CEAS
Council of European Aerospace Societies

BULLETIN AEROSPACE EUROPE

THE AIR AND SPACE ACADEMY HELD ON 11-12 MARCH AN INTERNATIONAL CONFERENCE ON THE SUBJECT: AIR TRANSPORT IN CRISIS AND THE CLIMATE CHALLENGES - TOWARDS NEW PARADIGMS -

Among keynote speakers: Violeta Bulç, former European Transport Commissioner

INTERVIEW WITH MICHEL WACHENHEIM,

PRESIDENT OF THE AIR AND SPACE ACADEMY

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

THE OFFICERS OF THE BOARD IN 2021:

President: Franco Bernelli
franco.bernelli@polimi.it
Vice-President, Finance:
Cornelia Hillenherms
cornelia.hillenherms@dlr.de
Vice-President, Publications and External Relations: Pierre Bescond
pierre.bescond@laposte.net
Vice-President, Awards and Membership: Anders Blom
anders.blom@innovair.org
Director General: Andrea Alaimo
andrea.alaimo@unikore.it
Financial Manager: Philip Nickenig
philip.nickenig@dglr.de
CEAS Administrative Officer:
Beata Wierzbinska-Prus
bprus@meil.pw.edu.pl
Chairman of the Aeronautics Branch: the successor of Christophe Hermans is in course of designation
Chairman of the Space Branch:
Torben Henriksen
torben.henriksen@esa.int

FULL MEMBERS:

■ Association Aéronautique et Astronautique de 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
Gestion & Admin.: Caroline Saux
gestionmembres@aaaf.asso.fr

■ Asociación de Ingenieros Aeronáuticos de España (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

■ Associazione Italiana di Aeronautica e Astronautica (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

■ Aeronautics and Astronautics Association of 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

■ Czech Aerospace Society (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

■ Deutsche Gesellschaft für Luft- und Raumfahrt Lilienthal-Oberth e.V. (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: Torsten Schilling – torsten.schilling@dglr.de

■ Flyg- och Rymdtekniska Föreningen (FTF)

Swedish Society for Aeronautics and Astronautics – Bengt Moberg – Box 357 -
SE-101 27 Stockholm
bengt.moberg@vernamack.se
President: Dr Roland Karlsson
Häradschammars Prästgard 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

■ Nederlandse Vereniging voor Luchtvaarttechniek (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: the successor of Christophe Hermans is in course of designation
Secretary General and CEAS Trustee: Fred Abbink
f.j.abbink@planet.nl

■ Polish Society of Aeronautics and Astronautics (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

■ Royal Aeronautical Society (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: Pr Jonathan Cooper FRAeS
CEAS Trustees: Emma Bossom
emma.bossom@aerosociety.com
Air Cdre Peter Round FRAeS
Chief Executive:
Sir Brian Burridge FRAeS

Head of External Affairs:
Dawn Nigli MRAeS
Dawn.Nigli@aerosociety.com

■ **Schweizerische Vereinigung für Flugwissenschaften/Swiss Association of Aeronautical Sciences (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

■ **Central Aerohydrodynamic Institute Russian Aerospace Society (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

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 A 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 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

PERSEVERANCE AND INGENUITY

This CEAS bulletin appears a few days after the conference/webinar organised by the Air and Space Academy on the subject "Aiir transport in crisis and the climate challenges – Towards new paradigms". This event which took place on 11 and 12 March was very successful thanks to the high level of the presentations and it is a great satisfaction to observe that it was followed by about two thousands persons, half of them students or young professionals. The interview with Air and Space Academy's president Michel Wachenheim herein published highlights the urgency to resolutely engage at international level the process of air transport transformation in accordance with the new environmental measures aiming at stopping the planet's warming.

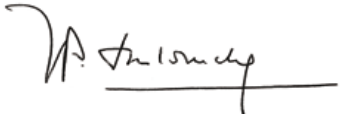
The general mobilisation for struggle against climate change occurs at a time when simultaneously, civil aviation has to bring into operation a vigorous action plan to recover from the pandemic crisis effects in 2021-2025 timeframe, so combining short-term tactical cares with long-term science and technology research. Three position papers from aerospace research and industry associations precisely deal with this subject.

Some articles provide a brief illustration of innovation activities being conducted by SESAR and Clean Sky.

Then in Defence area, the actual state of the Future Combat Air System programme is presented in the interview with Philippe Koffi, Head of Joint French, German and Spanish team of FCAS management.
As regards Space, it is briefly reported on Mars2020, showing the amazing "landing" on Mars of the rover "Perseverance" on 18 February 2021, a new landmark in space exploration history! Very deservedly, the Mars2020 mission is called "**Perseverance and Ingenuity**", the word "Perseverance" illustrating the extraordinary obstinacy and determination of all actors and the word "Ingenuity" their extraordinary level of inventiveness and creativity.

Perseverance and ingenuity are effectively the fundamental qualities to be cultivated for taking up the many challenges in front of us. These two words will dominate the AEC2021 conference "**Restore, Rethink, Redesign**" CEAS and PSAA will hold in next November.

.



CONTENTS

CEAS
– Presentation - Members and Partners 2-4
– Editorial 5
– CEAS President Elect's Message 6
– In Memoriam Christophe Hermans 7-8
– Preparation of AEC2021 Warsaw 8
– Latest issues of the CEAS Journals 9-12

• Personality Interview
– Interview with Michel Wachenheim, President of the Air and Space Academy 13-15
– Summary Report on the Webinar "Aviation in Crisis and the Climate Challenges" 16-17

• Point of view
– Accelerating Transition Towards Climate Neutral Aviation by EREA 18-19
– Critical Aspects of Operational Principles for Institutionalised Partnerships in HORIZON EUROPE 20-21
– Recovery of European Aviation: an Urgent Call for EU Pact for Sustainable Aviation 22

• Civil Aviation Operations
– Tenth SESAR Innovation Days – 7-10 December 2020 23-24
– Among SESAR Innovation Projects 25-26

• Aeronautics Technology
– Hydrogen-Powered Aviation: Preparing for Take-Off 27-28
– Paving the Way Towards Climate-Neutral Aviation 28

• Aerospace Defence and Security
– About the Future Combat Air System (FACS) 29-32

• Space
– Mars2020 'Perseverance and Ingenuity' 33-35
– About Artemis 36-37
– Traffic Rules are also needed in outer space 38

• Education ad Training
– The EREA Best Paper Award 39
– The Best PhD Award 2020 of the Clean Sky Academy 40-41

• Event Calendar 42-44

PRESIDENT'S MESSAGE

Franco Bernelli Zazzera
CEAS President 2021-2022

The year 2021 will bring many changes within CEAS, some driven by external factors and others stimulated by internal discussions within the Council.

Sadly, the year started with the premature death of Christophe Hermans, former CEAS President and still extremely active within the Council. His figure is well depicted in a dedicated page of this bulletin. With his death, we have lost an excellent manager and a very dear, dedicated and valued colleague who was appreciated by everyone. He will not be forgotten. As immediate consequence, CEAS needs to reorganize a series of activities that were in his precious hands and this might take a while.

The newly elected CEAS officers, including the new Director General, are now completing the takeover of responsibilities and will be fully operational very soon. Unfortunately, this takeover implies also a relatively huge amount of formal procedures to follow, due to the nature of CEAS, but we are almost done in this respect.

With the intent to increase its visibility and range of action, CEAS is in the process of amending its Statutes and Bylaws, adapting them to the evolution of the European context. It is CEAS's ambition to become the obvious European focal point fostering knowledge dissemination and provide a platform for all European individuals and organizations engaged in aerospace activities. To further grow and increase critical mass and visibility, CEAS not only has to engage with other organizations, but CEAS must entice organizations to become a full member with a sufficiently attractive role, influence and impact. The amendments to the current Statutes and Bylaws will take into account the protection of the principle of one-nation-one-vote in the essence of the decisions that preserve the identity of CEAS, as well as the benefits of opening its structures to the enriching participation of other transnational organizations of recognized prestige in the aerospace sector. Four main objectives need to be achieved with these changes:

1. recognition of entities with significant contributions to and support of the association, including national societies as well as European aerospace agencies;

2. adapt to current trends in Europeanisation of the aerospace industry landscape;

3. recognition of the "current practice" within CEAS, where some Corporate Members such as ESA and EUROCONTROL participate with the same involvement and responsibilities as National Societies and this is welcome and appreciated by the Board of Trustees;

4. preserve CEAS identity.

In parallel to the change of Statutes and Bylaws, another important action pursued by CEAS is the strengthening of its relations with similar organisations in Europe, understanding that each organisation has distinctive characters and objectives. Most of them have complementary objectives and lines of action, therefore mutual collaboration can bring benefits to the European aerospace community. This is indeed a part of CEAS obligations, resulting from the MoUs and Cooperation agreements already signed.

Last but not least, let me mention that in 2021 CEAS is planning new interesting events for the aerospace community, the most relevant being the Aerospace Europe Conference planned for November 2021 in Warsaw, where we sincerely hope to be able to restart meetings in presence, or at least in hybrid mode, with classical sessions for limited number of participants and simultaneous on-line connection. The organizing committee is already working hard to propose an interesting event, covering all the typical topics for aerospace conferences but specifically focused on the 3R triptych "**Restore, Rethink, Redesign**". I encourage all the European aerospace community to participate in the conference and contribute to the relaunch of the sector since, hopefully, the covid pandemic will be under control by the end of the year.

IN MEMORIAM CHRISTOPHE HERMANS

Christophe Hermans died on January 24, 2021

It was a great shock to hear that our friend and colleague **Christophe Hermans** died of a massive heart attack on January 24, 2021.

I have known him since his start at the Netherlands National Aerospace Lab NLR. He was always full of positive energy and a very active supporter and stimulator for the European Cooperation in Aeronautics.

Christophe was born on October 22 1960, followed the Coriovallum College Gymnasium in Heerlen (NL), and after that studied Aerospace Engineering at the RWTH Aachen University in Germany. His specialty was rotorcraft.

In May 1986 I had the pleasure to select him for the Helicopter Group of the Flight Test and Helicopter Department of the Netherlands National Aerospace Laboratory NLR. In 2000 Christophe became Department Manager of the new NLR Helicopters and Aeroacoustics Department and in 2012 he was promoted to Deputy Director of the German-Netherlands Windtunnels DNW. In 2018 he became Director of DNW and Chief Technology Advisor to NLR.

Next to his direct NLR-related activities, Christophe enjoyed national, European and international cooperation in the field of aeronautics. In 2006 he was asked to become secretary of the Netherlands Association of Aeronautical Engineers NVvL. In 2016 he became President of the NVvL. The NVvL was one of the Founding Fathers of the Council of European Aerospace Societies CEAS and of the International Council of Aeronautical Societies ICAS.

In 2007 Christophe became, as a representative of NVvL, Member of the Board of Trustees of CEAS and in 2008 Member of the General Assembly and of the Programme Committee of ICAS. In 2009 he very successfully organized the meeting of the ICAS Programme Committee meeting in Amsterdam.

Within CEAS in April 2010 he became Chairman of the Aeronautics Branch and member of the editorial board of the CEAS Aeronautical Journal. He became responsible for the organisation of the CEAS cooperation in various European and international conferences such as the AIAA/CEAS Aeroacoustics conferences, the European Rotorcraft Forum (ERF), and the Society of Flight Test Engineers (SFTE).

Special conferences were in 2015 the CEAS Congress in Delft on the "Challenges in European Aerospace" and in 2016 the conference held on the occasion of the celebration of 75 years of NVvL. At this celebration Christophe was made Honorary Member of NVvL.

In 2017 Christophe succeeded me as President of CEAS, in the same year in which Franco Bernelli, our present CEAS President, joined the CEAS Board of Trustees.

In the two year of his CEAS Presidency he focused on the strategy of CEAS for the coming 4 years. Central in this was the long-term view to coordinate the conferences of the various European organizations as EUCASS, EASN and the AAE into truly European Conferences, analog to the American Institute of Aeronautics and Astronautics (AIAA). Under his leadership a cooperation with the European Aeronautics Science Network (EASN) was set up. In an EU sponsored E-CAero project CEAS, a cooperation with ECCOMAS, ERCOFTAC, EUCASS, EUROMECH and EUROTURBO, tried to formalize an Aerospace Europe platform. CEAS became a member of the EU Clean Sky Academy. In contact with the EU PEGASUS network of aerospace engineering faculties, an EU quality system for higher education was set up. The CEAS Bulletin became the Aerospace Europe Bulletin. The refereed CEAS Aeronautics and Space Journals became more and more visible and important.

