amsterdam Economics.

"This long-planned vision and roadmap for the future of European aviation underlines our sector's commitment and determination to play our part in tackling climate change despite the current crisis. A robust regulatory framework will be paramount in achieving not only an environmentally sustainable future, but also a financially resilient and competitive European aviation industry as a whole. We remain committed to work with policy-makers to take aviation forward jointly for the next generation of travellers," said Thomas Reynaert, Managing Director at A4E.

"The Air Traffic Management industry and the rest of the aviation sector in Europe have come together to present a solution to our common challenge – reducing carbon emissions, while still delivering valuable economic and social benefits. With improvements across the sector, we aim to make a meaningful impact and help to achieve Europe's climate goals," said Tanja Grobotek, Director Europe Affairs at CANSO.

"The decisive and tangible actions set out in this roadmap are unprecedented. Here we have an entire sector not just committing to decarbonisation, but actually charting the path to make it happen and effectively contribute to the EU's Climate objectives and the Paris Agreement. But whilst we embrace our responsibilities, it is clear that we cannot do this alone. It takes two to tango. Now we need the EU to deliver the policy and regulatory framework that will enable us to deliver net zero European Aviation by 2050. We therefore urge institutional stakeholders to respond to our call and now join the EU Pact for Sustainable Aviation we tabled last November," said Olivier Jankovec, Director General at ACI EUROPE.

"This is a pivotal moment for sustainability and innovation for many industries, including aviation. The European aviation sector will take a strong leadership and collaboration position through its strengths in innovation and technology. The achievement of the goals of this roadmap is possible provided that the EU and national governments play their part through increased public funding for civil aviation research & technology. This will also have wider benefits globally, taking into account the European aeronautics industry's global leadership," said Vincent De Vroey, ASD Civil Aviation Director.

"Robust economic measures and much needed government and regulatory support in the short term will be necessary to bridge the gap until innovation, technology and sustainable aviation fuels become more widely available to help our industry reach its environmental targets. Our industry wants to be a part of a clean recovery that has a lasting positive impact whilst still providing essential connectivity to Europe's citizens; we will take positive steps to make it happen," said Montserrat Barriga, Director General, ERA.

FOR MORE INFORMATION :
visit: www.destination2050.eu

> LINK TO THE PRESS RELEASE
> LINK TO THE VIDEO

Media Contact, ASD:
Paul Kimon Weissenberg, EU Affairs Manager
Email: Paulkimon.weissenberg@asd-europe.org
Phone: +32 473 13 34 92

INDUSTRY CONSIDERATIONS ON TECHNOLOGICAL SOVEREIGNTY - CONCEPT PAPER

April 9, 2021

Driven by geopolitical uncertainties and growing awareness of technological dependencies and vulnerabilities, technological sovereignty has become an important point on the EU's strategic agenda. As one of the key objectives of the European Commission, it has begun to appear frequently in EU policies and programmes.

At the same time, coherent and generally accepted responses to key questions are still missing: What does sovereignty mean in the context of technology and how can it be achieved? For which technologies does Europe want to be sovereign? And what does technological sovereignty mean for the EU vis-à-vis Member States and allied third countries?

Technological sovereignty concerns different sectors and a broad variety of emerging technologies, which are pervasive by nature. As a consequence, we propose to use for all strategic sectors a common approach to defining and operationalising the concept.

A general agreement on how to select the technologies for which Europe should have (a higher degree of) "sovereign" control, and how to achieve this sovereignty would help create a common ground to debate the development and implementation of policies, funding priorities, investment and procurement decisions, etc.

We believe that this common approach should consist of a combination of strategic (capability-driven) planning and targeted industrial policy, supported by coherent and persistent investments in selected key technologies. Capability-planning is well known in defence, but as a general approach it can also be used in other strategic sectors to identify critical technologies for which sovereignty matters. At the same time, the EU's new industrial policy offers instruments that can enhance technological sovereignty of value chains in all strategic sectors.

Against this background, we propose to implement the concept of technological sovereignty in each strategic sector through the following five-step approach:

(1) identification of the relevant technologies, through the analysis of the links between function / capability / technology;
(2) selection of the relevant value chains;
(3) definition of the appropriate level and form of European control over the value chain

(4) identification of gaps and dependencies that (may) undermine sovereignty;
(5) preparation and implementation of the measures to ensure the desired level of control.

Defining and sharing technological sovereignty in a Union of 27 Member States, with extensive political, economic and military ties to third countries, is a major challenge. Moreover, bringing together strategic planning and industrial policy raises thorny issues of governance, as it brings together different policies, actors and instruments. However, we do believe that the stakes are sufficiently high to justify the effort and stand ready to support EU institutions and Member States in this endeavour.

> LINK TO THE POSITION PAPER

Contact:
Benedikt Weingärtner
Benedikt.Weingartner@asd-europe.org
+32 2 775 8124

ASD is the voice of European Aeronautics, Space, Defence and Security Industries, representing over 3,000 companies and actively supporting the competitive development of the sector in Europe and worldwide. It has direct members, active in 18 countries, including 18 major European industries and 23 National Associations. ASD members together employed more than 870,000 people and generated a turnover of €246 billion in 2018. For the benefit of European industries and in the collective interest of its members, ASD seeks to:

- act as a single voice to promote the best interests of the Industry in dialogue with the EU Institutions and other stakeholders;
- contribute to shape effective policy and legislation at European and global level by advocating common positions;
- promote international cooperation and dialogue with other international associations and organisations;
- raise awareness about the benefits of our sectors to a large variety of audiences: politicians, decision-makers, businesses, the media, general public, NGOs and other stakeholders;
- act as the central intelligence hub for expert knowledge on industry-related issues.

ASD concentrates on issues covering civil aviation, defence, security and space. It is committed to sustaining and growing a competitive sector. It is to achieve this strategic objective that ASD analyses, formulates and establishes policy positions for the industry on key strategic sectorial issues, cooperating with industry and EU institutions on a number of market developments and technology research projects.

ASD also coordinates European and international policy, communications, analysis and provides support to its members' requirements and needs to help their development, offering the best networking and learning opportunities in the sector. In addition, the advocacy activities undertaken by ASD help create a suitable policy framework within which members can successfully develop their businesses.
ASD has affiliated associations: ASD–STAN and ASD-CERT, together with EAQG, form the quality-related services of ASD. The purpose of these services is to contribute to improvements in quality and reduction in costs throughout the value stream by maintaining cooperation between European Aerospace Companies in business areas.

At global level, ASD is a member of the International Coordinating Council of Aerospace Industries Associations (ICCAIA). ICCAIA provides an avenue for the world's aerospace manufacturers to offer their industry expertise to the development of the international standards and regulations necessary for the safety and security of air transport. Recognized by the International Civil Aviation Organization (ICAO) with observer status, ICCAIA actively participates in the work of ICAO regarding the environment, air navigation and air transport matters. ICCAIA also interacts with such regulatory authorities as the European Aviation Safety Agency (EASA) and the United States' Federal Aviation Administration (FAA).
With this approach, ASD enables a unified voice on the number of fora where industry needs to be active and engage with European Institutions.

https://www.asd-europe.org/about-us-at-a-glance

GETTING AHEAD OF « CRITICAL » FLIGHTS IN FLOW MANAGEMENT

Apr. 16, 2021

SESAR JU partners are developing a more proactive approach to identifying and managing "critical" flights in the Network. The aim is to help airlines minimise costs while improving flight predictability.

A delayed flight can be seen as critical for several reasons: It may miss an important connection; an airport curfew may come with heavy cost penalties; expiry of crew hours; high passenger compensation; or few scheduled alternatives. Researchers in the SESAR 2020 programme are working on a solution (PJ.07-W2-38: enhanced integration of AU trajectory definition and network management processes) that will allow airspace users to flag up critical flights with the Network Manager (NM) using a proactive flight delay criticality indicator (P-FDCI). This SESAR research activity is conducted in close collaboration with the Network Manager following an iterative approach and focusing on quick wins.

This collaborative decision-making process will help airlines to work more closely with the Network Manager and local flow Managers to find solutions to adhere as closely as possible to the original schedule for critical flights. This solution contributes also to the digitalisation and automation of information exchanges to reduce operators workload.

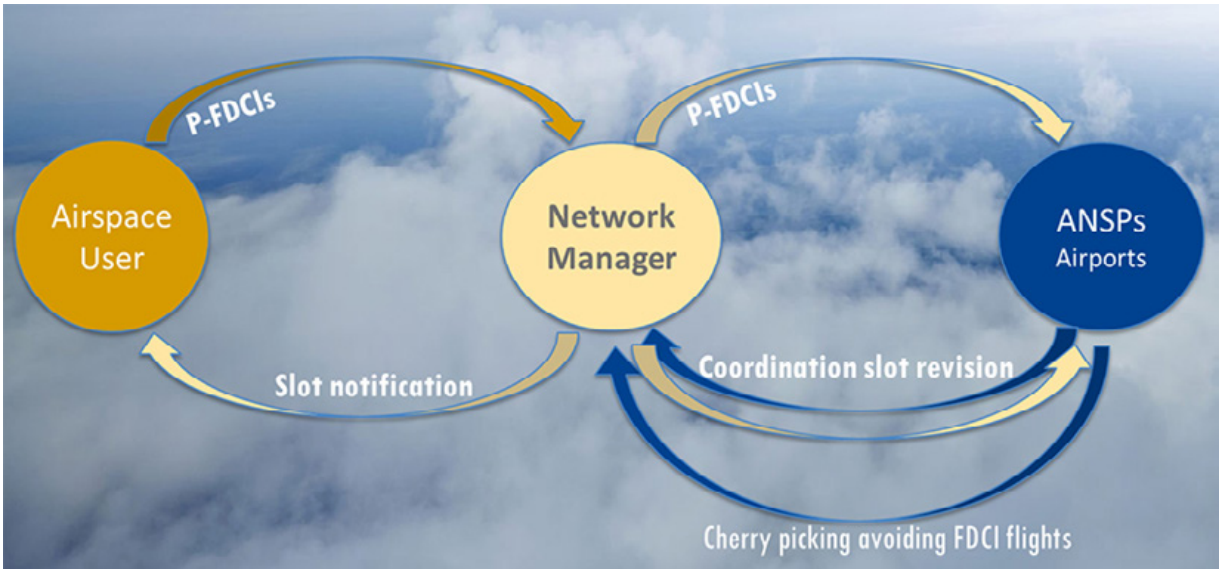
All of which helps to minimise operational costs and increase transparency.
Two types of the FDCI can be activated at any point in the day in view of the evolution of traffic:

- Proactive FDCI or P-FDCI - (currently under development): issued for critical flights before any demand and capacity balancing (DCB) measure is allocated to the flight by the Network Manager. In these cases, airlines can indicate preferences such as making progress in time or a specific flight level so the Network Manager can adapt measures to these preferences, where possible.
- Reactive FDCI (delivered in 2020 as part of SESAR 2020 wave 1 reaching V3 maturity) and deployed by the Network Manager in releases NM24.0 and NM25.0 : issued when a DCB measure is already affecting the flight allowing the Network Manager make any corrective action to reduce the impact when possible

The solution also makes use enhanced 'What-If" function, and enriched DCB information such as hotspots and congestion indicators, to allow airlines to assess the network DCB impact on a flight plan or preliminary flight plan.
Led by EUROCONTROL's Network Management Innovation Unit, the SESAR solution is developed in strong collaboration with operational experts from airlines,the Network Manager, air navigation service providers and industry (Airbus, Thales, Navblue, Metron, Dassault) with a view to its implementation.

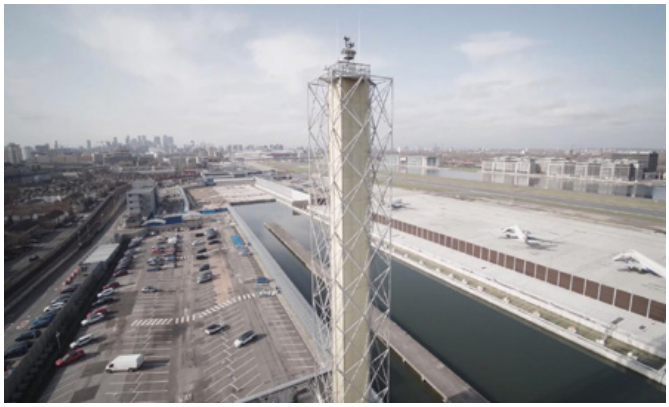
This solution is one of several in the PJ07-W2 Optimised Airspace Users Operations (OAUO) project. The project has received funding from the SESAR Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement No 874470

More on this project



LONDON AIRPORT GOES DIGITAL

May. 19, 2021

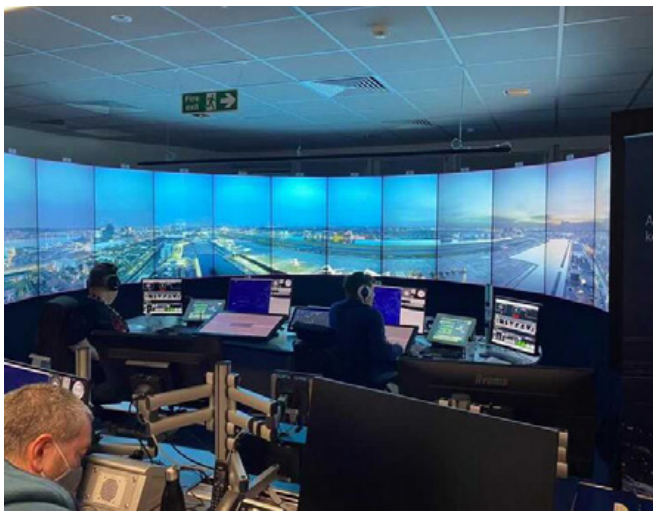


London City Airport has become the first international airport in the world to be fully controlled by a remote digital air traffic control tower. This is the latest application of a technology, the groundwork for which was laid by SESAR JU members and partners over the last decade.

Implemented by SESAR JU members, NATS and Saab, the 50-metre tower will enable traffic to be managed by controllers 115 kms away at NATS' air traffic control centre in Swanwick, Hampshire using an 'enhanced reality' view supplied by the tower.

"This investment in smart infrastructure will help us meet future growth in passenger demand, improve air traffic management and give us future capability as the aviation industry bounces back from the pandemic," said Alison FitzGerald, chief operating officer at London City Airport.

"Digital tower technology tears up a blueprint that's remained largely unchanged for 100 years, allowing us to safely manage aircraft from almost anywhere, while providing our controllers with valuable new tools that would be impossible in a traditional control tower," said Juliet Kennedy, operations director at NATS.



The digital tower technology has progressed in leaps and bounds over the last decade thanks to the work of SESAR JU members and partners. This research and innovation led to the first single remote tower deployment at Sweden's Örnsköldsvik Airport in 2014, which in many ways has become the template for ensuing deployments.

"Having worked on the first digital tower implementation in Sweden, I am immensely proud to see how far we have come with this latest installation with NATS at London City Airport," says Niclas Gustavsson, Vice President Business Development & Governmental Affairs, SAAB Digital Air Traffic Solutions.

"This is an important milestone not just for Saab, but also for the SESAR research and innovation programme, which laid the groundwork by bringing together manufacturers, clients and users to develop, test and prove the safety and efficiency of this pioneering technology. It is thanks to that support that the technology is now taking off, offering very smart and sustainable solutions to the aviation industry," he added.

Read full press release by NATS

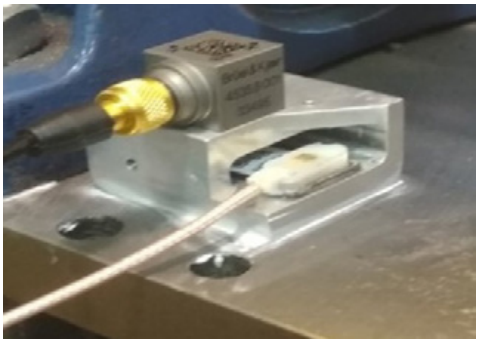
Read about SESAR R&D on remote towers

AN INTELLIGENT GEARBOX HELPS "RACER" HELICOPTER SAFELY TAKE FLIGHT

10 JUNE 2021

Monitoring the health of the main and lateral rotor gear boxes is a key priority for fast compound helicopters.
The IGEAR project has developed a state-of-the-art health monitoring system for RACER. Attuned to the specific characteristics of the new rotorcraft, the intelligent gearbox combines information gleaned from multiple sensors, advanced data fusion and rule-based diagnoses to determine the health of the gearboxes.
The technology pushes the boundaries of what was previously thought possible, developing a miniaturised solution capable of functioning in extreme environments. The sensors are packaged into a single small footprint, designed to fit on the limited flat areas on a commercial gearbox, ready for installation on the aircraft.

The gearbox rig allows rapid test of sensors and gears



Sensors are packaged into a light weight assembly with a small footprint

The developed health monitoring system is lightweight, in keeping with Clean Sky's objectives, is designed to be long-lasting and will contribute to the increased safety during operation and to reduce maintenance.
A test programme is currently in progress, which will validate the measurement chain and algorithms, but preliminary results have already confirmed the reliability of the system.
IGEAR received € 471 855,69 from the European Commission's Horizon 2020 programme. The participating organisations were Cranfield University and Active Space Technologies, Actividades Aeroespacials S.A.

WATCH THE VIDEOS OF THE TEST RIG DEMONSTRATIONS BELOW:

> **iGear Test rig**
> **Preliminary test1**

RE-IMAGINING THE FUTURE OF CIVIL AVIATION - SOME UK PERSPECTIVES*

By David Marshall

Emeritus member of the Air and Space Academy (AAE), former president of the Royal Aeronautical Society, former president of the Council of European Aerospace Societies

***Article published in the Air and Space Academy (AAE) newsletter no.121, May 2021**

The UK is looking at how it will participate in the future path for civil aviation taking account of both the current Covid-19 pandemic and the environmental challenges.
At a recent virtual summit, hosted by Cranfield University, the UK Transport minister, Grant Shapps, set out how he wants the UK to become a hotbed for design, manufacture and use of clean aircraft in the 21st century. The UK must share, he said, in an industry that could be worth £4 trillion globally by 2050. In 2019 the government announced a £300m joint investment with industry in the Future Flight Challenge to fund electric plane innovation and research into other forms of aviation technology. A further £2bn is being invested in aviation research and technology through the Aerospace Technology Insti-

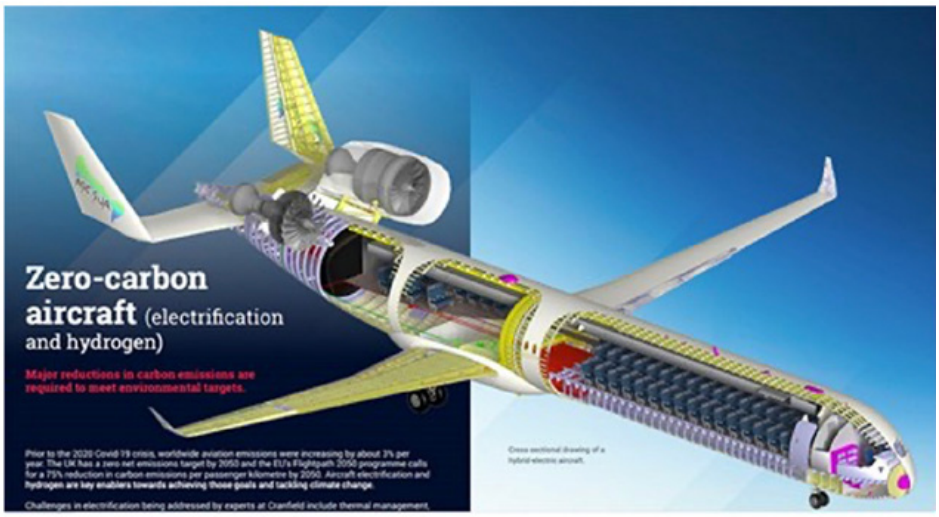


Figure 1: Cranfield concept design for a future hybrid hydrogen-electric commuter aircraft. (© Cranfield University)

tute (ATI) programme - part of which involves Cranfield's work on a groundbreaking project to make electrically powered commercial flights a reality in the UK within two years. The minister flagged other examples of world-leading UK innovation, such as the world's first hydrogen fuel cell powered flight of a commercial-grade aircraft by ZeroAvia at Cranfield's global research airport.