*Photo taken on the occasion of the CEAS Biennial Conference held in Bucharest in September 2017. L-R: Pierre Bescond, Fred Abbink, **Christophe Hermans**, Georges Bridel, Joachim Szodruch*

In Bucharest a CEAS organized CEAS Aerospace Europe Conference took place, celebrating also 25 years of CEAS. A lot of effort was spent on the preparation of the next CEAS Aerospace Europe Conference to be held in Bordeaux on Greener Aerospace Innovative Technologies and Operations for a Human Friendly Environment.

Christophe was dedicated to the aerospace community. He was reliable, systematic, well-organized efficient and proactive. His leadership was always focused on strengthening European cooperation in aerospace, in a calm, amiable and friendly way.

On behalf of CEAS we address here our deep sympathy to his family and his close colleagues.

"It was an honour and a great pleasure working with him and we will miss him dearly".

Fred Abbink, CEAS President 2014-2016

AEC 2021 – "RESTORE, RETHINK, REDESIGN"

POLISH SOCIETY OF AERONAUTICS AND ASTRONAUTICS (PSAA) TOGETHER WITH COUNCIL OF EUROPEAN AERONAUTICAL SOCIETIES (CEAS) ARE HAPPY 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.

CALL for ABSTRACTS is OPEN: www.aec2021.meil.pw.edu.pl

KEY DATES

1 Jan 2021	First Announcement and call for papers, website open
15 Mar 2021	Abstract uploading open
30 Apr 2021	Abstract uploading deadline
15 Jun 2021	Acceptance of papers finished
30 Jul 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**

TOPICS

- **General Aviation**
- **Aircraft Design**
- **Aerodynamics (incl. CFD)**
- **Flight Dynamics**
- **Helicopter Dynamics**
- **Control and Flight Tests**
- **UAVs**
- **Green Aviation**
- **Materials and Structures**
- **Space Mission Analysis and Design**
- **Spacecraft Design**
- **Space Robotics**
- **Space Propulsion**
- **Spacecraft Subsystems**
- **Satellite Dynamics and Control**
- **Airports**
- **Maintenance and Repair and Overhaul (MRO)**
- **Recovery and re-launch of air transport**
- **SESAR and EUROCONTROL (ATM) challenges**
- **Skills for the aerospace sector**
- **Clean Sky: status & reports**

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
Website: www.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

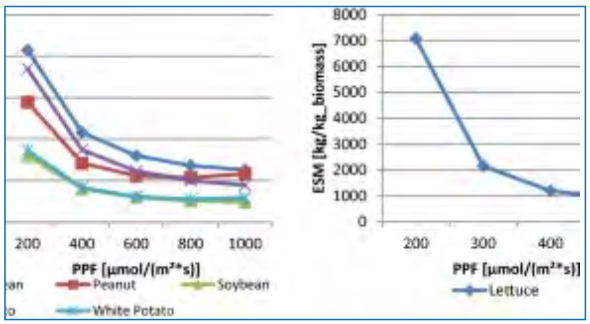
CEAS SPACE JOURNAL

Volume 13, Issue 1, January 2021

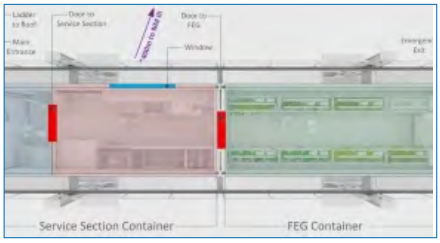
Thank you to our CEAS Space Journal Reviewers.
Stefan Leuko/ 01 January 2021

INFLUENCE OF CROP CULTIVATION CONDITIONS ON SPACE GREENHOUSE EQUIVALENT SYSTEM MASS

P. Zabel / Published: 06 May 2020



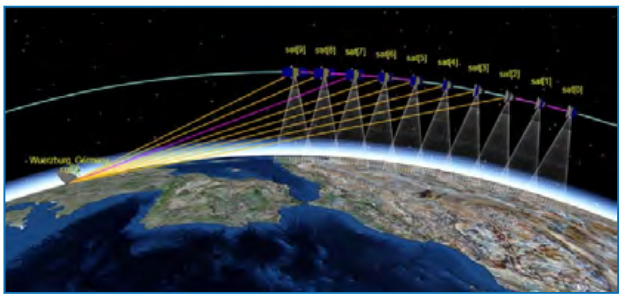
FROM ICE TO SPACE: A GREENHOUSE DESIGN FOR MOON OR MARS BASED ON A PROTOTYPE DEPLOYED IN ANTARCTICA



V. Maiwald, V. Vrakking, P. Zabel, D. Schubert, R. Waclavicek, M. Dorn, L. Fiore, B. Imhof, T. Rousek, V. Rossetti & C. Zeidler / Published: 16 May 2020

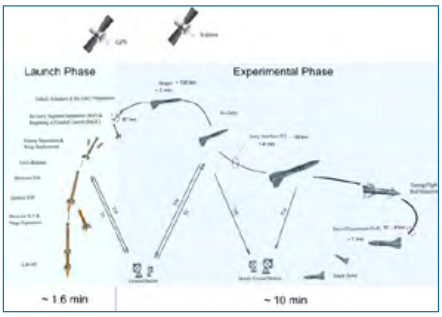
ESTNET: A DISCRETE EVENT SIMULATOR FOR SPACE TERRESTRIAL NETWORKS

A. Freimann, M. Dierkes, T. Petermann, C. Liman, F. Kempf & K. Schilling/ Published: 26 May 2020



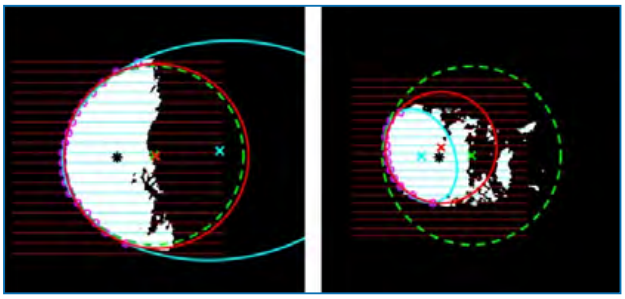
STABILITY ANALYSIS AND FLIGHT CONTROL DESIGN OF THE WINGED REUSABLE LAUNCH VEHICLE REFEX

D. Kiehn / Published: 30 June 2020



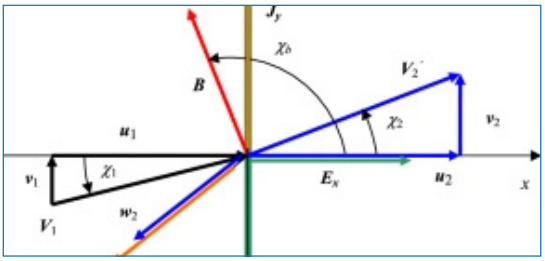
AUTONOMOUS GNC STRATEGY FOR AN ASTEROID IMPACTOR MISSION

G. Purpura & P. Di Lizia / Published: 02 July 2020



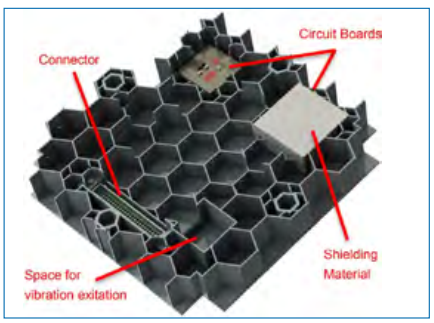
ANALYTICAL MODEL OF A PLANE RESISTIVE MAGNETOHYDRODYNAMIC SHOCK WITH HALL EFFECT

R. P. H. Berton / Published: 21 July 2020



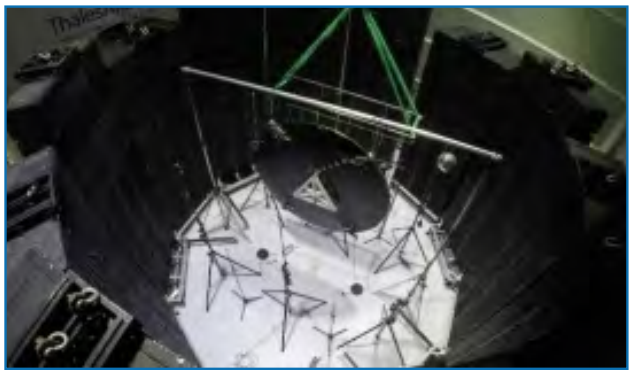
PRODUCTION AND PLANNED IN-ORBIT QUALIFICATION OF FUNCTION-INTEGRATED, ADDITIVE MANUFACTURED SATELLITE SANDWICH STRUCUTRE WITH EMBEDED AUTOMOTIVE ELECTRONICS

M. Echsel, P. Springer & S. Hümbert /
Published: 25 July 2020



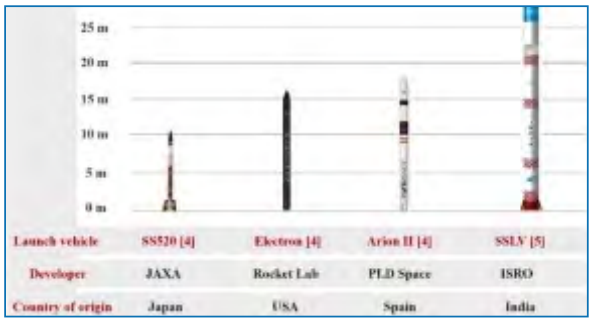
FREQUENCY DEPENDENT SELECTION OF CONTROL SENSORS IN MULTI-CHANNEL ACOUSTIC CONTROL

M. Alvarez Blanco, E. Matas, H. Bériot, B. Peeters & W. Desmet / Published: 08 August 2020



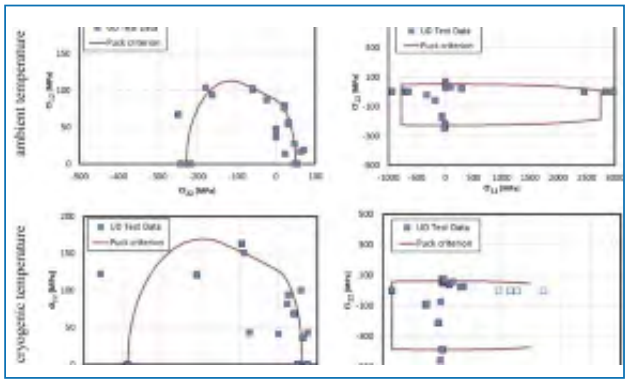
VALIDATION AND VERIFICATION OF A NANOSATELLITE PASSIVE ISOLATOR FOR PYROSHOCK ATTENUATION

A. Almesmari, F. Jarrar, F. Almaskari, P. Marpu, N. A. Shukoor & J. Govindan
Published: 16 August 2020



VALIDATION OF PUCK'S FAILURE CRITERION FOR CFRP COMPOSITES IN THE CRYOGENIC REGIME

J. Hohe, M. Schober, K. P. Weiss & S. Appel
Published: 11 September 2020



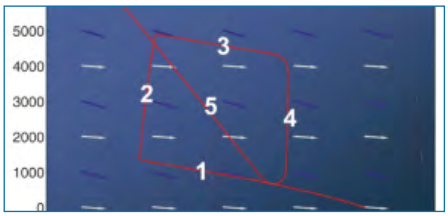
CEAS AERONAUTICAL JOURNAL

Volume 12, issue 1, January 2021

Thank you to our CEAS Aeronautical Journal Reviewers: Cornelia Hillenherms, Andrea Dieball
Published: 01 January 2021

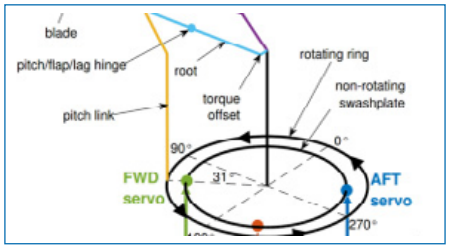
MARITIME OPERATION OF AN UNMANNED ROTORCRAFT WITH TETHERED SHIP DECK LANDING SYSTEM

B. I. Schuchardt, T. Dautermann, A. Donkels, S. Krause, N. Peinecke & G. Schwoch / Published: 24 September 2020



FAULT-TOLERANT CONTROL ON A UH-60 BLACK HAWK HELICOPTER USING HORIZONTAL STABILATOR

Praneet Vayalali, Michael McKay, Farhan Gandhi
Published: 06 October 2020

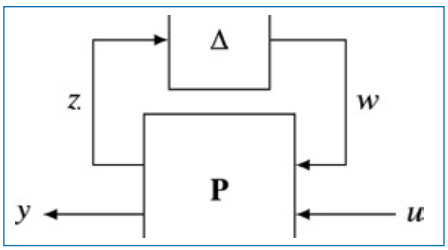


INCREASING HELICOPTER FLIGHT SAFETY IN MARITIME OPERATIONS WITH A HEAD-MOUNTED DISPLAY

Christian Walko, Bianca Schuchardt
Published: 06 October 2020

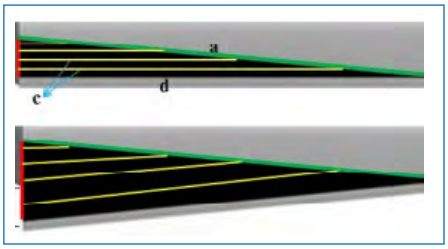
ADVANCED AEROELASTIC ROBUST STABILITY ANALYSIS WITH STRUCTURAL UNCERTAINTIES

Özge Süelözgen / Published: 09 October 2020



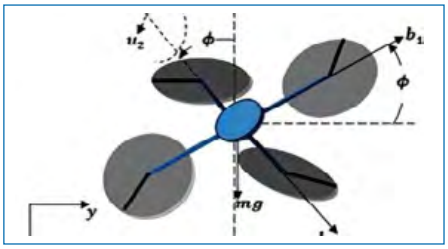
LINEARLY VARIABLE CHORD-EXTENSION MORPHING FOR HELICOPTER ROTOR BLADES

Rohin K. Majeti, Berend G. van der Wall, Christoph G. Balzarek / Published: 15 October 2020



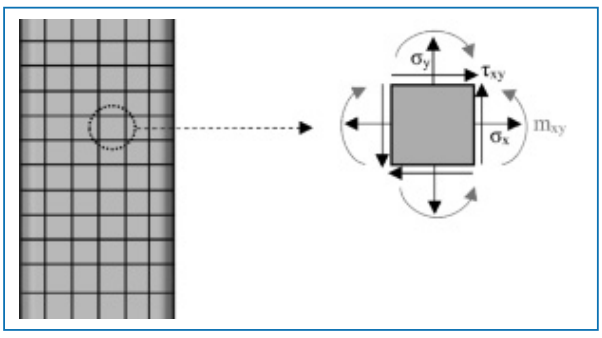
AUTONOMOUS TRAJECTORY TRACKING OF A QUADROTOR UAV USING ANFIS CONTROLLER BASED ON GAUSSIAN PIGEON-INSPIRED OPTIMIZATION

Boumediene Selma, Samira Chouraqui, Belkacem Selma, Hassane Abouaïssa & Toufik Bakir
Published: 29 October 2020



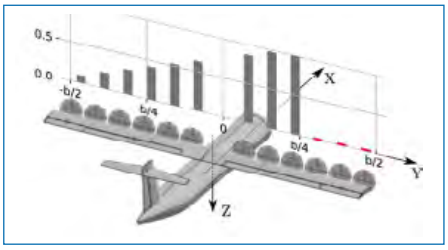
EXACT SOLUTION FOR THERMAL–MECHANICAL POST-BUCKLING OF FUNCTIONALLY GRADED MICRO-BEAMS

Mohammad Rezaiee-Pajand, Farhad Kamali
Published: 13 November 2020



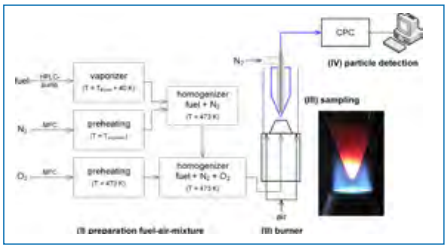
CO-DESIGN OF AIRCRAFT VERTICAL TAIL AND CONTROL LAWS WITH DISTRIBUTED ELECTRIC PROPULSION AND FLIGHT ENVELOP CONSTRAINTS

Eric Nguyen Van, Daniel Alazard, Carsten Döll & Philippe Pastor / Published: 16 November 2020



INVESTIGATION OF THE SOOTING PROPENSITY OF AVIATION FUEL MIXTURES

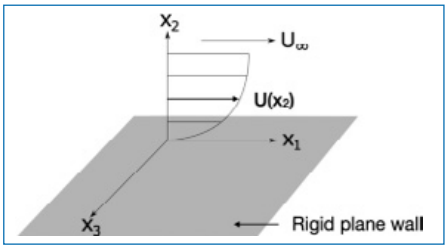
S. Richter, T. Kathrotia, C. Naumann, S. Scheuermann & U. Riedel / Published: 24 November 2020



CFD-BASED PREDICTION OF WALL-PRESSURE SPECTRA UNDER A TURBULENT BOUNDARY LAYER WITH ADVERSE PRESSURE GRADIENT

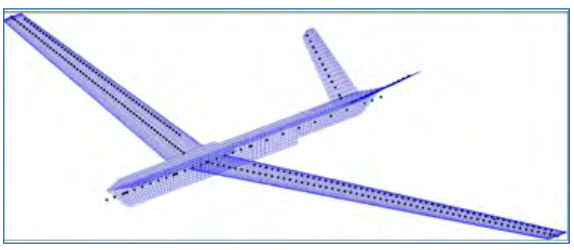
Gabriele Grasso, Hao Wu, Susanna Orestano, Marlène Sanjosé, Stéphane Moreau & Michel Roger

Published: 04 January 2021



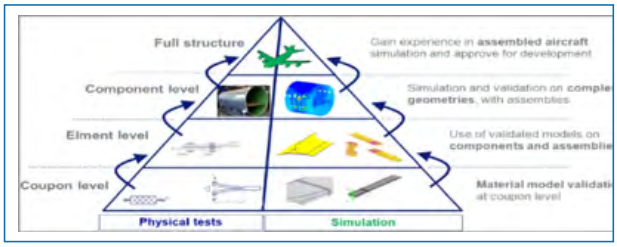
NUMERICAL POSITION OPTIMIZATION OF AN OVER-THE-WING MOUNTED ENGINE INSTALLATION

F. Lange, R. Rudnik / Published: 23 December 2020



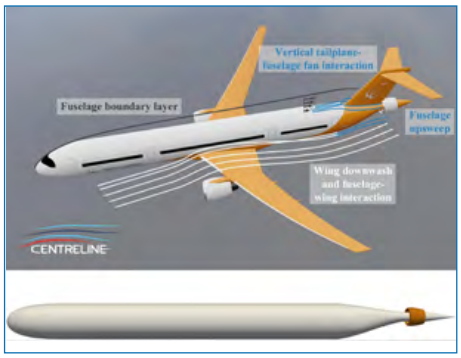
A MESO-MECHANICAL MATERIAL MODEL DESCRIBING A CRASH BEHAVIOR OF 2D PLAIN WEAVE FABRIC COMPOSITES

Redouane Lombarkia, Augustin Gakwaya, D. Nandlall, M. L. Dano, J. Lévesque, A. Benkhelifa, P. Vachon-Joannette & P. Gagnon / Published: 04 January 2021



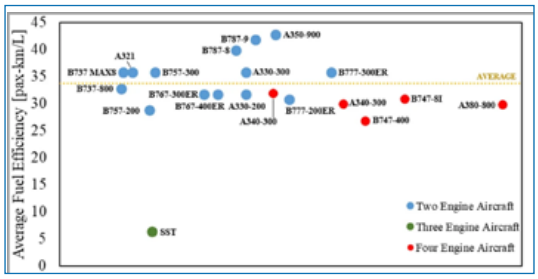
NUMERICAL INVESTIGATION OF THE EFFECTS OF FUSELAGE UPSWEEP IN A PROPULSIVE FUSELAGE CONCEPT

Anaïs Luisa Habermann, Anubhav Gokhale, Mirko Hornung / Published: 06 January 2021



ESTIMATING SUPERSONIC COMMERCIAL AIRCRAFT MARKET AND RESULTING CO2 EMISSIONS USING PUBLIC MOVEMENT DATA

Colby J. Weit, Jiajie Wen, Turab A. Zaidi & Dimitri N. Mavris / Published: 04 January 2021



METHODS OF THE WALL INTERFERENCE REDUCTION AT LOW SUPERSONIC VELOCITIES IN WIND TUNNELS

S. L. Chernyshev, A. I. Ivanov, A. O. Volkova

Published: 04 January 2021

INTERVIEW WITH MICHEL WACHENHEIM, PRESIDENT OF THE AIR AND SPACE ACADEMY (AAE)

By Jean-Pierre Sanfourche, Editor-in-Chief

WITHIN THE CONTEXT OF CLIMATE CHANGE, AIR TRANSPORT IS CALLED ON TO DRASTICALLY REDUCE ITS CARBON FOOTPRINT BY 2050. THIS OBJECTIVE IS PARTICULARLY CHALLENGING SINCE THE NUMBER ONE PRIORITY AT PRESENT IS TO FIND WAYS TO RECOVER AS SOON AS POSSIBLE FROM THE CONSEQUENCES OF THE PANDEMIC CRISIS ON CIVIL AVIATION.

ON 11 AND 12 MARCH THE AIR AND SPACE ACADEMY (AAE) HELD A CONFERENCE/WEBINAR TO TACKLE THE BROAD SUBJECT: "AIR TRANSPORT IN CRISIS AND THE CLIMATE CHALLENGE – TOWARDS NEW PARADIGMS".
OVER TWO DAYS, IT BROUGHT TOGETHER CLIMATOLOGISTS, EXPERTS FOR THE VARIOUS INDUSTRIAL SECTORS CONCERNED AS WELL AS SOCIOLOGISTS AND ECONOMISTS FROM DIFFERENT COUNTRIES.

Michel Wachenheim

Michel Wachenheim is a graduate of Ecole Polytechnique (France) and Ecole Nationale de l'Aviation Civile (ENAC, France).

He is a former Director General of Civil Aviation (France) and former Head of staff for the French Transport Minister (Dominique Bussereau).
He has represented France on the Council of the International Civil Aviation Organization (ICAO) and he was senior Advisor to the Airbus CEO from 2014 to 2020
He took over as President of the Air and Space Academy (AAE) on 1 January 2021.

Jean-Pierre Sanfourche – **Just a few weeks after you assumed presidency of the Air and Space Academy, a major international conference was organised remotely by AAE on 11 and 12 March, dealing with one of the highest priority subjects in civil aviation: "Air Transport in Crisis and the Climate Challenge – Towards New Paradigms". But before discussing the main opinions, proposals and recommendations that emerged from this remarkable conference, I would first like to approach the question of the air transport sector's recovery from the Covid-19 pandemic.**

Michel Wachenheim - The recovery of the Air Transport sector will require a harmonization of processes and measures at global level. To this end, ICAO set up the Council Aviation Recovery Task force (CART) last year tasked with providing continuous guidance to Member States to enable civil aviation to recover. Unfortunately, these recommendations were not really implemented. A harmonization of Covid measures within EU, on the basis of EASA recommendations, also appears difficult, since health policy remains mainly at State level. Likewise, last November the European associations collectively representing the entire aviation sector came together at a 'European Aviation Round Table'. They urged the EU and its Member States to implement an Urgent Call for Action comprising two pillars: 1) a European Aviation Relief Programme and 2) an EU Pact for Sustainable Aviation. Let's hope that these propositions will be implemented.
The conference did not focus on this subject. However, the economic crisis resulting from the pandemic raises the question of the sector's capacity to maintain the proper level of efforts to combat climate change. The time has come to resolutely engage at international level in the process of air transport transformation in accordance with environmental policy goals.
Our conference provided the opportunity to re-examine the different aspects of the subject, hear the presentations of top experts, clarify positions and finally outline a corpus of orientations.

J-P. S. – **Until recently opinions diverged as regards the impact of civil aviation on climate warming: is there now a general consensus on the key scientific figures and on the urgency of the actions to be taken?**

M. W. - Global warming is not open to questioning, it is now an established fact. All sectors of activity are concerned, including aviation. Among the information presented during the conference, I would like to bring your attention to the following:

- Today, the CO_2 emitted by aviation represents 2.4% of human CO_2 emissions, growing to 3.5%if we consider indirect impacts;
- Indirect impacts include nitrogen oxides (NO_x), particles and contrails. However, regarding the impact of contrails, further studies are necessary and some fuel categories might reduce this impact;
- Air transport must be profoundly transformed in order to play its part in combating climate change, while also needing to adapt to the resulting changing meteorological conditions.

***J-P. S.* – Energy transition is the top priority of the required programme to transform air transport, could you briefly indicate the main trends expressed during the conference?**

M. W. - Experts confirmed that the situation is evolving very quickly with regard to drop-in synthetic kerosenes which have a neutral carbon footprint.