IATA has confirmed the unprecedented level of impact of recent events on commercial air travel, the worst since World War 2. In April 2020 the number of global passenger kilometres flown was 94% down in comparison to 2019, seeing very little improvement by August 2020. For the air cargo sector, the picture is very different, a shortage of capacity rather than a shortage of demand, as nations looked to secure emergency medical supplies and global supply chains. It has predicted that recovery in air travel would be slow even with the mass availability of vaccines. Recovery of the industry may not happen until 2024.

RE-IMAGINING THE FUTURE

Regenerating the sector is going to need deep changes and innovation such as:

- disruptive technologies with electric energy for shorter range journeys, providing a huge benefit in terms of noise pollution, and hybrid electric increasing the range length further;
- sustainable aviation fuels for long haul, with nuclear being a potential source of e-fuels. Small nuclear reactors can drive the price of electricity down, creating an economic pathway to produce sustainable aviation fuels from low cost nuclear to hit 2050 targets;
- one of the main outcomes from the pandemic will need to be a global agreement and approach to sanitisation and security before getting on an aircraft. There will also be an impact on business travel, with virtual conferencing used to a greater degree;
- employing innovative solutions across the product cycle to increase efficiency.

Ultimately, there are enormous technological challenges ahead that we must overcome.

The right thing for the industry and academia to do is to keep pushing technology, to take risks and strive for zero emissions.

We must work together more effectively in the wider environment.

The industry needs to get through this short-term cash squeeze, but in the medium term needs to support the globalisation of economic activity through open research, the movement of people and data, as a means of protecting trade relations. More active dialogue will be needed across the globe, particularly with China, and with all forms of regulators, not just in aviation. For example, can we create a shared virus management system to create a greater degree of transparency on what happens with an upsurge of cases?

In order to keep the future of aviation debate alive among stakeholders in the UK and internationally, Cranfield plans a follow up event for 2021, focusing on developments in the Asia-Pacific market and involvement with France is planned for June.

This event is one of many indicators that the UK intends to maintain its key roles in aviation **and that it recognises that much of these require continued international cooperation as well as continuing government support at home**.

Figure 2: Cranfield's new DARTeC (Digital Aviation Research and Technology Centre. (© Cranfield University)

AEROSPACE – DIGITALIZATION AND ARTIFICIAL INTELLIGENCE INTRODUCING AEROSPACEAI – A NEW WAY TO DO RESEARCH

By Thomas Vermin

Thomas Vermin studied Aerospace Engineering at TU Delft. He has worked with ESA and JAXA and currently heads Aerospace AI
verminth@gmail.com

Once upon a time Isaac Newton sat under a tree. It would take only a single observation, the apple falling on his head, to come to a conclusion and make a monumental discovery about the nature of physics. Today, a research paper on average will hold a thousand observations, or datapoints, before arriving at a conclusion that may have similar implications, and every year some 5 000 papers will be published in the aerospace industry alone.
It is not hard to argue that in the huge amount of data and discoveries some findings will be overlooked or even worse, never get made in the first place. Yet the process of comparing all the outcomes and rate them accordingly is something we cannot possibly expect any human to be capable of doing. However it is something we can expect a machine to do. This is what we set out to accomplish with AerospaceAI.
Over the years we have worked to create an assistant, albeit a digital one, that helps to define and refine the researcher's scope and work. It takes the available research, understands its relevancy and context, and presents it to the researcher in a concise manner with actionable ideas. For the researcher, the whole body of knowledge in a respective area becomes a more tangible and graspable concept.

The AerospaceAI engine has been trained on more than 10,000 papers and a million data points to be able to understand relevancy, context, and quality. These traits are also its most experimental ones, as deep learning models are not yet entirely proficient at understanding human language in all its aspects. It then proceeds to do what machine learning do exceed in; is to dissect, clean up and recognize patterns in data sets and return relevant findings and predictions.

Aerospace AI was set up in 2017 as a research project between several aerospace professionals following preliminary discussions with several institutions and companies regarding the implication of artificial intelligence.
It has a primary goal to bring easy to use AI applications to a wider aerospace audience enabling wider adoption, understanding and utilization of the benefits of machine learning.
In 2021 Aerospace AI will launch its platform with applications.
In a more practical sense this implies that the user can verify his or her research question quickly while keeping oversight of the available research throughout the process. It is our hope this will free the mind of the researcher and allow it to do what it does best; to explore and wonder. This will lead to more diverse research and improve the quality of the subsequent findings. In the long term it may provide greater leeway in exploring the more challenging problems we face in the industry.
We intend to release AerospaceAI to the public at the Aerospace Europe conference 2021. It will be free for students and research institutions.

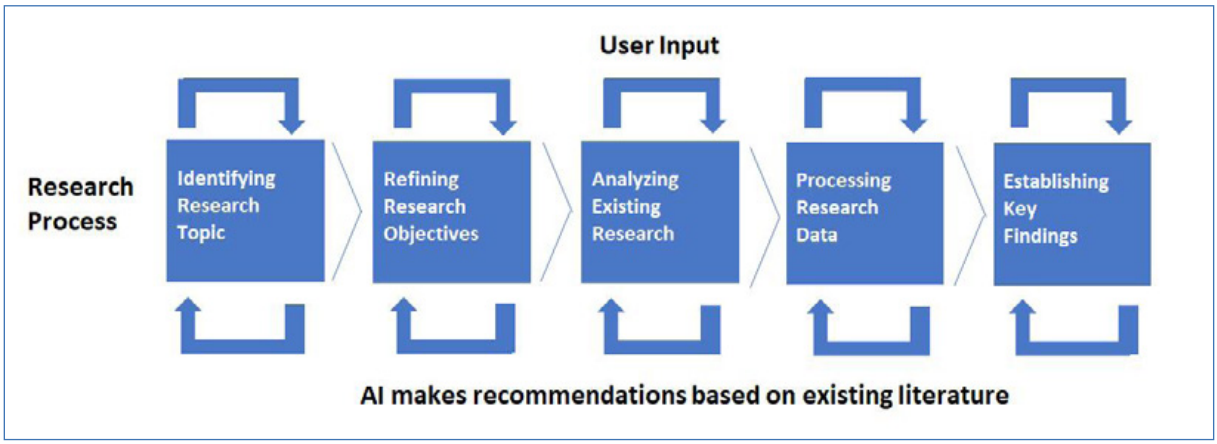


Figure 1. The AerospaceAI engine.

THE "ASCEND" DEMONSTRATOR: : ADVANCED SUPERCONDUCTING AND CRYOGENIC EXPERIMENTAL POWERTRAIN DEMONSTRATOR

By Ludovic Ybanez, Head of ASCEND demonstrator, Airbus Upnext

The aeronautics industry is anticipating deep changes and new challenges in the near future. It is expected that air traffic will continue to grow in the next decades even taking into account the impact of COVID-19, social acceptability and long-term roadmaps such as ACARE (Advisory Council for Aeronautics Research in Europe) Flightpath 2050. The SRIA (Strategic Research and Innovation Agenda) set specific goals such as a 75% reduction of CO_2 emissions and 90% reduction of Nitrogen Oxides (NOx) as a result of ecological and sustainable development obligations (source: https://www.acare4europe.org).

For urban mobility and small aircraft, ambitious projects have been launched during the past years, to demonstrate the feasibility, and to accelerate the development of fully electric or hybrid electric propulsion systems with "conventional" technologies. However, for single-aisle and long-range applications, the challenge is even greater for current electric technologies to be competitive with the very performant combination of kerosene and turbofan. This is especially true for longer range needs where the propulsive power is several tens of megawatts and a large amount of energy must be carried for the long flight in the form of chemical fuel.

A promising avenue to replace conventional fuel, thanks to its high specific energy, is liquid hydrogen; whether to "burn" it in a turbofan or to use it in a fuel cell to generate electrical power. A lot of work is currently underway on Fuel Cell or H2-burn propulsion but it remains essential to develop an ultra-efficient electric or hybrid propulsion system for the future aircraft.

If a cryogenic source like liquid hydrogen is available on board, it can be used in two ways to increase performances of electrical components:

- **Cryogenic technologies**: by cooling "conventional" technologies and dramatically increasing electrical propulsion system performance by reducing losses (because resistivity and losses depend on system temperature) and therefore the weight of components.
- **Superconducting technologies**: by using high-temperature superconducting technologies for DC (direct current) distribution components, electric motors to increase performances because of no resistivity, no losses and magnetic behaviour of superconducting materials.

Their potential and maturity are now demonstrated in several applications (MRI, ground distribution of electricity, scientific equipment) and promise a profound revolution in the field of high power electrical engineering in the years to come. It is now essential to accelerate the adaptation of these technologies, to demonstrate their potential and feasibility with the main European institutes, SME and large groups and mature them with a flying demonstrator in order to be able to propose TRL6 at powertrain level before 2030 for future generations of "greener" aircraft.

Four main advantages are targeted:

1- Increase the power-to-weight ratio by a factor of 2 to 3

2- Enable lower voltage because of high current capabilities to reduce safety and technological issues and improve stability

3- Propose new technologies based on superconductivity such as Fault Current Limiter to reduce the short circuit current and the oversizing of distribution network

4- Improve efficiency thanks to a decrease of Joule losses, leading to a powertrain efficiency greater than 97%, reducing weight and volume of fuel.