The possibilities are no longer restricted to "classic" biofuels, whose resources are limited, but now include Sustainable Aviation Fuels (SAF), less "bio-based" and more "electric", produced from hydrogen and carbon, from biomass, waste, etc., or even taken directly from the atmosphere. Pilot plants are appearing, at different stages of readiness depending on the process. Boeing, Rolls-Royce and German industrialists are all involved in this sector.

The way is thus open to decarbonisation efforts which push beyond the current bio focus, encouraging the certification of "drop-in" fuels and a fall in their prices with mass production. They would rapidly be mixed in with jet-fuel according to local availability, to reach 100% by 2050. And what about hydrogen? This high energy, but very bulky gas could play a part in short-haul air transport, just as it has in ground transport, but there is still a long way to go before it can be used in compact form (liquid at minus 253 degrees Celsius) in radically new medium- to long-haul aircraft. Issues around production, transportation and refuelling at airports around the world would also have to be resolved. Even assuming that technical solutions are found, any reduction in CO_2 accumulation would be very limited before 2050.

To sum up, a "defossilisation" solution can be technically implemented quickly and progressively, without waiting for fleet renewal. Such a large-scale project must involve oil companies, renewable energy producers and air transport. Once again, the aviation industry could play a pioneering role.

***J-P. S.* – Concerning commercial aspects, I assume that the notion of Environmental Taxes gave rise to differing opinions?**

M. W. - The question of tax policy was discussed from the airline perspective. The viewpoints expressed by the different speakers converged around the conclusion that to add new taxes to CORSIA (Carbon Offsetting and Reduction Scheme for International Aviation) would be counterproductive. A consensus clearly emerged on the fact that instead of creating new taxes, which would have a deterrent effect on passengers, it would be much more efficient to massively invest in alternative fuel research and production, i.e. to establish regulatory financial support for the bio and synthetic alternative fuels (SAF) industry
Aircraft manufacturers, Air Navigation Service Providers, airport and airlines must definitely work together within a "Systemic Aviation Cluster"..

***J-P. S.* – What about the geopolitical and societal aspects of the air transport transformation?**

M. W. - While some talk of slowed, or even negative growth, economists and sociologists have contrasting views on the need for long-distance transport, where there is no substitute for air travel.
Why should it be reprehensible to use aircraft to satisfy this need and less reprehensible to use internet networks all day long, especially for entertainment, when their electricity consumption emits greenhouse gases at a rate 2 or 3 times higher than aviation proportionally?
It must also be recognised that global objectives may not be applied evenly across all sectors of activity; measures may be calibrated according to socio-economic needs and deadlines may evolve according to technical capacities and social acceptability.

***J-P. S.* – What is your general opinion about changes needed to education and training due to the air transport transformation?**

M. W. - Air transport transformation will be a long process, requiring more and more innovation, and relying on highly disruptive technologies, this is the reason why climate change, the environment and the ecological transition will occupy a larger and larger part in aerospace training programmes in higher education centres.

For the 1000 connected students, the conference presented a very comprehensive scientific and societal overview of all issues related to carbon-free aviation. The quality and precision of the presentations meant that they were able to access a coherent set of consolidated information as well as confronting opinions that were sometimes less well-founded.

Based on the high-level presentations by specialists in climate studies, new technologies and air operations, they now have the elements they need to build roadmaps for each of the solutions discussed, particularly electricity, synfuels and hydrogen. The future engineer-architects of the aeronautics and space sector are thus combining their knowledge of the environmental impact of aviation with an interest, from start to finish, in technological breakthrough solutions, from primary energy sources to the certification of completely new aircraft.

***J-P. S.* – Among your recommendations, you highlighted the absolute necessity for strong international governance: which kind of initiative should be taken?**

M. W. - The international institution already exists: ICAO. However, ICAO is not equipped to address urgent decisions and policies. It will have to improve its decision-making processes and work more closely with aviation industries, not only within the framework of current actions but above all to prepare for the future.
I would like to take this opportunity to look back at the creation of ICAO.

On 7 December 1944, i.e. before the end of World War Two, 52 nations assembled in Chicago, Illinois (USA), to sign the Chicago Convention on International Civil Aviation, a fundamental text which stated in its preamble: "The future development of international civil aviation can greatly help to create and preserve friendship and understanding among the nations and peoples of the world, yet its abuses can become a threat to the general security. [...] The undersigned governments having agreed on certain principles and arrangements in order that international civil may be developed in a safe and orderly manner and that international air transport services may be established on the basis of equality of opportunity and operated soundly and economically..." The Chicago Convention came into force two years later, with the creation of ICAO on 4 April 1947 .

If I look back at this Chicago Convention, it is because we consider it both vital and urgent to introduce, at the same level as Safety, a fundamental role for this organization in the fight against Climate Change. This would considerably ease decisions regarding long-term objectives. However, I also know that this is a political challenge. At the very least, and within a short-term timeline because decisions are needed urgently, an international conference (similar to Chicago) dedicated to climate change policy might be convened. The next ICAO Assembly will take place at Montreal in 2022. It is time to organize an event at the level of Heads of States, ahead of this event, in order to send a strong political message to the ICAO Assembly.

TOWARDS A WORLDWIDE CIVIL AVIATION OBSERVATORY

In order to monitor the evolving impact of aviation on climate change, the Air and Space Academy is suggesting the setting up of an air transport observatory to keep a tally of the systemic rate of progress towards climate objectives; its content and operation will have to be defined. The neutrality of this observatory will be a crucial element and its scope should be global.
It is only through such a system that we will be able to effectively monitor the "aviation climate programme".

J-P. S. **– Perhaps to conclude, what are your main objectives for the Air and Space Academy for the next two years?**

M. W. - First of all, I have to manage in the best possible manner all the actions undertaken by my predecessors which are currently under active preparation: Dossiers, Opinions, upcoming Conferences and Lectures as well as our quarterly Newsletters. Incidentally I would like to take this opportunity to thank my predecessors for the high value of the works they have conducted.

In particular I wish to congratulate all members of the team in charge of the programming and organisation of this remarkable Conference/webinar of 11 and 12 March. "Remarkable" is not an overstatement because it was followed by an audience of some 2,000 persons of which at least 1,000 aerospace students and young professionals. May I thank you, as Editor-in-Chief of the AEROSPACE EUROPE bulletin, for having distributed our Announcement document to all members of the Council of European Aerospace Societies (CEAS) and so contributed to this achievement.

Concerning publications, my very first priority is of course to report on this event in the form of an "Opinion" booklet to appear shortly, let's say in next May/June.
With regard to training initiatives, the "Entretiens de Toulouse – Toulouse Encounters" to be held on 14-15 April is vitally important: as we discussed earlier it is obvious that due to the unprecedented challenges we are facing and thanks to the extraordinary explosion of new technologies, the future of aviation is in the hands of present students and young professionals.
This thought directly leads to my next priority: the rejuvenation of the Air and Space Academy. The rapidity of aviation evolution makes it imperative to take action aimed at electing younger and younger Members. This will be a long process, all the more reason to initiate it without delay.
Also regarding AAE membership, it is necessary to give a strong impulse to internationalisation. When it was created in 1983 by André Turcat, it was a national institution named "Académie Nationale de l'Air et de l'Espace (ANAE)". A major change occurred in 2007, when the adjective "National" disappeared, the title becoming the present one "Académie de l'Air et de l'Espace – Air and Space Academy". From this date non-French members were progressively elected as Fellows. The present ratio of non-French/French members is around 30%/70%, which is very insufficient and I am therefore determined to engage initiatives aimed at increasing this ratio. The ideal would be to move towards becoming a "European Air and Space Academy" within a medium timeline. This internationalisation is a sine qua non condition if we are to make a high level contribution in the international world of aerospace decision makers.

I would like to conclude our interview by saying that if today, because of the Covid-19 pandemic, we are experiencing a period of difficulty unprecedented since the end of World War 2, very soon the time of recovery will come and the aerospace players will embark on a fascinating era of limitless scientific and technological advances.

AT A GLANCE THE CONFERENCE HELD ON 11-12 MARCH ORGANIZED BY THE AIR AND SPACE ACADEMY : AIR TRANSPORT IN CRISIS AND THE CLIMATE CHALLENGES – *TOWARDS NEW PARADIGMS*

THE CONFERENCE WAS STRUCTURED ACCORDING TO FOUR SESSIONS: 1. CLIMATE ISSUES – 2. NEW ENERGY AND CONTRIBUTION OF TECHNOLOGY – 3. EVOLVING AIR TRANSPORT AND INTERNATIONAL INTERACTIONS – 4. MOBILITY OF THE FUTURE ON GLOBAL SCALE

THURSDAY 11 MARCH MORNING

- Welcome speech, by **Michel Wachenheim**, President of the Air and Space Academy

Michel Wachenheim

- Opening speech, by **Violeta Bulç**, former European Transport Commissioner

Violeta Bulç

SESSION ONE: CLIMATE ISSUES

- Chair: **Philippe Forestier**, Member of the Air and Space Academy
- Scientific opinion on climate change, the part played by human activities, the work of the IPCC (International Panel on Climate Change). Policies under way, what share to attribute to air transport?
  By **Valérie Masson-Delmotte**, Co-Chair of Group n° 1 of IPCC
- The energy transition for air transport
  By **Jean-Marc Jancovici**, specialist energy and climate, teacher and lecturer
- **ROUND TABLE** – Moderator: **Olivier del Bucchia**, co-Founder of SUPAERO-DECARBO – Participation of students and young professionals
- Conclusion, by **Philippe Forestier**

Upper L-R: Valérie Masson-Delmotte, Jean-Marc Jancovici, Violeta Bulç – Bottom: Philippe Forestier

THURSDAY 11 MARCH ATERNOON

SESSION TWO: NEW ENERGIES AND CONTRIBUTION OF TECHNOLOGY

- Chair: **Xavier Bouis,** Member of the Air and Space Academy
- Part 1 - Energy: to what extent will the new sustainable aircraft fuels contribute to reducing emissions? What energy source(s) will fuel aircraft in 2030, 2040, 2050?
- Energies envisaged to decarbonize aviation – Primary energy sources needed and availability. By **Philippe Novelli**, Director propulsion and Environment at ONERA (France) and former ICAO Expert Alternative Fuels
- Production and distribution of hydrogen and/or PTL (Power-to-liquids – or e-Fuels): overview, challenges to be met, economic aspects. Industrialisation of SAF (Sustainable Aviation Fuels) and hydrogen. By **Patrick Le Clercq**, DLR/Stuttgart
- Part 2 – Aircraft and engines, overall progress and use of decarbonised energies
- Progress expected in aircraft and engines by 2050 – Airworthiness of new fuels. By **Axel Krein**, Executive Director of Cleansky
- **ROUND TABLE** – Moderator: **Bruno Stoufflet**, Director R&T, Dassault Aviation – Participants: **Paul Stein**, CTO Rolls

Left: Xavier Bouis – Right: Axel Krein

Royce, **Rolf Henke**, DGLR President, **Stéphane Cueille**, SAFRAN, **Sheila Remes**, Boeing, **Dominique Boujeux,** former Chief Engineer Ariane 5, ArianeGroup. Thematic: Assessment of ideas put forward trust, timeline, overall CO_2 reduction? Overview of trajectory till 2050.

- Conclusion, by **Xavier Bouis**
- Point of view, by **Jean-Paul Herteman**, former President and Director General, SAFRAN

FRIDAY 12 MARCH MORNING

SESSION THREE: EVOLVING AIR TRANSPORT STRATEGIES AND INTERNATIONAL INTERACTIONS

- Chair: **Pierre Caussade**, Member of the Air and Space Academy
- Global air transport vision, by **Alexandre de Juniac**,

Pierre Caussade

Director General, IATA

- Towards net zero emissions – CO_2 footprint from well to wing: where to act and what coalitions to reach net zero emissions?

By **Vincent Bamberger,** Managing Partner, Arthur D. Little

• **ROUND TABLE I** – Thematic: The climate change from the operators' point of view. Moderator: **Paul Steele**, former Environment director at IATA (International Air Transport Association) – Participants: **Anne Rigail**, DG Air France; **Michel Gill**, Executive Direcctor, ATAG Air Transport Action Group); **Jonathan Counsell**, Group Head of Sustainability, ATAG; **Nancy Young**, VP Environmental Affairs, Airlines for America.

• **ROUND TABLE II** – Thematic: International perspectives, industrial stakes.