The potential and maturity of superconducting and cryogenic technologies have been assessed by Central Research and Technology team and are also demonstrated on several ground applications (MRI, ground distribution of electricity, scientific equipment...). This shows a potential deep revolution in the field of high power electric engineering in the years to come.

It is now essential to accelerate the adaptation of technologies and demonstrate their potential and feasibility for future generations of aircraft. That is the aim of ASCEND (**A**dvanced **S**uperconducting and **C**ryogenic **E**xperimental powertrai**N** **D**emonstrator) over the next three years *(see Illustration 1).*

The main objectives can be detailed as:

- Demonstrate the feasibility of cryogenic and superconducting technologies for aircraft applications with a voltage below 500 V for multi-megawatt applications
- Demonstrate that the propulsion system (from DC bus to shaft) can be more than two times lighter than conventional technologies and can reach 98% efficiency
- Give recommendations on the potential of these technologies on the Airbus product range and more particularly on regional and long range aircraft
- Strengthen the partnership with the best industrial and academic partners in the world and animate the ecosystem

DC link

A direct current distribution network is used in a propulsion chain to transfer energy from the power sources to an electrical converter, which transforms this energy into

an alternating voltage/current to drive the superconducting motor. The functions fulfilled by this link are therefore energy transport functions but also protection of the network against faults such as a short circuit, arcing or other to ensure the safety and reliability of the aircraft. However, the fault management of such a direct current distribution network is much more difficult than that of an alternating current network because of the absence of the zero-crossing of the current. This is even more challenging for a superconducting and cryogenic powertrain because the electrical system has an extremely low impedance. It is therefore essential to develop a high-power density, high-efficiency, fast-operating circuit breaker (CB) with fault current limiter and fault detection capability.
Because this link has a significant impact on the total mass and safety of a propulsion chain, superconducting technologies, which are mature for terrestrial applications, will allow a significant gain over the conventional technologies currently in use.

Power electronics
The superconducting motor controlled by cryogenic power electronics is essential in order to reach the targeted performances for two main reasons:
- to increase the performance of the inverters thanks to cryogenic technology
- to maintain low temperature thermal continuity between the superconducting DC distribution and the superconducting electric motors to reduce thermal losses.

Existing research has already demonstrated the feasibility and potential of cryogenic power electronics. This information is further reinforced by the results of the latest project according to which the main power components (power modules, busbars, passive components...) have better performance at lower temperatures, thus increasing the overall efficiency and power density of cryogenic power converters.

The targeted power range can be achieved without any problems under ambient temperature conditions with voltages up to 1200 V but in a cryogenic environment with low voltages and very high currents is more difficult because there are no standard "commercial" components characterized for this temperature range.
Currently, there is no demonstrator at the targeted power level because no application of superconductivity requires an increase in power density for converters as required for aeronautical applications.

AC link
As for the DC link, the AC link has a significant impact on the total mass and safety.
While superconducting is characterized by zero resistance in DC, the variation of AC current amplifies electromagnetic phenomena known with traditional technologies and generates losses specific to superconductivity directly related to the frequency of the current.It is essential to understand and control these effects.

Superconducting electric motor
High power electrical propulsion will require electrical machines with a greater power-to-weight ratio and cur-

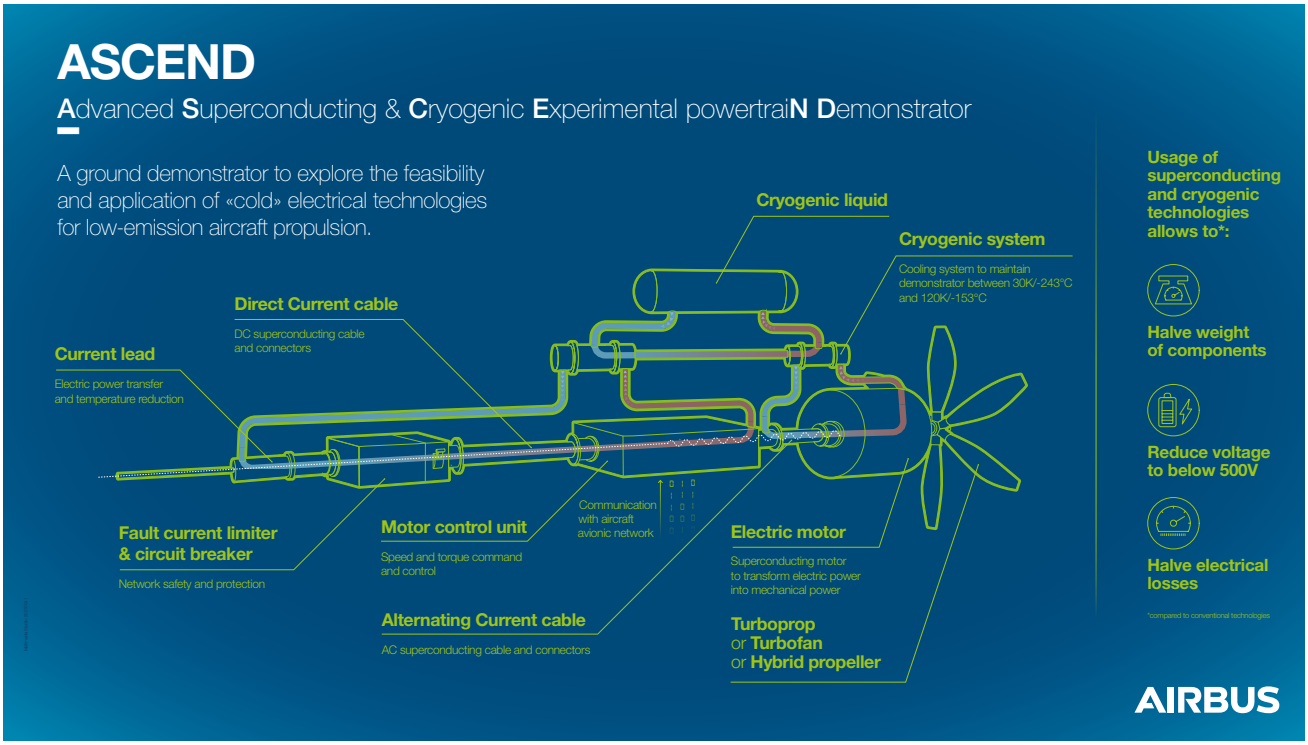


Illustration 1: ASCEND demonstrator © AIRBUS S.A.S. 2021. All rights reserved.

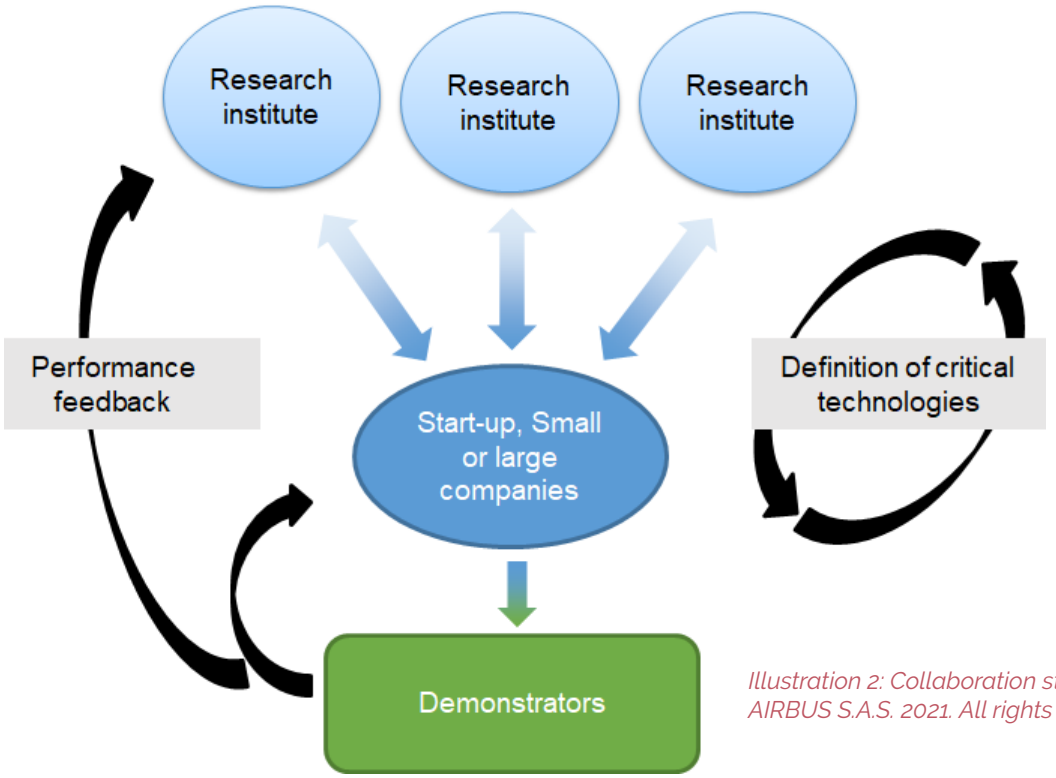


Illustration 2: Collaboration strategy for ASCEND © AIRBUS S.A.S. 2021. All rights reserved.

rently, conventional technologies do not allow for such performance. Disruptive technologies will be required to achieve the performance targeted for such use. In this context, superconducting machines have been identified as a potential solution, and therefore represent a key element of future high-power electric propulsion for aircraft applications.

However, several challenges are associated, in particular the generation in superconducting materials of significant losses due to alternating current, and the difficulty of controlling heat exchanges to keep all parts of the motor below their critical temperatures.
In order to go further in the demonstration of these technologies, it is necessary to operate them within a high-power electric propulsion chain for aeronautical applications to evaluate the interaction with power electronics and control the major parameters of the system, such as operating temperature, the capacity to evacuate losses or the intrinsic parameters of the machines, such as electric characteristics, mass and volume, or efficiency.
Connecting all these components, observing their interactions and achieving stable operation will be a world first; an essential step towards future full scale tests and flying demonstrators.