Moderator: **Paul Steele** – Participants: **Patrick Gandil**, former Director General of Civil Aviation (France); **Michel Wachenheim**; **Charles Schlumberger**, Lead Air Transport Specialist of the World Bank; **Laurent Timsit**, Director, International Affairs Air France/KLM; **Adefunke Adeyemi**, Regional Director Advocacy and Strategic Relations, IATA Africa.

FRIFAY 12 MARCH AFTERNOON

SESSION FOUR: MOBILITY OF THE FUTURE ON A GLOBAL SCALE

- Chair: **Eric Dautriat**, Vice-President of Air and Space Academy
- Travel: a given of civilisation – The evolution of air transport uses. In the use of long-distance travel linked to

Eric Dautriat

the model of Western Society, or to a deep anthropological need? What are its sociological characteristics at the global level? What role can citizens' people climate concerns play in the future in the evolution of usage, in particular under the possible of cataclysmic effect of the health crisis?

By **François Gemenne**, Director of Hugo Observatory, Liège University, member of IPCC; Stefan Gösseling, professor at Lund University

- Public policy for sustainable mobility: What are the parameters governing mobility, and what levers can public policies use to reorient mobility (especially air transport) in the direction of global decarbonisation.

By **Yves Crozet**, Institut d'Etudes Politiques de Lyon.

• **ROUND TABLE:** Thematic: Geopolitics of attitudes towards the air transport of tomorrow? What is the anticipated importance of future air transport? What priority is given to the question of its impact of the climate in the different regions of the world? What consequences for mobility and perhaps reinvented air transport?

Moderator: **Sophie Voinis**, Journalist.

Participants: **Andrey Murphy**, former Director Transport and Environment, Brussels ; **Xu Bo**, Shanghai world Exposition Air Show Commissioner ; **Fadimatou Noutchemo**, President Young Africa Aviation Professionals Association ; **John Bierly** ,State Department, USA.

- Conclusion: **Eric Dautriat**
- Closing speech: **Michel Wachenheim**

Air and Space Academy
www.academieairespace.com
contact@academieairespace.com

ACCELERATING TRANSITION TOWARDS CLIMATE NEUTRAL AVIATION

July 2020

EREA Association of European Research Establishments in Aeronautics

The COVID-19 crisis has hit the global aviation sector hard. It is expected that the recovery process of the sector will carry us over 2024 in order to achieve pre-corona levels, bankrupting many businesses along the way. Private investments in R&D will dry up, and we risk falling significantly behind on our ambition to become the world's first climate neutral continent.

But not all is gloomy. Being Research and Innovation Institutes, we see exciting new innovations coming to be which will revolutionize aviation and the transport system it operates in. Fully autonomous aircraft, revolutionary configurations and new, climate-neutral propulsion mechanism are just few of the areas where significant changes can be expected in the next decades.

The question is not if, but how fast can we make this transition happen. **This is more a political question, than a technological one.**

EREA calls upon the European Commission, and in particular Commissioners Vălean and Gabriel, to renew Europe's aviation vision

Much has changed since 2011, when Flightpath 2050 was first published. Covid-19, but also the extensive digitization has changed the air transport system dramatically. Therefore, **it is time for the European Commission to call upon Europe's aviation stakeholders to draft an updated Vision and roadmap on how to get towards a climate neutral continent in 2050, whilst maintaining Europe's competitiveness and highest levels of aviation safety and security.**

EREA is in the midst of developing its own vision on the future of aviation in a comprehensive study. This study will be made available at the end of the year to all who wish to see it, as we believe our vision is a shared one. **EREA is ready and able to participate in a High Level Group tasked to develop an updated Flightpath 2050.**

Reinforce public funding to accelerate the transition towards a climate neutral aviation

It is clear that European economic recovery is of utmost importance. All measures that contribute to this goal should be carefully considered, including reinforcement of public R&D-budgets that is needed more than ever for successful technological transitions for both EU economy and society. There is ample research that backs the statement that public investments in R&D not just leverage significant private R&D, it also adds substantial value to the economy. Where most countries cut spending, only a few have increased public R&D-spending after the credit crisis hit in 2008. Data suggests that this helped them emerge from the crisis stronger and more competitive. Let us learn from this example. The European Council's agreement on a new MFF and recovery fund unfortunately does not live up to this standard. **We urge the European Parliament and EU leaders to reconsider the EU budget and recovery proposal and make it ambitious and fit for purpose, especially as current circumstances have made this necessary and justified.**

There is no doubt that the first priority of the EU budget should be to find a cure or a vaccine for COVID-19. But at the same time, we must invest in a swift economic recovery to remain at the forefront of Research & Innovation by supporting the development of innovative technologies. We firmly believe that this recovery is an opportunity to accelerate the transition towards a sustainable and competitive aviation sector. **Not stepping up now could mean leaving room for others elsewhere in the world to step into the vacuum. We must not let this happen. Europe should and can lead the way, if we choose to do so. An appropriate, ambitious budget is instrumental in doing so.**

Create the right framework conditions for an accelerated transition

European Research and Innovation will be key to support recovery and transition. The current and previous framework programs for Research and Innovation have supported the creation of European R&I ecosystems integrating Industry, SME, Research Organisations and Academia to jointly work together on solutions to global challenges to implement large-scale projects that each individual nation could not carry out alone.

The upcoming framework program Horizon Europe including its partnerships should continue to support these fruitful, cross-EU and cross-sectoral collaborations with appropriate budget and framework conditions for participation. This applies in particular to public-private partnerships, where strategic, long-term cooperation in ecosystems is at its core. It is absolutely essential that such partnerships are **inclusive and attractive** to all stakeholders and no barriers exist for participation in calls. This includes taking stock of **all in-kind**

contribution by partners, which is not the case under the new proposed rules by the Commission.
For every technological breakthrough, Research and Technology Infrastructures were key to prove an idea, test & validate the technology and simulate its effectiveness. For this reason, the European Union together with its Member States have a long history of investing in state-of-the-art Research Infrastructures. However, **in order to bring technologies beyond the lab-environment, applied test facilities, or Technology Infrastructures (TIs), must be fully recognized.** Such facilities are indispensable in the innovation process; without them research cannot be valorised into products and services. Large TIs are expensive to build, run and maintain and rarely can be exploited commercially. EREA institutes manage many of such infrastructures and by doing so, guaranty the technological transfer by helping industry to get from TRL 2 to 6 and beyond.
A recent needs, gaps and overlap study, found that in aviation alone, over 24 facilities and capabilities are currently lacking and need to be addressed as soon as possible. To remain competitive, it is calculated that approximately €400 million extra funding is needed to build and upgrade Research and Technology Infrastructures. **Investing in new technologies is futile if we cannot test, validate and certify them.**

Stronger Together

EREA firmly believes that close cooperation is needed, also amongst ourselves; after all, we are more than the sum of our parts. This is why EREA took the initiative for the Future Sky Joint Programme. Within this framework, the 15 EREA members together define a path on key issues such as aviation safety, energy, noise, UAM, security and circularity. The Future Sky Joint Programme is open to everyone who wishes to join. The broad, inclusive Future Sky approach produced large Flagship projects such as Future Sky Safety[1], ANIMA[2] and IMOTHEP[3], having significant impact on aviation safety, aviation noise perception and management and hybrid-electric propulsion respectively.
What is unique in the Future Sky approach is the joint programming of own institutional research and innovation, making these EU-projects go far beyond their EU funding. EREA calls upon the Commission to continue to support the Future Sky approach.

But to achieve the ambitious goal of a climate neutral continent, cooperation amongst all partners in the aviation value and innovation chain is vital. **EREA advocates from a well-functioning innovation funnel, starting with bright, new ideas, working towards specific applications and to finally be validated and find its way to the market.** No one programme should limit itself to a specific TRL-range, but instead offer a free flow of technologies towards demonstration and implementation. **Only close public-private cooperation in each phase will yield the desired result.**

Conclusions - EREA calls upon:
- **The European Commission, and in particular Commissioners Vălean and Gabriel, to renew Europe's aviation vision;**
- **Europe's leaders to reinforce public funding to accelerate the transition towards a climate neutral aviation;**
- **The Commission to create the right framework conditions for an accelerated transition addressing Technology Infrastructures and operational principles for partnerships;**
- **To foster a balanced coverage of the aviation RTD cycle, both TRLs and different products;**
- **All aviation stakeholders to join forces and for the European Commission to continue to support the Future Sky approach.**

EREA Registered in the EU Transparency-Register under No. 010397411668-54
Contact for EREA, the Association of European Research Establishments in Aeronautics:
Ms. Anne-Laure Delot, EREA Secretary, c/o ONERA, International Affairs Directorate,
6, Chemin de la Vauve aux Granges
91123 Palaiseau cedex, FRANCE
Phone: +33 1 80 38 67 48
Email: anne-laure.delot@onera.fr

1 Horizon 2020 project funded under Grant Agreement ID: 640597
2 Horizon 2020 project funded under Grant Agreement ID: 769627
3 Horizon 2020 project funded under Grant Agreement ID: 875006

EREA-EASN-ASD-EACP-EUREC-HER ONE PAGER ON CRITICAL ASPECTS OF OPERATIONAL PRINCIPLES FOR INSTITUTIONALISED PARTNERSHIPS IN HORIZON EUROPE

November 2020

In the context of the preparation of (institutional) partnerships in Horizon Europe (HEU), it is essential to develop administrative / operational principles which ensure the full and unrestricted participation of private partners in such partnerships. Such principles should foster the continuation of the well-functioning ecosystems of industry, Research and Technology Organisations (RTOs), Small and Medium sized Enterprises (SME) and Universities. To contribute to the discussion on these operating principles, the signatory organisations share their views on the following four principles.

1. FUNDING RATE & IKOP (IN-KIND CONTRIBUTION FOR OPERATIONAL ACTIVITIES) METHODOLOGY – NEED TO ENSURE RECOGNITION OF FULL IN-KIND CONTRIBUTIONS FROM INDUSTRY, NON-PROFIT AND SMEs

The European Commission expressed the desire to increase private investments in European PPPs, by decreasing funding rate while simplifying financial reporting by counting the difference between eligible costs and reimbursed cost as in-kind contribution.

Administrative simplifications are always welcome. Yet, any simplification needs to account for the following facts:

i) For companies, RTOs and universities, the total project costs of a project are *significantly higher* than the eligible costs reimbursable by the Commission. In fact the EU-funding of eligible costs in H2020 covers a maximum of around 60-70% of the actual total project costs and less (50%) for large industries. The real difference between total project costs and eligible costs represents *in-kind contributions to the partnerships* and needs to be credited to the private partners. By applying the rule proposed by the Commission, the situation is made particularly difficult for **RTOs and universities** as the figure corresponding to their in-kind contribution would drop to **zero**. As a consequence the participation of RTOs and universities would represent an **additional burden for industry** and would therefore make the participation of RTOs and universities significantly less attractive.

A large part of the project costs is ignored by the proposed simplification of HEU IKOP definition. **Therefore, the signatories recommend keeping the H2020 definitions and certification methodology** as the participants and their auditors have learnt to cope with them over the H2020 JU duration.

ii) For RTOs and universities, the 100% funding of eligible direct costs with 25% flat overheads rate principle is appropriate and desirable and needs to be retained. In general, partnerships derive their added value from a well-balanced composition of participants, therefore the *funding rate* must not undermine the attractiveness of the partnerships for the specific sectors, this holds particularly true for SMEs.

iii) In terms of funding rate, and regardless of the type of actor (industry, SME, RTO, academia) in the ecosystem, 50% of total project costs (which is equivalent to **70% of the total eligible costs**) **is the lower limit which can be afforded for a wide range of partners.**

In order to allow all (research) stakeholders to participate appropriately in partnerships, the **signatories recommend to maintain the current approach of bringing in total project costs, of course with appropriate certification, for calculating in-kind contributions and retain the 100% funding plus 25% flat rate principle for non-profit entities. Incorporating SMEs at an early stage of the research phase into new potential products and processes is essential to allow them to be integrated**

Comparison CS2/H2020 - CAP/ HE
(Based on full costs incurred 2014 - 2018)

TEC: Total Eligible Cost
TPC: Total Project Cost
IKOP: in-kind contribution of co-funded operational projects

All values TEUR	Years	Total Project Cost (1)
RTO #	2014 - 2018	41.557,79

	Total Eligible Cost (3)	Grant (2)	IKOP (1)-(2)	TPC Funding Rate (2)/(1)	TEC Funding Rate (2)/(3)	IKOP "simply (TPC - grant)"	IKOP (visible)
H2020	24.839,18	24.839,18	16.718,61	59,77	100,00	16.718,61	16.718,61
HE	26.047,57	26.047,57	15.510,22	62,68	100,00	15.510,22	0,00

Table: Example from one of Europe's leading aerospace RTOs showing that under current scheme, approximately 40% of the total project cost is contributed to the PPP as an in-kind contribution and that under the new rules, this amount would be reduced to zero on paper

until the final production of future products and to be involved in global and competitive supply chains in the long run. Thus, a higher funding rate for SMEs up to 100% of Total Eligible Cost is needed. It is necessary to maintain at least the same funding conditions for HEU partnerships as for H2020 ones.