In addition to the hardware demonstrator itself, this demonstration will make it possible to increase the maturity of these technological bricks and the cooling options with or without liquid hydrogen. It will also make it possible, thanks to the development of thermo-electrical behavioural models and architectural trade models, to evaluate the contribution of these technologies and give strong recommendations to the whole range of future Airbus products.
To increase the maturity for aeronautic applications, strong collaborations will be established with the best academia, research institutes, small or large companies all around the world *(see Illustration 2)*.

Generally speaking, the objective is to define critical technologies with partners in order to increase the potential for technological breakthroughs. It is therefore necessary to rely on research institutes to develop the maturity of said breakthroughs before integrating them into demonstrators. This ensures that an industrial approach is followed while promoting the integration of novel technologies.

In fine, the successful demonstration of superconductors and cryogenic technologies in the field of aeronautics could encourage the industrial ecosystem to go a step further in the industrialization of alternative propulsion systems.

THE FUTURE COMBAT AIR SYSTEM 'TEMPEST' INTERVIEW WITH MICHAEL CHRISTIE, HEAD OF FUTURE COMBAT AIR SYSTEMS AT BAE SYSTEMS

By Jean-Pierre Sanfourche, Editor-in-Chief

Michael CHRISTIE, Head of Future Combat Air Systems at BAE Systems

Jean-Pierre Sanfourche – *May I ask you to give us the historical background of the 'Tempest' programme? In which international framework is this programme being conducted?*

Michael Christie – At the Farnborough International Air Show in 2018, the UK's Combat Air Strategy was launched.

This strategy set out a bold vision for future combat air capability for the UK. This was embodied by a goal to create Tempest, a UK-led international future combat air system that will pioneer new technology and will be capable of exploiting and staying ahead of evolving threats, enabled by decades of expertise in a world-leading industry.

Tempest is focused on delivering a capable, flexible and affordable future combat air system by the mid-2030s, providing military, economic and industrial benefit to the UK and our international partners.

Launched at the same time as the strategy were the UK Government's Acquisition Programme, which is intended to define and deliver the future combat air capabilities required to achieve the vision within the strategy, and Team Tempest, a UK partnership made up of the best of British industry - BAE Systems, Leonardo UK, MBDA UK and Rolls-Royce – working in close partnership with the UK Ministry of Defence to generate the technologies and experience required for the UK to lead the development of a next generation international combat air system.

Since then, significant progress has been made. We have rapidly created technologies and undertaken development work that would previously have taken years through the transformation of our businesses and working collaboratively and in innovative ways with partners and suppliers; reaching into and beyond the traditional defence sector to bring the very best in innovation from across the UK.

In parallel to this work we are continuing to mature detailed relationships with our international partners in Sweden and Italy; continuing our track record of successful international partnerships.

We are on track to deliver an ambitious international programme whilst at the same time investing in people, technology and infrastructure, supporting the economy and long term prosperity of our nation.

J.-P. S. – *Could you provide our readers with a general description of the overall system of systems Tempest?*

M. C. – As a partnership, we are working on the development of the overall concept of what the Tempest future combat air system, with a future combat aircraft at its core, will need to look like in the 2030s, 2040s and beyond. This is why we talk about the development of a whole 'system' rather than a 'platform' or 'aircraft'.

As a partnership on Tempest, we recognise that the future combat air environment will be increasingly complex, with rapid technological advancements, especially in areas like sensing, data management, connectivity and autonomy. A connected 'system of systems' – across the Air domain but also connected to the Land, Sea, Cyber, and increasingly Space, domains - will be vital to adapting to this fast-changing environment.

'Information advantage' is at the centre of this combat air system vision – with platforms across all domains being able to seamlessly exchange and interpret huge amounts of data to provide armed forces with a complete picture of that future battlespace.

We see a connected, agile, flexible future combat aircraft as a 'central node' within that wider system, able to interact with and leverage other capabilities to provide a powerful and unique capability – a 'next level' of combat air power.

Imagining and delivering this concept is our central aim and is guiding our investment, know-how, expertise and technology development activities.

J.-P. S. – *What is the general rationale as regards the development process: research & technology basic works, new technology advances still to be achieved, demonstrators, simulation laboratories, test campaigns?*
M. C. – The work of Team Tempest is helping demonstrate that the UK can deliver the required game-changing technology, capability, skills, expertise, tools and processes to deliver the vision within the Combat Air Strategy.
Collectively, the team is working on a wide range of technology demonstrations across the whole spectrum of combat air.
Technology developments on Tempest are focused on delivering a flexible and upgradeable system; exploiting leading technologies to ensure our customers stay ahead of evolving threats, while delivering an advanced and cost-effective solution.
For example, if you can imagine a cockpit without a single physical dial or screen in front of you, that since the launch of Team Tempest, is just one example of what our technologists have been working on – the creation of a future cockpit concept based on Augmented and Virtual Reality.

At its core, this demonstrator leverages the adaptability of a helmet-mounted display, which is used to project augmented and virtual reality interactive cockpit displays and controls directly in front of the pilot's eyes, replacing current physical cockpit layouts.
The technology allows pilots to customise the cockpit display and the way they interact with it based on their own personal preferences and mission objectives. By replacing the limitations of current physical cockpits with a projection - which is capable of being infinitely reconfigured - the technology is designed to provide major improvements in situational awareness, speed of decision-making and the ability to affordably and rapidly upgrade the cockpit in line with aircraft enhancements.
MBDA UK has also embedded one of its Human Factors Engineers within this wearable cockpit team, ensuring early introduction of weapons concepts that exploit these future technologies. This close partnership approach between MBDA UK and BAE Systems will allow the companies to help to collaborate at an early stage of the programme, shaping how weapons systems information and operation is optimised for the pilot.
Another example is development of new radar technology by experts at Leonardo UK, capable of providing over 10,000 times more data than existing systems. The new sensor, called the 'Multi-Function Radio Frequency System', will collect and process unprecedented amounts of data on the battlespace – equivalent to the internet traffic of a large city, every second. This huge volume of information, processed on-board, will give Tempest a battle winning edge in combat situations, with the ability to locate and target enemies well before they are targeted themselves.
The brand new sensor will provide a wide range of abilities beyond traditional radar, with all-digital technology providing the operator with an exceptionally clear view of the battlespace and of potential targets. Leonardo has already built complete sub-systems using the new technology and successfully tested them at the Company's site in Edinburgh, in the UK, with a path to airborne demonstrations in the coming years.
At the same time, Rolls-Royce engineers have been developing advanced combustion system technology as part of the company's power and propulsion work. The combustion system is where fuel is introduced and burned to release energy into the gas stream.
A next-generation system will need to be hotter than any previous platform, increasing the efficiency of the engine and meaning it can go further, faster, or produce less carbon dioxide. Rolls-Royce has been exploring advanced composite materials and additive manufacturing as part of this work, producing lightweight, more power-dense components capable of operating at these higher temperatures.
Underpinning all of this kind of technology work, we are demonstrating how we are transforming the way we work to ensure that we can deliver this future combat air capability more rapidly and more cost-effectively than previous programmes.
To achieve this we, are developing and leveraging of new digital tools, techniques and technologies. One example of how we have done this already is in our wind tunnel testing work.
Wind tunnel testing is a critical element in any aircraft development programme. Using the latest digital twin technologies, conceptual shapes for an aircraft were virtually designed and tested, with high-performance computers able to calculate the aerodynamic performance of different aircraft features and test pilots taking Tempest to the skies from a ground based simulator.
Once digitally tested, scale models were 3D printed and tested at our wind tunnel facilities at our Warton site in the UK. As a result of this digital approach, work which would have traditionally taken several months has been achieved in just days.
> More information on this work is available here

Another key example of how we are taking a transformative approach is in advanced manufacturing.
We have created a first-of-its-kind facility at our Warton

site to demonstrate how future military aircraft could be built to meet our time and cost challenge.
The Factory of the Future is a digital facility - completely connected by data - and draws on Industry 4.0 technologies, with the ultimate goal of helping to drive pace, productivity and cost efficiency into the manufacturing process. The entire facility has been designed to streamline the way that humans and machines work together.

> More information on the Factory of the Future is available here

We are also taking a transformative approach to partnership, working with the very best capability within the defence supply chain, but also beyond it, with Small and Medium-sized Enterprises (SMEs) and the academic commuinity, to bring the very best innovation into the programme. Within the Factory of the Future alone, we are working with more than 60 companies, SMEs and academic institutions.

J.-P. S. – *How is organised the Tempest programme management team (the overall international organisational structure)?*
M. C. – Team Tempest is a UK partnership made up of the best of British industry - BAE Systems, Leonardo UK, MBDA UK and Rolls-Royce – working in close partnership with the UK Ministry of Defence to generate the technologies and experience required for the UK to lead the development of a next generation international combat air system.

At the same time, we are continuing to mature detailed discussions with international partners in Sweden and Italy; continuing our track record of successful international partnerships. Effective international partnering will play a fundamental role in defining and meeting the goals set out in the UK Combat Air Strategy and our vision for Tempest.

In December 2020, the governments of UK, Sweden and Italy signed a trilateral memorandum of understanding to strengthen collaboration between the three nations, in a significant step towards the joint development of world-leading future combat air capability.

This agreement is underpinned by ongoing collaboration between UK, Swedish and Italian industry partners, announced in July 2020: comprising of leading defence companies from the UK (BAE Systems, Leonardo UK, Rolls-Royce and MBDA UK), Italy (Leonardo Italy, Elettronica, Avio Aero and MBDA Italia) and Sweden (Saab and GKN Aerospace Sweden).
Taken together, we are making progress on the route to a concept and assessment phase, which is the next phase of the programme.

J.-P. S. – *What are the general principles of the industrial policy?*
M. C. – Alongside the UK Government, the Team Tempest industry partners are making significant investments in research and development to support Tempest, and remain committed to delivering this programme of national importance.

J.-P. S. – *How would you like to conclude our interview?*
M. C. – Tempest is an ambitious military programme that will deliver independent military 'freedom of action' and will help to preserve our national security and that of our allies through the development of a UK-led international collaborative future combat air system.