2. NEED TO ENSURE A SUFFICIENTLY BROAD SCOPE OF ELIGIBLE IKAA (IN-KIND CONTRIBUTIONS FOR ADDITIONAL ACTIVITIES)

The operating principle on IKAA should not limit the scope of additional activities that allow accounting for in-kind contribution only to activities either which contribute directly to the uptake of results under current and previous partnerships, or which can serve as a basis for synergies with other EU, national or regional programmes.

By allowing for a broad scope of additional activities **the whole community (industry, SMEs, RTOs and universities) has an opportunity to bring in higher leverage as requested by the Commission.** As an example a **significant additional contribution** of academia and other stakeholders (industry, RTOs) in realising any PPP is to **ensure high quality and properly skilled human power.** This contribution should be **recognised as in-kind contribution** from the stakeholder academia and other stakeholders and hence as a contribution from private partners, in case the particular activity can be certified and directly contribute to achieving the goals of the respective Partnership. In general, **the signatories recommend accepting additional activities with a much broader scope, including synergies with national and regional programmes and own institutional funding.**

3. NEED TO LIMIT THE FINANCIAL CONTRIBUTIONS TO 50% OF THE RUNNING COSTS OF THE JU

As far as the financial contributions are concerned, there is a need to limit the financial contributions to 50% of the running costs of the Joint Undertaking (JU) and not to further increase it for financing operational activities. It needs to be underlined that although RTOs and universities are allowed by law to contribute to the running costs (administrative costs) of a JU, in most countries it is *prohibited* by law to pass on institutional research funds to another organization for further distribution; the same prohibition applies to industry as well. **If such an additional financial contribution were required, it would make it almost impossible for private participants to take part in a partnership. Therefore the signatories recommend limiting the financial contribution only to running/administrative costs of the JU.**

4. NEED TO CLARIFY QUESTIONS ON PRIVATE MEMBERS' COMMITMENT & AVOID ANY CONFLICT OF INTEREST FOR PRIVATE MEMBERS

The signatories ask for clarification on the commitment of the *Founding Members* to the partnership and stress the importance of avoiding any conflict of interest for private partners as Founding Members with regard to calls for proposals.

In partnerships in which *only associations* provide the private partners, the problem of conflict of interests will potentially be solved because the approval of the work programme is given by the respective association; the individual organisations are not per se involved.

When it comes to pre-commitment of resources from associations, the capability of associations to fulfil their liabilities for the duration of the Partnership needs to be secured prior to commitment. However, this securement of pre-commitment has been eroded by the new framework conditions as the number of members terminating their membership will dramatically increase due to the unbalanced financial burden between members and free-riders. In consequence, associations in partnerships in which *only associations* provide the private partners will no longer be capable to fulfil their liabilities.

Before the kick-off of institutionalised partnerships, *Founding Members* will be requested to sign an individual Letter of Commitment to contribute with their *own resources* to the implementation of the partnership's objectives.

Such an approach leads to the following open issues in the planned partnerships:

- One of the roles of members of the respective Governing Board will be to decide on the work programme of the partnership. Given that the private Members of the Governing Board *will apply to calls for proposals* based on this work programme, clarifications are needed to avoid a prospective **conflict of interest** and to **ensure that all Founding Members are entitled to make bids in the open calls**.
- Since the *Founding Members* must engage in competitive calls for all EU funding under the partnership, **a legally binding commitment by companies, RTOs and universities will need to refer to the fact that this is subject to the condition that relevant EU funding is available for the specific entity/organisation as a result of competitive calls for proposals.**

The signatories ask the Commission to clarify the above mentioned two main issues on both pre-commitment in PPP in which associations are the private members and conflict of interests for private partners as Founding Members with respect to calls for proposals.

CONCLUSION AND PROPOSAL

As the partnerships can contribute significantly to solving the industrial problems of the Covid-19 crisis and at the same time to achieving the Commission's objectives (Green Deal, Digitisation), especially through the interaction of industry, RTOs, universities and SMEs, addressing the above-mentioned issues is essential to ensure the smooth operating of partnerships and in particular the protection of established ecosystems, which is a central issue in the preparation of Horizon Europe.

RECOVERY OF EUROPEAN AVIATION: AN URGENT CALL FROM THE EUROPEAN AVIATION SECTOR

EU AVIATION MAPS A SUSTAINABLE, POST-CRISIS FUTURE IN ROUND TABLE REPORT

Over 20 associations representing the entire aviation ecosystem have come together in the **European Aviation Round Table** to establish joint proposals for the recovery and re-launch of air transport. They announced a Joint Commitment to work with policy makers to achieve net zero CO2 emissions by 2050, part of a comprehensive collaboration analysis released on 16 November 2020 detailing ways aviation can recover sustainability and more resilience from the COVID-19 crisis whilst supporting the EU's Green Deal objectives.

They address an urgent call for action to all policy makers in the EU and its member states.

RESTORING PUBLIC CONFIDENCE

Restoring the public's confidence in air transport is an urgent prerequisite for making possible the start of the recovery. An effective coordination of travel restrictions and requirements imposed by member states is needed. The measures to be taken should be based on a common set of criteria, data and guidelines provided by the ECDC (European for Disease Prevention and Control) and the EASA (European Aviation Safety Agency). Consumer protection should also be taken into consideration.

EUROPEAN AVIATION RELIEF PROGRAMME

The Aviation Round Table calls on the EU and its Member States to put in place a targeted European Aviation Relief Programme at European level to rebuild the sector and to preserve the Aviation Single Market. It should cover the period until the recovery of air traffic, which is not expected before 2024-2025. The Aviation Round Table welcomes the recent prolongation of the State Aid Temporary Framework until 30 June 2021 and it expresses the need for its prolongation until at least until the end of 2021 because of the long-lasting impact of the humanitarian crisis. It also calls the introduction of specific support measures for the aviation sector beyond 2021.

The ERRF (European Recovery and Resilience Facility) may provide support for such Relief Programme in the National Recovery and Resilience Plans.

EU PACT FOR SUSTAINABLE AVIATION

The Round Table agreed to that the long-term sustainability of the aviation sector requires a balance between the environmental, social and economic impacts of human activity. So, the EU and its Member States are invited to join the Round Table team in order to define and agree by the end of 2021, an EU Pact for Sustainable Aviation, setting out the steps necessary to guarantee a cleaner and quieter aviation system putting the interests of the people and the aviation workers first.

- **The European aviation sector is committed to continue its efforts to reduce its negative environmental impacts, both locally and globally, and so working together with a view to achieving net zero CO_2 emissions from all flights within and departing from the EU by 2050.**

The pact should chart the path towards net-zero CO_2 emissions by 2050 whilst also achieving significant emission reductions by 2030 so as to strongly contribute to the EU Climate Action objectives. It should specify the supporting facility framework and financial mechanisms needed at EU level to achieve these objectives, in particular a comprehensive EU legislation framework to promote the uptake and deployment of Sustainable Aviation Fuels (SAF), as a key opportunity to accelerate aviation decarbonisation.

- To accelerate technology advances process, he EU should establish a **green incentive scheme** for fleet renewal coupled with retirement, and **increase co-funding rates** for Civil Aviation Research & Innovation - **Clean Sky** and **SESAR** - through EU recovery mechanisms.

Recognition should be given to the revision of the SES (Single European Sky) and the continuation of the ETS (Emissions Trading Scheme) and CORSIA (Carbon Offset and Reduction Scheme for International Aviation).

- **Speeding up digitalisation** is quite essential for modernisation and decarbonisation of the EU aviation system. The Single European Sky (SES) and its upcoming revision play a crucial role in stimulating digital innovations. The EU should prioritise funding for the full SESAR cycle of the SESAR programme – including R&I, industrialisation and deployment - in the EU MFF (Multiannual Financial Framework) 2021-2027. The EU should temporarily increase the ATM research partnership and SESAR deployment funding rates to 100% for aviation stakeholders to ensure continuity for existing projects and adapt regulatory processes to accommodate disruptive technologies, including UAS (Unmanned Aircraft Systems) and UTM (Unmanned Traffic Management) operations.
- The pandemic having had a profound impact on workers, whose needs are reflected in the **social dimension** of the pact.
- Ensuring a resilient sector.

In addition to all above mentioned challenges is the need to **strengthen the resilience of European aviation system against new shocks** beyond the crisis, by tackling its inefficiencies, strengthening its governance and improving its flexibility as well as its overall international competiveness.

All above mentioned actions are presented in detail in the document 'Aviation Round Table Report on Recovery of European Aviation' November 2020.

https://www.asd-europe.org/eu-aviation-maps-a-sustainable-post-crisis-future-in-round-table-report

TENTH SESAR INNOVATION DAYS – 7-10 DECEMBER 2020

The SESAR Innovation Days (SIDs) are the main vehicle for SESAR Joint Undertaking to share progress and disseminate exploratory research results. Unlike other scientific events in ATM research, the SIDs focus explicitly on exploratory research. Organised annually since 2010, the SIDs have become a landmark event in the European aviation research calendar.

Given the current situation with COVID-19 and the associated impact on travel and gathering, the 2020 edition of the SESAR Innovations Days (SIDs) took place online from 7th to 10th of December in a virtual capacity.
Despite not being able to take place as a physical event, over 1,200 representatives from the global ATM communities registered to this event to present their researches and discuss important topics that will define the future of ATM.

THE ROLE OF INNOVATION IN THE TIME OF COVID-19

Altogether the conference featured more than 30 posters and 30 papers covering machine and deep learning techniques to optimise aviation network performance data-driven traffic prediction, climate-optimised trajectories, behavourial economics, drone traffic management altitude zoning, and intermodality modelling, among other research topics.
The concepts presented reflect Europe's vision to make its airspace the most efficient and environmentally friendly sky to fly in the world, and will contribute to the long-term sustainability of the aviation industry and its recovery from the COVID-19 crisis. This was the message delivered by keynote speakers throughout the conference.

"The crisis has severely hit Europe's aviation industry, jeopardising millions of jobs and livelihoods. We do what is necessary to get the industry back on its feet as quickly as possible, but we must do it in a way that supports a sustainable and smart recovery, as well as strengthens the resilience of the sector," **says Henrik Hololei, Director General of the Directorate General for Transport and Mobility (DG MOVE), European Commission, and Chair of the SESAR JU Administrative Board.** "We also need to think long-term by investing in innovation and research to allow us to go towards technologies that will give us a global competitive edge."

"If the COVID19 crisis has shown us anything, it is that we can only deal with challenges if we innovate, think out of the box, take a risk and dream big," **said Eamonn Brennan, Director General, EUROCONTROL, and Vice-Chair of the SESAR JU Administrative Board.** "The crisis of this past year gives us even more reason to look for innovative concepts and solutions to drive the digital transformation that will ensure we can build back better with a sustainable, resilient, and scalable ATM industry able to deliver the services needed for 21st century aviation."

Thanks to the innovation pipeline established in the SESAR research and innovation programme (SESAR 2020), the most promising of the SESAR concepts presented at the SIDs will move into the next phase of research, industrial development, and eventually implementation. This factory-style approach has helped to significantly accelerate the pace of innovation in SESAR 2020.
"The pandemic has highlighted the urgent need to move ahead with the digital transformation of air traffic

[1] The ECHO consortium brings together the leading European industry, organisations, institutes and research centres dealing with on higher airspace operations. The partners are: Airbus UTM (Airbus Operations SL), CIRA, DASSAULT AVIATION, DLR, DSNA, ENAC (Italian NAA), ENAV, EUROCONTROL, ONERA and THALES Alenia Space. This project has received funding from the SESAR Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement No 890417.

management in Europe, to build greater resilience, scalability and sustainability into the system," **said Florian Guillermet, Executive Director of the SESAR Joint Undertaking.** "This not only requires stakeholders to implement the new technologies that are already available, but also to continue to invest in the innovative concepts of the future. For this, the continuing engagement of the ATM research community is essential, harnessing the young talent and collaborations that we see every year at the SESAR Innovation Days. We have a chance to build back better – let's take it!"

For its 10th edition, the SIDs joined forces with two other major aviation events: the ICAO Global Symposium on the implementation of innovation in Aviation, and the ATCA (Air Traffic Control Association) Annual Conference to host a joint panel on higher airspace operations – a new frontier for aviation. A concept of operations for this portion of airspace is currently under development in SESAR 2020 by partners in the ECHO project, which was presented during the panel [1].

YOUNG AVIATION RESEARCH TALENT CHAMPIONED AT SESAR INNOVATION DAYS

Europe's most promising young minds in air traffic management (ATM) research were celebrated at the SESAR Young Scientist Award ceremony, which took place during the closing plenary of the SESAR Innovation Days virtual conference on 10 December.

Awarded annually, the prize aims to recognise young scientists, who have demonstrated excellence in ATM and aviation-related research fields. The award also provides researchers starting out in their career with an opportunity for further professional development. A further objective of the award is to showcase the potential of young talent to formulate fresh ideas and solutions to the challenges facing ATM and aviation.

The award was presented during a virtual ceremony, presided over by Dr.-Ing. Peter Hecker, Chair of the SESAR Young Scientist jury/evaluation, and featured presentations from all three short-listed scientists.

In third place, **Eulalia Hernández Romero**, Universidad de Sevilla was recognised for her research into how available meteorology data can be better integrated into conflict detection and resolution processes – the jury commended the research for trying to solve a very realistic, everyday problem.

Alvaro Rodriguez Sanz, Universidad Politécnica de Madrid (UPM), was awarded the second place for his thesis work on uncertainty management and performance optimisation in airport operations using probabilistic reasoning and reinforcement learning techniques, which the jury described as innovative, scientifically sound and convincing.

Finally, this year's top award went to **Christian Eduardo Verdonk Gallego**, CRIDA, for his research into data-driven trajectory prediction. While the basic concept of trajectory prediction has been extensively studied, the jury commended Verdonk Gallego for adopting state-of-the art approach, broadening the scope of data and operational factors that impact the trajectory and looking at the wider air transport system.

"I want to congratulate all the applicants, short-listed candidates, and Christian Gallego, our overall winner. The fresh thinking that Christian brings to his research and the collaborative spirit he demonstrates through his participation in numerous SESAR projects, makes him an asset for the ATM community," **said Florian Guillermet, Executive Director of the SESAR** Joint Undertaking. "Seeing the talent displayed during this year's SESAR Innovation Days, I am confident that we can deliver innovative solutions to build a smart and sustainable aviation for generations to come!"

AMONG SESAR INNOVATION PROJECTS

PREPARING THE GROUND FOR SAFE AND EFFICIENT HIGHER AIRSPACE OPERATIONS IN EUROPE

Nov. 13, 2020

SESAR partners have started work on a comprehensive demand analysis and concept of operations for higher airspace, with the objective of allowing safe, efficient and scalable operations above the flight levels where conventional air traffic operates. The European concept for higher airspace operations (ECHO) is a two-year SESAR 2020 project, comprising representatives from partners Airbus UTM (Airbus Operations SL), CIRA, DASSAULT AVIATION, the DLR, the DSNA, ENAC (Italian NAA), ENAV, EUROCONTROL, ONERA and THALES Alenia Space.
New airspace users and operations are increasingly emerging in this higher airspace. There is a broad diversity of vehicles, ranging from unmanned balloons, airships and solar planes capable of persistent flight, collectively known as high-altitude platform systems (HAPS) to supersonic and hypersonic aircraft, and trans-atmospheric and suborbital vehicles. Commercial and State space operations are also transiting through the higher airspace for launches and re-entries.

Henk Hof, ECHO project manager at EUROCONTROL said: "*Higher airspace operations represent a unique opportunity for innovation and the ECHO project will help unleash the great potential of this new frontier for flight. I am delighted to be in charge of the coordination in the ECHO consortium, which comprises the leading European industry, organisations, institutes and research centres dealing with higher airspace operations*".

Funded within the framework of Horizon 2020 **(grant agreement No 890417)**, the work of ECHO on the future definition of a European concept of operations for higher airspace will feed into the ICAO global framework, ensuring a global harmonised approach for higher airspace operations. It will also constitute the foundation and the starting point for the development of the future European higher airspace operation regulatory framework by the European Union Aviation Safety Agency (EASA).

BRINGING AI ON BOARD THE ATM TEAM

Nov. 19, 2020

Air traffic management is all about teamwork. A recently started SESAR research project is investigating how to make artificial intelligence an integral part of the air traffic control team, helping to improve situational awareness and decision making in sometimes very complex traffic situations. Read our interview with Prof. Tomislav Radišić, University of Zagreb, Coordinator of the AISA (AI Situational Awareness Foundation for Advancing Automation) project.

Why is artificial intelligence (AI) needed in air traffic management (ATM)? Is the goal to replace the human?
In normal conditions, Europe has to deal with a very complex and busy airspace: automation and AI solutions will obviously not replace the human, but on the contrary; they will ensure that air traffic controllers have the support tools they need to make the best decisions and handle traffic efficiently. In many ways, it's about making AI part of the team! The usage of artificial intelligence is more and more common within automation, and air traffic management as a technology-driven industry is no exception!

How is AI being developed to improve the performance of ATM? Can you give concrete examples?
By combining reasoning engine with machine learning, it will be possible for AI to become aware of the situation in a manner similar to a human. In this way AI will be able to participate in the team situational awareness[1] and therefore this shared situational awareness will be developed for a given traffic situation. ATM will improve using shared situational awareness while AI will, for example, be able to assess complex interactions between objects, draw conclusions and explain the reasoning behind them.

What is meant by shared situational awareness and why is that a challenge in a human-machine interface?
It is clear that shared situational awareness is very important in teams, for example, between the planning and the tactical air traffic controllers. The challenge comes when the system should also be part of the team. For this, the air traffic controller (ATCO) should know what the system knows, and the system should know what information is available for the human. The most interesting part is that the system should know what it does not know, e.g. what is the linked information cluster that is important for the work of the team but it is not directly assessed by the system.

What is the main aim of the AISA project?
The main aim of the project is to investigate if human and machine can work in a team and what are the current and likely future possibilities in this field.

The main project objectives:
- explore the effects of human-machine distributed situational awareness and opportunities for automation of monitoring tasks in en-route operation,
- identify the data needed by air traffic controller to ensure that the proposed solution is correct and develop the method to provide that data,
- investigate methods for adaptation of the automated system to changes of the environment, ensuring business continuity and safety.

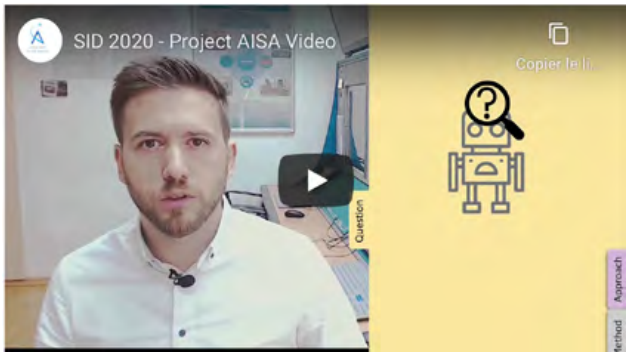
Is this first time such research has been done? Or are you building on previous research?
There is a lot of research ongoing in automation and in the field of AI. In terms of SESAR projects, AISA is built on the former AUTOPACE and BEST projects. On the other hand, the project includes some experiments which will be quite novel in the field of ATM; we will try to produce knowledge graphs (KG) based on the aeronautical data exchange models and combine those knowledge graphs with machine learning to develop KG-based artificial situational awareness system.

What benefits do you hope your project will bring? How do you hope the results of your project will be used?
It is a shared interest among the stakeholders in the European ATM community that new ATM-related methodologies are researched properly, and only validated approaches are taken towards implementation. It is our hope that AISA can bring an important added value to the digital transformation that is underway in ATM.

General additional information on AISA:
The project brings together a consortium of European partners from Austria, Croatia, Germany, Hungary, Spain and Switzerland. The Faculty of Transport and Traffic Sciences at the University of Zagreb is the coordinator of this project and the consortium has four other universities on board: Johaness Kepler University of Linz, Technische Universität Braunschweig, Universidad Politécnica de Madrid, Zurich University of Applied Sciences, an Air Navigation Service Provider: Skyguide and an SME: Slot Consulting. The project started on the 1st of June 2020 and will run for two and a half years.

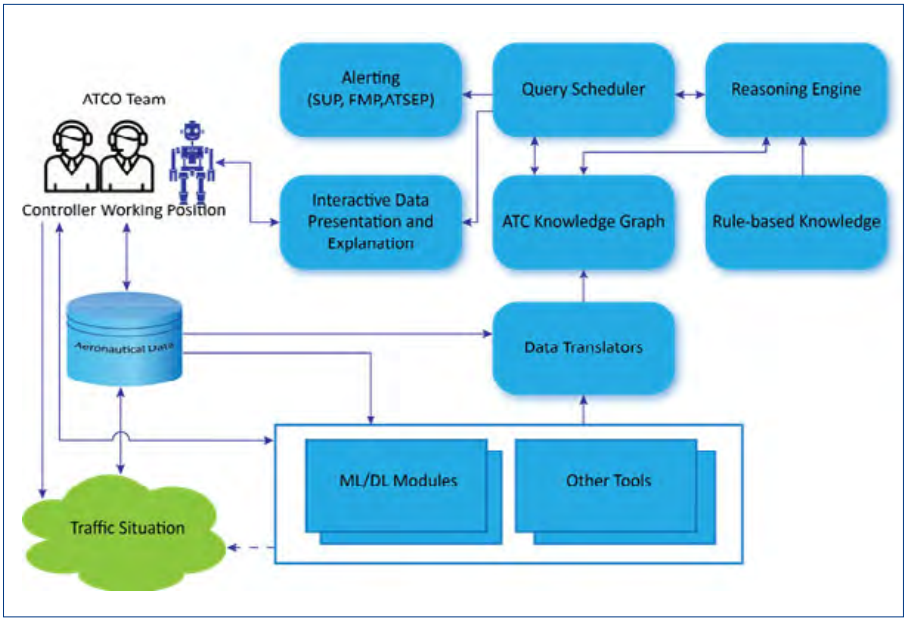
This project has received funding from the SESAR Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement No 892618

To see the video clic on the photo



Project coordinator: Prof. Tomislav Radišić
Email: tradisic@fpz.unizg.hr

Website: www.aisa-project.eu



[1] The level of situational awareness a team can achieve is an overlap of each member's individual level of situational awareness, including the AI.

HYDROGEN-POWERED AVIATION:PREPARING FOR TAKE-OFF

22 JUNE 2020

Hydrogen as an energy source will play a key role in transforming aviation into a zero-carbon / climate-neutral system over the next few decades. **Novel and disruptive aircraft, aero-engine and systems innovations in combination with hydrogen technologies can help to reduce the global warming effect of flying by 50 to 90%.** Moreover, these innovations can help to meet the drastic reduction targets for aviation emissions set out in the EU Green Deal.

A new independent study, commissioned by Clean Sky 2 and Fuel Cells & Hydrogen 2 Joint Undertakings on hydrogen's potential for use in aviation, was presented at an event on 22 June which featured **Adina-Ioana Vălean**, the European Commissioner for Transport, and **Patrick Child**, Deputy Director-General of the Directorate-General for Research and Innovation at the European Commission, as keynote speakers, in addition to leading industry representatives **Stéphane Cueille** (CTO, Safran), **Glen Llewellyn** (VP Zero Emissions Technology, Airbus), **David Burns** (VP Global Business Development, Linde), **Per Ekdunge** (Executive Vice-President, PowerCell) and **Rolf Henke** (Member of the Executive Board, German Aerospace Centre - DLR).

The study found that hydrogen – as a primary energy source for propulsion, either for fuel cells, direct burn in thermal (gas turbine) engines or as a building block for synthetic liquid fuels – could feasibly power aircraft with entry into service by 2035 for short-range aircraft. Costing **less than €18 [$20] extra per person** on a short-range flight, and **reducing climate impact by 50 to 90%,** hydrogen could play a central role in the future mix of aircraft and propulsion technologies.

Such disruptive innovation will require significant aircraft research and development, further development of fuel cell technology and liquid hydrogen tanks, and also investment into fleet and hydrogen infrastructure and accompanying regulations and certification standards to ensure safe, reliable and economic hydrogen-powered aircraft can take to the skies. Industry experts anticipate that it will take 10 to 15 years to make these important advancements, and consequently the research needs to start now. The study estimated that the first short-range hydrogen-powered demonstrator could be developed by 2028 if sufficient investments into R&I are made.