It will deliver game-changing technologies and capabilities that are affordable, flexible, upgradeable, connected and cooperative. It will provide the Royal Air Force and their allies with a highly advanced military capability to counter an increasingly complex and data driven battlespace, and, as part of industry, working closely with the Ministry of Defence, we have a critical role to play in Tempest's success.

We will build on our strong heritage of delivering and supporting world-leading Combat Air capability but work in an increasingly agile way, with new partnerships and approaches that accelerate the use of new technologies and ensure we can produce results faster and more cost effectively than ever before.
We are on track to deliver this next generation capability in the mid-2030s and it is tremendously exciting to be part of the programme.

For more information on BAE Systems role in the project, click here

INTRODUCING ESA AGENDA 2025

7 April 2021

ESA Director General Josef Aschbacher has worked with our Member States to define new priorities and goals for ESA for the coming years.

The Director General has set high ambitions for space in Europe – while ESA has a huge role to play, it also requires cooperation with the European Union, space industry and scientific community and the co-creation of a new vision for Europe in space.

ESA Agenda 2025 outlines the challenges ahead – in the first instance for the next four years – but also for the longer term in maintaining and growing Europe's role in the space economy. This means working with the European Union and with companies of all sizes involved in the space industry, as well as inspiring and encouraging educators, entrepreneurs and the next generation of space scientists and engineers, and all the professions needed to make great space missions. It also means developing the kind of programmes and missions that ESA Member States can be proud of – new flagship missions in cooperation with European Union member states, and ESA-led missions to expand our knowledge as well as protecting Earth and its orbit.

"Where does Europe want to be in 15 years from now?" asks the Director General. "Europe means of course the European Space Agency but also all the stakeholders in Europe – Member States, industry, the European Commission".

"We have defined an Agenda, which for the next four years, puts ESA and puts space on track so we can be among the top space agencies in the world".

Read the Executive Summary, outlining five immediate priorities for ESA and a vision for the next four years.

Read the full Agenda 2025 document.

EUSPA AT THE HEART OF EU'S NEW SPACE APPROACH

11 June 2021

EUSPA Executive Director Rodrigo da Costa spoke at the opening session of the New Space Atlantic Summit.

At the fourth edition of the New Space Atlantic Summit, key players from Europe and the Atlantic region gathered in Coimbra, Portugal and online to discuss the role of New Space for people. European Union Agency for the Space programme (EUSPA) Executive Director Rodrigo da Costa gave a keynote address at the opening session, outlining EUSPA's role as the key actor in the European Union's New Space approach.

Introducing the opening session, Ricardo Conde, President of the Portuguese Space Agency noted that innovative solutions were needed to address user needs and to link space to non-space sectors. This was something that EUSPA Executive Director Rodrigo da Costa also picked up on in his address.

Da Costa noted that EUSPA was at the heart of New Space and that its mission was to take advantage of the opportunities that come from the development of innovative space products based on satellite navigation, Earth observation and telecoms to maximize synergies between EU Space Programme components at user level.

FOSTERING COLLABORATION

"We will do this by fostering collaboration between space and non-space actors, allowing greater cross-fertilisation. For example, space and non-space companies are already teaming up on several of our Horizon-financed projects to bring innovative solutions to diverse markets, such as agriculture, transport, or resource management, just to cite a few," he said.

> Read this: CASSINI hackathon leverages space to digitise green spaces

Da Costa said that EUSPA was encouraging all the EU Member States to benefit from the innovation brought by space technologies, stressing that it was particularly important to build capacity in the Member States, including those with emerging capabilities.

"In the provision of Galileo and EGNOS services, we involve large, small and medium actors from several Member States, and with them we ensure the 24/7 operations of these key EU infrastructures. In GovSatCom also, we are now looking for innovative approaches to build the GovSatCom Hub," he said.

Speaking at the session, Elodie Viau, Director of Telecommunications and Integrated Application at the European Space Agency (ESA) said that space had entered the digital economy and society. "Data generated in space and on Earth are improving our daily lives," she said, adding that ESA was supporting European industry, start-ups and SMEs and was looking at new concepts of innovation, for technology. "We are going to work with all the institutional players and the private sector to create even more innovation. This is key for Europe to maintain its competitiveness," she said.

ROLE OF PRIVATE SECTOR

The EUSPA Executive Director also highlighted the key role of the private sector. He said that EUSPA would create opportunities for EU companies to explore new markets, through dedicated procurements, grants and prizes to create new business opportunities and connect them with private investors and venture capitalists for the necessary financing capability to jump-start their business cases.

> And this: Going green? Look to EU Space!

"For example, one of our winners in the MyGalileo Solution competition, 10 lines, an Estonian company, is developing an automated robot to design parking places. They already have contracts in the EU and have recently won a large contract in the US," he said.

Da Costa stressed that the recently approved conclusion of the EU Council on "New Space for people" calls upon EUSPA, with the Commission, to foster the uptake of space services by stimulating the adoption of space-based solutions and by increasing the competitiveness of the EU industry. "We are ready to play our fundamental role on this," he said, adding that this New Space development was essential for European economies and for European integration.

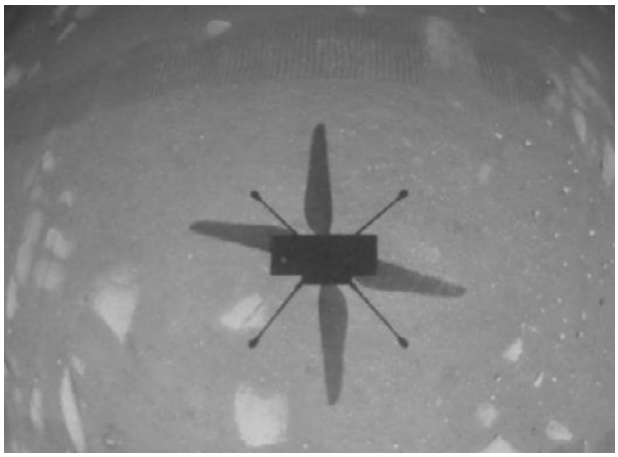
■

http://www.euspa.europa.eu

MARS 2020 MISSION : THE 'INGENUITY'FEAT

The **Ingenuity Mars helicopter** was built by JPL (Jet Propulsion Laboratory), which also manage the demonstration project for NASA/HQ. It is supported by NASA's Science Aeronautics Research Center in California's Silicon Valley, and NASA's Langley Research Center in Hampton, Virginia, provided flight performance analysis and technical assistance during Ingenuity's development. Qualcomm and SolAero also provided design assistance and major vehicle components. Lookheed Martin Space designed and manufactured the Mars Helicopter Delivery System.

19 APRIL 2021: AN HISTORIC TIME – NASA'S INGENUITY MARS HELICOPTER SUCCEEDS ITS FIRST FLIGHT



NASA's Ingenuity Mars Helicopter captured this shot as it hovered over the Martian surface on 19 April 2021, during the first instance of powered, controlled flight on another planet. It used its navigation camera, which automatically tracks the ground during flight. Credits: NASA/JPL-Caltech

On 19 April 2021, NASA's Ingenuity Mars Helicopter became the first aircraft in history to make a powered, controlled flight on another planet. The Ingenuity team at JPL confirmed the flight succeeded after receiving data from helicopter via NASA's Perseverance Mars Rover at 6.46 a.m. EDT. The solar powered helicopter became airborne at 3.34 a.m. EDT a time the Ingenuity team determined would have optimal energy and flight conditions. Altimeter data indicated that Ingenuity climbed to its prescribed maximum altitude of 3 meters and maintained a stable hover for 30 seconds. Ingenuity then descended, touching back down on Mars surface after logging a total of 39.1 seconds.

22 APRIL 2021: NASA'S INGENUITY MARS HELICOPTER LOGS SECOND SUCCESSFUL FLIGHT

Ingenuity successfully completed its second Mars flight on 22 April 2021. Lasting 51.9 seconds, this flight added several new challenges to the first, including a higher maximum altitude, longer duration and sideways movements. It took off at 5.33 a.m. EDT. It climbed to 5 meters, preformed a slight tilt (5°), allowing some of the thrust from the counter-rotating rotors to accelerate the craft sideways for 2 meters.

Ingenuity hovers over Jezero Crater during its second experimental test flight on 22 April 2021. Imagery captured by Perseverance's rover's Mastcam-Z imager.
Credits: NASA/JPL-Caltech/ASU/MSSS

25 APRIL 2021: INGENUITY FLIES FASTER AND FURTHER ON THIRD FLIGHT

Perseverance Rover's Mastcam-Z captures Ingenuity's third flight. Credit: NASA/JPL-Caltech/ASU/MSSS.

> See the video

This 25 April flight was conducted at speeds and distances beyond what had ever been previously demonstrated even in testing on Earth. Ingenuity took off at 4.31 a.m. EDT, rising 5 meters altitude. Then it zipped downrange50 meters, reaching a top speed of 2m/s.

30 APRIL 2021: INGENUTY SUCCESSFULLY COMPLETES ITS FOURTH FLIGHT

NASA's Ingenuity Mars Helicopter is viewed during its fourth flight (above centre to the right) by one of the hazard cameras about the Perseverance rover. Credit: NASA/JPL-Caltech

Ingenuity successfully completed its 4th flight on 30 April 2021. It took off at 10:49 a.m. EDT, climbing at 5 meters altitude before flying south about 133 meters and then back, for an 266 meters round trip. In total it stayed in the 'air' for 117 seconds.

7 MAY 2021: INGENUITY COMPLETES ITS FIFTH FLIGHT ON MARS WITH ITS FIRST ONE-WAY JOURNEY

The flight began at 3:26 a.m. EDT and lasted 108 seconds, completing its fifth test with its first one-way trip from initial site Wright Brothers Field to another airfield 129 meters to south. This new site had been selected by the Ingenuity team, on the basis of data gathered during the fourth flight. After arrival above its new airfield, Ingenuity climbed to an altitude record of 10 meters and could capture high resolution colour images of its new neighbourhood before touching down.

This fifth flight represents the rotorcraft's transition to its new operational demonstration phase. The latter will focus on investigating what kind of capabilities a rotorcraft operating on Mars can provide. Examples include scouting, aerial observation of areas not accessible by a rover, and detailed stereo imaging from atmospheric altitudes. Having successfully landed at its new airfield, Ingenuity awaits future instructions from mission controllers.

J.-P. S. Synthesis written on the basis of information availble on https://www.nasa.gov/

Ingenuity's successful fifth flight was captured on 7 May 2021 by one of the hazard cameras abpord the Perseverance rover. This was the first time it flew to a new landing site. Credits: NASA/JPL-Caltech

NASA'S COMMERCIAL CREW PROGRAMME: LAUNCH OF CREW-2 AND RETURN OF CREW-1

23 APRIL 2021: LAUNCH OF SPACE X CREW-2 MISSION

Space X Crew-2 was the 2nd crewed operational flight of a Crew Dragon spacecraft and its 3rd overall crewed orbital flight. Crew-2 used the same capsule as historic Demo-2 (Endeavour) and used the same Falcon 9 rocket first stage (booster) as Crew-1. It was the first mission with astronauts onboard with a previously used booster rocket. It also was the first commercial crew mission with two international partners. And for the first time two commercial crew spacecraft were docked at the same time to the ISS (between Crew-2 arrival and Crew-1 depart).

The mission in brief:

- Name: Alpha
- Type: ISS Crew Transport
- Operator: SpaceX
- Launch: 23 April 2021 at 09:49:02 UTC from KSC
- First stage return and landing to Earth: 23 April 2021 at 09:58:32 UTC
- Docking of the capsule to the ISS (Harmony module) on 24 April at 09:08 UTC
- Duration: 180 days
- Landing: 31 October 2021 (planned) in the Atlantic Ocean
- Spacecraft: Crew Dragon Endeavour
  - Manufacturer: SpaceX
  - Launch mass = 12,519 kg
  - Landing mass = 9,616 kg

- **Crew , L-R:**
  - Pilot : K. Megan Mc Arthur, NASA
  - Mission Specialist: Thomas Pesquet, ESA
  - Mission Specialist: Akhido Hoshide, JAXA
  - Sapcecraft Commander: Shane Kimbourg, NASA

KSC, 23 April 2021 at 09:49:02 UTC: a SpaceX Falcon 9 rocket carrying the Crew Dragon spacecraft is launched on NASA's SpaceX Crew-2 mission to the ISS with 4 astronauts onboard. Credits: NASA

Google: nasa spacex crew 2 docking to ISS
24 April 2021 at 09:08 UTC, Space X Crew-2 capsule docks to the ISS. Credits: NASA
The crew L-R: K. Megan Mc Arthur, Thomas Pesquet, Akihiko Hoshide and Shane Kimbourg

Eleven crew members on ISS
The joint crews of SpaceX'Crew-2 and the ISS have joined up to form a big group of 11 people in orbit during five days only because the 4 astronauts of Space X's Crew-1 mission returned to earth on 28 April, leaving 7 crew members behind. The 4 Crew-2 astronauts will stay on board until the end of October (6-month mission). Credit: NASA TV

Let's recall that Crew Dragon Resilence was launched on 16 November 2020 from KSC at 00:27:17 UTC, carrying to the ISS NASA astronauts Michael Hopkins, Victor Glover and Shannon Walker, and JAXA astronaut Soichi Noguchi, all members of Expedition 64 crew.

CREW-1 ASTRONAUTS SAFELY SPLASHED DOWN ON EARTH ON 2 MAY 2021 AFTER ISS 6-MONTH MISSION

The mission was scheduled to depart the ISS on 28 April but due to weather the return to Earth took place a bit later, on 2 May: undocking at 00:35 UTC, splashdown at 06:56 UTC. The capsule Resilience will be reused on a future mission.

The four Crew-1 astronauts splashed down safely in the Gulf of Mexico on 2 May 2021 at 06:56:33 UTC, during night, completing NASA's first commercial crew long-duration mission aboard the ISS. This return arrives 6 months after they arrived at the ISS and marks the longest-duration mission of a crewed American spacecraft to date. After the successful splashdown, NASA Administrator Sen. Bill Nelson said: "*We have accomplished another incredible spaceflight for America and our commercial and international partners. Safe, reliable transportation to the international space station is exactly the vision that NASA had when the agency embarked the Commercial Crew Programme.*"

THE RETURN TO EARTH SEQUENCE, IN BRIEF

- Dragon fires its thrusters to move a safe distance from the ISS's space facing of the *Harmony* module;
- Vehicle jettisons the trunk to reduce weight and mass to help save propellant for the de-orbit burn;
- Initiation of de-orbit burn and re-entry into Earth's atmosphere sequence;
- Dragon deploys its two drogues and then four parachutes for a soft splashdown.

An intensive scientific work

Crew-1 accomplished an intensive scientific work programme during their 6-month mission onboard the ISS: protein crystal development to advance new drug discoveries, robot assistant technology, new methods for producing semi-conductor crystals, crew Earth observation investigation, crop growth, etc.

J.-P. S. Synthesis written on the basis of information available on https://www.nasa.gov/

L-R: NASA astronauts Shannon Walker, Victor Glover, Mike Hopkins and JAXA astronaut Soichi Noguchi are seen inside the Space X Crew Dragon Resilience spacecraft on board the Space X GO Navigator recovery ship shortly after landing in the Gulf of Mexico off the coast of Panama City (Florida), 2 May 2021. Credit NASA

PREPARING FOR THE COMPETENCES AEROSPACE INDUSTRY WILL NEED IN THE NEAR FUTURE: ASD – EUROPE ON THE FRONT LINE

THE HIGH-LEVEL ROUNDTABLE HELD ON 16 OCTOBER 2020: SKILLS FOR THE AEROSPACE AND DEFENCE SECTORS

On 16 October 2020, ASD-EUROPE President and Secretary General took part in the High-Level Roundtable on Skills for Aerospace and Defence sectors together with several CEOs from ASD Member Companies. The roundtable was organised by the European Commission in the framework of Pact for Skills. It aimed at establishing a dialogue at senior level with Commissioner Thierry Breton and Nicolas Schmit in the run up towards the official launch of the Pact for Skills which will address the urgent need for up-skilling and re-skilling the workforce in Europe for the period 2021-2027.

Senior industry leaders had the opportunity to share their ideas and commitments in relation with their plans to increase investments in skills and competencies of employees in the near future and also to express expectations about the kind of support in Aerospace & Defence ecosystem needs for the EU, in order to meet these important objectives.

ASD-EUROPE President Alessandro Profumo stated: "Europe is at an historic crossroad in capability of nurturing strategic skills, a need that in the Post Pandemic scenario, has become an imperative. The Aerospace Defence & Space sector is inherently focused on shaping future technologies and capabilities, with important returns in terms of value, competitiveness and overall sustainability. Its companies have an excellent track record in independent investments for new skills development, which include collaboration with education stakeholders, with the supply chain and SMEs. Therefore, as ASD, we welcome the establishment of the **Skill Agenda of Europe** and are willing to contribute to its success with our knowledge and expertise, by formally committing to the **Pact for Skills**."

ASD-EUROPE Secretary General Jan Pie said: "We consider that what is at stake is the survival and the capacity to engage a positive growth of our industry which is crucial for European Sovereignty, Economy and Growth. Therefore, our engagement will be taken by clear Action Plans engaging all Pact for Skills eco-systems with formal KPIs (Key Performance Indicators) to measure value added of all dedicated investments." He concluded: "Our Member Companies are committed to take part of experimentations and to apply solutions agreed."

THE PACT FOR SKILLS FOR AEROSPACE AND DEFENCE

ASD and the top leaders of European Aerospace and Defence Industry in close cooperation with universities and VET (Vocational Education and Training) organisations have confirmed their full engagement to the **European Pact for Skills Plan** for their relative ecosystem highlighting the crucial need to collectively address unprecedented challenges due to COVID-19 crisis; climate neutrality; competitive environment (fast digitalization, industry 4.0); demographic (aging staff); low attractiveness to young talents.
The ambition is to collectively ensure a continuous and sustainable supply of skills with equality and diversity for around 600,000 employees in major actors and their whole supply chain to reach our ecosystem sustainable growth.

The Proposal is to develop and run concrete solutions on three main axes:

1. The **skills forecasting** with the objective to anticipate all main skills gaps we will need to address on time collectively, considering Industry Skills needs and all EU demographic skills forecasts for 5 to 10 years.
2. The **up-skilling/re-skilling Programmes** set-up with the objective to develop and implement solutions allowing up-skill and re-skill of around 200,000 employees in Europe the next five years (2026) in emerging and transforming jobs.
3. The **talents development and engagement** to elaborate partnership programmes to boost attraction, development and retention of talents, considering we will need 300,000 people in the next ten years (by 2030) to join aerospace industry.

Commitment and Key Performance Indicators (PKIs)
The partnership will ensure sector cooperation based on commitment of all stakeholders involved including social partner representatives well-established and functioning anticipation system, as well as systematic recognition and mutual recognition of skills and qualifications acquired across the EU. The goal is to re-skill 6% of the workforce each year to reach the target of 200,000 and up-skill 300,000 talents to enter the sector in the next 10 years. This would represent an estimated budget of € 1 Billion based on an average cost per individual of 2,000€.
Additional PKIs will be defined, including number of stakeholders involved, geographic coverage in engagement with national, regional and local authorities, number of graduated and new incumbents, areas of

the ecosystem covered, equality and diversity, number of competences in the ESCO (European Skills Competences and qualifications and Occupations) database.
ASD-EUROPE will contribute in particular to ensure common aerospace industry orientations and actions are at the focus setting up the different activities and to ensure the full industry eco-systems, key partners and observers have access and knowledge about it.

Organisations engaged on Pact of Skills Aerospace and Defence

- **Indutry:** Airbus – Saab AB – Leonardo S.p.a. – Hensolt Group – Safran Group – Navantia – Sensus Septima – Aero Vodochody Aerospace
- **Associations – Regional Clusters – Partnerships:** ASD-EUROPE – Assts+ - European Aerospace Cluster Partnership (EACP) – Aviation Valley – CenSec – European Welding Federation
- **Education and Vocational Education and Training:** University Pisa – University Aalborg – Rzeszon University of Technology – Charles III University Madrid – University Seville – University Nice – Belgium Royal Military Academy – Aerocampus Aquitaine

For further information, consult:
https://www.asd-europe.org/pact-for-skills-for-aerospace-and-defence

ASD Points of Contact:

- **Mr Jan Pie, Secretary General:** jan.pie@asd-europe.org
- **Ms Stefania Mortelliti, Head of Civil Aviation:** stefania.mortelliti@asd-europe.org

EUROAVIA AT A GLANCE

EUROAVIA is the European Association of Aerospace Students, representing the interests of over 2000 students from 42 universities in 18 European countries. Established in 1959, EUROAVIA wants to be a bridge between companies, universities and students. Its goals are:

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

EUROAVIA works to develop current and future leaders promoting the EUROAVIA Spirit, a set of common values based upon hard work, innovation, cultural awareness, teamwork and international networking.

> "Jean RoederCo-operation is greatly a matter of education and, therefore calls for an early preparation of students for this purpose. This is, besides a wider stimulation of European co-operation one of the aims of the association we intend to establish"
>
> *Jean Roeder*
>
> *EUROAVIA Founder and IB President, 1959*

Being both a non-political and non-profit association, EUROAVIA is managed exclusively by voluntary students with its various activities and projects entirely financed by membership fees, sponsorship and participation fees.
The International Board (IB) represents EUROAVIA on the international level. The IB is elected during the yearly EMEAC (Electoral Meeting of the EUROAVIA Congress), which is held in Spring. The Designated International Board (DIB) officers prepare a Business and Financial Plan before they take over their predecessors' job at the AMEAC (Annual Meeting of the EUROAVIA Congress) in Fall.

Affiliated Societies' representatives participate to these two congresses. Besides the International Board's election, the representatives discuss future international activities and receive reports from the established international Working Groups. And since the congresses are always organized by one of the 42 Local Groups, they are also an excellent opportunity to see more of Europe!

The Working Groups, then, take care of specific long-term projects. They have financial and decisional autonomy and report to the International Board and to the EUROAVIA Congress. Some of them are founded on a permanent basis while others expire at the end of their project.
Read more about the International Board, the Working Groups and the Local Groups.

ACTIVITIES

Each year various activities are organized throughout Europe:
Local activities, for which the Local Groups are responsible, and which include: visits, workshops, lectures, parties and social events;
International events coordinated by the International Board and the International Events Working Group, like fly-ins, Congress meetings, symposiums, etc...
Read more about Events.

PUBLICATIONS

An internal publication, the Newsletter, is distributed monthly and provides the Local Groups with activity reports of the IB and other LGs, with announcements of forthcoming events.

https://euroavia.eu/index.php/about-us1/about-euroavia

2021

AMONG UPCOMING AEROSPACE EVENTS

JULY

06-08 July – ESA – **ISDE12** – 12th International Symposium on Digital Earth – To explore pathways towards a vision of "Digital Earth" – HYBRID EVENT Online and on-site in Salzburg (Austria). https://digitalearth2021.org

11-16 July – EUROMECH – **10th European Nonlinear Oscillations Conference –** Lyon (France) – https://euromech.org/

14-15 July – RAeS – **10th European Nonlinear Oscillations Conference –** Theme: The Air and Space Force of 2040 – London (UK) – IET, savoy Palace, London and ONLINE – www.airpower.org.uk – Catherine@airpower.org.uk

14-17 July – Aerofriedrichshafen – **The Chief of the Air Staff's Global Air Chiefs' Conference –** Leading Show for General Aviation – https://www.aero-expo.com/aero-en/index.php

AUGUST

02-08 August – AIAA – **2021 AIAA FORUM and EXPOSITION –** HELD IN ONLINE-ONLY FORMAT – https://www.aiaa.org/aviation

09-11 August – AIAA – **AIAA Propulsion & Energy Forum –** Denver, CO (USA) – Sheraton Denver Downtour – https://www.aiaa.org/events-learning/Forums

11-13 August – AIAA/IEEE – **EATS2021 - Electric Aircraft Technologies Symposium –** 4th annual edition of EATS symposium organized by AIAA/IEEE - VIRTUAL EVENT only – https://www.aiaa.org/propulsionenergy/program/eats/

23-26 August– EUROMECH – **ETC18 – 18th European Turbulence Conference** – Dublin (Ireland) – https://euromech.org/

31 August - **03** Sept. – AIDAA – **AIDAA XXVI International Congress** – VIRTUAL – http://www.aidaa.it/

SEPTEMBER

01-04 September – EASN – **11th EASN International Conference** – Salerno (Italy) – https://easnconference.eu

06-10 September – ICAS – **ICAS 2021 - 32nd Congress of the International Council of the Aeronautical Sciences** – (ICAS2020 postponed to 2021 because pandemic) – Shanghai (China) – HYBRID FORMAT – www.icas.org/Calendar.html

07-09 September – ERF – **47th European Rotorcraft Forum** – Organised by RAeS – Lead Sponsor: Leonardo - Glasgow (Scotland, UK) – VIRTUAL – www.aerosociety.com.events/ - https://www.rotorcraft-forum.eu/

20-25 September – TsAGI – **7th Open Russian National conference on Aeroacoustics** – Moskow – http://tsagi.com/pressroom/events/Aeroacoustics

OCTOBER

19-20 October – RAeS – **RAeS Conference: Cutting Aviation's Climate Change impact** – VIRTUAL + RAeS/HQ – www.aerosociety.com/events

19-21 October – Aviation Week – **MRO Europe 2021** – Amsterdam (NL) - #MRO – https://mroeurope.aviationweek.com/en/plan-your-visit/Latestupdate.html

19-24 October – SeoulADEX – **Seoul International Aerospace & Defense Exhibition** – Seoul (South Korea) – Seoul Airport Seongnam Air Base – www.seouladex.com

20-21 October – 3AF – **Conference - MEA: Towards Cleaner Aviation** – Bordeaux (France) – https://www.3af.fr/agenda/

25-29 October – IAF – **IAC 2021 – 72nd International Astronautical Congress** – Inspire, Innovate & Discover for the benefit of Mankind – Dubai (UAE) – Dubai World Trade Centre – https://iac2021.org/registration - https://www.iafastro.org/events/iac/iac-2021/

26-27 October – ACI-EUROPE – **31st ACI EUROPE Annual Congress and General Assembly** – TBC Save the date – www.aci-europe.org

26-28 October – CANSO/ATCA – **World ATM Congress 2021 –** ATM congress and Exhibition – Madrid (Spain) – IFEMA Feria de Madrid – In-Person Event held As A Live - https://www.worldatmcongress.org

NOVEMBER

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

AMONG UPCOMING AEROSPACE 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

23-25 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

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

16-24 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

16-24 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 for General Aviation** – Friedrichshafen (Germany) – https://www.aero-expo.com

MAY

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

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

AMONG UPCOMING AEROSPACE EVENTS

2022

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/

14-17 July – Aerofriedrichshafen – **The Chief of the Air Staff's Global Air Chiefs' Conference –** Leading Show for General Aviation – https://www.aero-expo.com/aero-en/index.php

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 – Sockholm (Sweden) – www.icas2022.se – 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

4 - 9 September
Stockholm, Sweden

ICAS 2022 SWEDEN

Welcome by FTF & Innovair

Welcome to the ICAS 2022 Congress in Stockholm, Sweden

Dr. Roland Karlsson
President, The Swedish Society of Aeronautics and Astronautics

Dr. Anders Blom
Program Director, Innovair

On behalf of FTF - the Swedish Society of Aeronautics and Astronautics - and Innovair - the Swedish Strategic Programme for Aeronautics, we are proud to invite professionals from academia and industry, as well as governmental representatives, to attend the 33rd Congress of the International Council of the Aeronautical Sciences (ICAS).

ICAS 2022 shall be held at the Stockholm Waterfront Congress Centre in Sweden, on 4-9 September 2022, and FTF and Innovair host the event.

ICAS was established in 1957 as a non-government, non-profit scientific organisation with the mission to advance knowledge and facilitate collaboration in aeronautics. Today ICAS gather members from 30 countries from five continents. One of the essential activities of ICAS is the biennial international Congress. Since the first ICAS Congress in Madrid 1958, this has grown to be the world´s primary forum for aeronautical technology. The Congress attracts leading experts and leaders of top aerospace research centres, industries, universities, and representatives from governments. The topics of the Congress include the most recent scientific achievements in aeronautics and top priorities in the design of future generation aircraft, engines, and systems to cater for the greening of sustainable aviation. Moreover, the Congress is a unique platform for companies to showcase products and services, and to network with professionals from all over the world. An essential part of the gathering is also to introduce and encourage young people to enter the aeronautics sector via higher education and research activities.

Sweden has a long and successful tradition of design and production of aircraft and propulsion systems, both for the civil and military markets which is unique for a small country. Furthermore, the Swedish industry, and society, are well-known for efficient, innovative and non-hierarchical organisations. Besides our big companies, there is a structured innovation system including academia, research institutes, and an increasing number of sub-contractors available in Sweden.

We envisage that the ICAS 2022 Congress in Stockholm will attract an unprecedented number of papers for presentation and discussion, and we anticipate more than 800 delegates from some 40 countries. When the ICAS congress now is back in Europe after South Korea 2016, Brazil 2018 and China 2020/2021 we expect an increasing number of European participants. However, in the case that the world still struggles with effects from the covid-19 pandemic, we also prepare for other alternatives than a traditional full-scale physical meeting of people.

We very much look forward to welcoming you to ICAS 2022 in Stockholm.

www.icas2022.com www.ftfsweden.se www.innovair.org

www.icas2022.se

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