The technical challenges and unique characteristics of hydrogen as an on-board energy source make it best suited to commuter, regional, short-range and medium-range aircraft. For the next decades, long-haul air travel is likely to be based on liquid hydrocarbon fuels; but increasingly these too will need to be sustainable and these 'drop-in' fuels will also rely on hydrogen for their production.

According to the report, the following **policy actions** are needed:

1. An aviation roadmap to guide the transition. This needs to set clear ambitions, align standards, coordinate infrastructure build-up, overcome market failures, and encourage first movers.
2. A strong increase in long-term Research & Innovation (R&I) activities and funding. This would lead to legal and financial certainty for technology development.
3. A long-term policy framework should lay out the rail guards for the sector, including how climate impact will be measured and how the roadmap will be implemented.

Commissioner Adina-Ioana Vălean says: "Hydrogen in aviation offers many opportunities for the transformation of our aviation sector. From production, to distribution, to new aircraft designs and large scale use, it provides numerous opportunities for European companies to be at the forefront of our industrial revolution in the years to come."

"Research and innovation is vital to realise the full potential of hydrogen technologies for decarbonisation of aviation. The EU's future Horizon Europe research and innovation framework programme is a fantastic opportunity to advance this agenda, working in partnership with industry and the research community. The excellent co-operation between the existing Joint Undertakings dedicated to Hydrogen Fuel Cells and Clean Aviation illustrates the need for close synergies between the two sectors as we work together on the ambitious objectives of the post-COVID recovery and the European Green Deal", **says Deputy Director-General for Research & Innovation Patrick Child.**

"Our ultimate goal is to achieve climate-neutral aviation by 2050. Turning this ambition into reality requires the seamless integration of a range of important new technological advancements, one of which is hydrogen-powered aircraft. This comes hand in hand with priorities such as hybrid engines, more electric aircraft, ultra-efficient short- and medium-range aircraft and lighter airframes. The mix of these various game-changing technologies will help us to reach our final destination," **says Axel Krein, Executive Director of Clean Sky 2 Joint Undertaking**.

"The cost of producing clean hydrogen came down in recent years thanks to cheaper renewable electricity and bigger and cheaper production technology. At the same time, fuel cell performance in terms of durability, capacity and cost has made big steps forward. This combination has now made it possible to look to such solutions for decarbonisation of the aviation industry and the results of the study are clear on the huge potential of hydrogen in aviation. The hydrogen and fuel cell sector

is ready to work hand in hand with the aviation industry to design, test and produce the required components and make zero-emission aviation an everyday reality," **says Bart Biebuyck, Executive Director of Fuel Cells & Hydrogen 2 Joint Undertaking**.

PAVING THE WAY TOWARDS CLIMATE-NEUTRAL AVIATION

15 JANUARY 2021

"There's no one silver bullet for clean aviation," said Clean Sky's Executive Director Axel Krein, while giving the keynote address at the American Institute of Aeronautics and Aviation's SciTech Forum on 14th January 2021. "We need a combination of different actors, technologies and measures."
Investment in a suite of different potential technologies is needed if we are to make clean aviation a reality. Transforming flight into a climate-neutral activity is a great technical challenge, and requires investigating a variety of avenues. In his keynote address 'Paving the way towards climate-neutral aviation', Axel outlined the strides that Clean Sky has made and the different technology streams that have been investigated since the programme was started 12 years ago.
Clean Sky's current programme examines many facets of aviation technology, from engine design to aerodynamics to cabins, and the solutions that emerge will combine to create a cleaner, greener form of air transport. If you're interested in discovering those technologies, visit our online stand!
Research carried out to date has identified three main change drivers to make aviation climate-neutral: reduction of aircraft fuel burn, air traffic management and operations, and new fuels. Going forwards, the technical areas that show the most promise for the future are: hybrid and full electric architectures, disruptive technologies for hydrogen-powered aircraft and ultra-efficient aircraft structures.

Over the past decades, with the exception of the 2020 pandemic, the aviation sector has grown rapidly, bringing economic growth, increased job opportunities and better global mobility. One of the issues facing aviation engineers is how to safeguard that growth and opportunities while protecting the environment from more harm.
"The big challenge is how can we keep the positive effects of flying and eliminate the negative effects," said Axel.
Not all aircraft affect the climate equally – 90% of all CO_2 emissions are generated by aircraft that are above 200 seats, while 60% of all CO_2 emissions are generated by flights at altitudes lower than 3000 km. According to Axel, we should be focusing our research efforts on those areas that will help reach our goals quicker.
"We are going to see new aircraft appearing in the market designed for climate neutrality with a small number of seats flying at low altitudes, because that is what's technically feasible," said Axel. He envisions that in the near-future, there will be less long-haul flights and more stopovers, which will mean fewer flights at altitudes above 3000km and therefore less impact on the environment.

Engaging with local projects has been a core part of Clean Sky's agenda to date. Clean Sky supports regional projects by engaging in Memoranda of Understandings with various regions. Although these are locally-funded projects, they are complementary to Clean Sky's objectives and Clean Sky works with regional authorities and local projects to help them to achieve their goals.
On 15th January, Clean Sky will also be presenting Special Sessions during the SciTech Forum. These sessions will feature several Clean Sky demonstrators, such as BLADE, the DRAGON concept, the Iron Bird and RACER, and there will be presentations on greener bizjets, smart fixed wing aircraft, load control, regional multi-mission aircraft, power composites, electrified aircraft technology and more.

TO VISIT THE CLEANSKY STAND (click here):

AMONG PRESENTATIONS

- **DRAGON:** Distributed fan Research Aircraft with electric Generators by ONera
  DRAGON aims to evaluate the benefits and drawbacks of distributed electric propulsion for an airliner -150 passengers at a cruise speed of Mach 0.78.
- **H-E DP TP 50:** Hybrid-Electric Distributed Propulsion TurboProp 50
  Hybrid-electric distributed propulsion concept of non-conventional aircraft technologies
- **SA2 FIR** Simulator of Aerodyanamic Aeroacoustic Fan IntegRation
- **ULTRAFAN** Technology demonstrator for the next generation of Gas Turbine Engines to improve fuel/performance efficiency and reduce environmental impact
- **FLOW CONTROL** Hybrid Laminar Flow Control maintenance demonstrator
- **NGCTR** Next Generation Civil Tilt Rotor
- **TECH TP** Turboprop demonstrator
- **RACER** Rapid and Cost-Effective Rotorcraft

THE FUTURE COMBAT AIR SYSTEM: INTERVIEW WITH PHILIPPE KOFFI, HEAD OF JOINT FRENCH, GERMAN AND SPANISH TEAM OF FCAS PROGRAMME MANAGEMENT

By Jean-Pierre Sanfourche, Editor-in-Chief of AEROSPACE EUROPE

Philippe Koffi *is a graduate of Ecole Polytechnique and of ISAE-SUPAERO. He started his career in 1999 at the French Armament Procurement Agency (DGA) as an engineer in the DGA Hydrodynamics Test Centre.*

In 2003 he moves to the Service for the procurement of Aeronautics Programmes as an aircraft LO expert and in 2005 he was also appointed as the technical Architect of the European nEUROn UCAV Demonstration Programme. In 2008 he was given the management of the nEUROn Project.
In 2011, he joins the Strategy Directorate, where he is in charge of the preparation of future combat aeronautics. He is highly involved in the preparation and in the implementation of the Anglo-French UCAS roadmap within the scope of the Lancaster-House treaty signed in 2010.
In 2014, he becomes FCAS/UCAS Programme Director within the Combat Aircrafts and Equipments Management Unit (UM ACE), in order, in particular, to launch and to pilot the FCAS Feasibility Phase, which Arrangement was signed in Farnborough on 15 July 2014.

In 2018, he launches the Man Machine Teaming (MMT) study to bring Artificial Intelligence technologies into the future fighter cockpit and to federate an innovative ecosystem of startups, SMEs and labs.
After the signature of the Next Generation Weapon System (NGWS/FCAS) Framework Agreement at the 2019 Paris Airshow, he takes the head of the French, German and Spanish Combined Project Team (CPT) Programme Division.

Q1 – *The Future Combat Air System (FCAS) programme is quite essential in view of renewing combat aviation in France, Germany and Spain at 2040 time horizon because of the end-of-service date for Rafale and Eurofighter, the imperative necessity to modernise the art of air war by introducing the highest level new technologies and also to contribute in a decisive manner to advance in the direction of Europe's strategic autonomy. This FCAS programme you are managing is now at a main milestone on the timetable of its development since you are finalizing a very important contract to be be awarded soon to Europe aerospace industry: the so-called "Demonstrator Phase 1B". Before presenting this Phase 1B, may I ask you to give us the historical background of the FCAS?*
A1 – Yes, willingly:

THE BIRTH OF THE PROGRAMME

The programme took in genesis in July 2017 with President Macron and Chancellor Merkel's decision to develop a new generation fighter in cooperation, the so-called **FCAS** (Future Combat Air System).

In late April 2018, at ILA Berlin International Air Show, German Defence Minister Ursula von Layer and French Army Minister Florence Parly officially announced the decision to undertake the development of a New Generation Weapon System (**NGWS**) – within the above mentioned **FCAS**. They signed a High Level Common Operational Requirements Document (**HLCORD**).
So, the FCAS programme was no longer only limited to a new air fighter aircraft, but henceforth was covering a complete combat air system, in fact a broad System of Systems (SoS) including in addition to the **NGF**s, a fleet of Remote Carriers (**RC**) and Unmanned Air Vehicles (UAVs) altogether operating within an Air Combat Cloud. The combinational concepts of "system of systems" and collaborative combat dominate the philosophy of FCAS's architecture.

THE JCS CONTRACT

On 31 January 2019, DGA, on behalf of France and Germany, awarded to Dassault Aviation and Airbus the first transnational study contract related to the FCAS: the Joint Concept Study (JCS). This so-called JCS was based upon the HLCORD. This €65 million worth contract covered a 2-year period.
In June 2019, at Paris Le Bourget Air Show, Spain officially joined the NGWS programme, so marking a significant step towards FCAS's Europeanization. The set-up of the CPT (Combined Project Team) gave a legal framework to the cooperation.

THE PHASE 1A R&T AND DEMONSTRATION CONTRACT

In February 2020, the Demonstrator Phase IA contract

was launched: this was the first step to begin technology and development maturation and to initiate the development of a complete demonstrator. This €155 million worth R&T contract covers an 18-month period. Dassault Aviation and Airbus GMBH together with their partners – MTU Aero Engines, SAFRAN AE, MBDA and THALES – were awarded this Initial Framework Programme. The distribution of tasks was as follows:

- Next Generation Fighter (NGF) with Dassault Aviation as Prime Contractor and Airbus DS as Main Partner;
- Remote Carriers (RC) with Airbus DS as Prime Contractor and MBDA as Main Partner;
- Engines with SAFRAN AE and MTU Aero-Engines as Main partners;
- Combat Cloud (CC) with Airbus Gmbh as Prime and Thales as Main Partner;
- SIMLAB with Dassault and Airbus GMBH as co-contractors.

In July 2020 the contract was amended when Spain (Indra) joined the JCS. In December 2020, Spanish industry entered into the pillars NGF (Airbus SAU), CC (Indra), RC (Satnuis) and Simlab (Indra). Moreover in the end of 2020, the pillars 'Sensors' and 'Stealth' were launched under Spanish leadership: Sensors with Indra Prime, Thales and FCMS Main Partners – Stealth with Airbus SAU Prime, Dassault and Airbus Gmbh Main Partners.

Already today, remarkable achievements have been achieved within a relatively short period of time thanks to a good and trustful collaboration of all partners involved.

Q2 – *I assume that the DEMONSTRATOR PHASE 1B is in the continuity of Phase 1A, but intends to go much further?*

A2 – Yes indeed!

The objective of phases 1B and 2 is the design and development of demonstrators aiming at validating the critical technologies and going up in maturity on the architectures.

Phase 1B: €6 bn worth programme covering period of time from 2021 to 2027

In order to ensure continuity, this long-term contract will be of course much more efficient than a succession of short-term contracts with the risk of discontinuities and in addition requiring repeated political approval. It implies a perfect reciprocal understanding between the three partners – France, Germany and Spain – based upon a "Joint Industrial Defence Strategy" including a provisional schedule of the different joint projects.

Objective: inaugural test-flight of technology demonstrators in 2027.

Structure: The 7 pillars and corresponding industrial leadership

The demonstrator Phase 1B is structured around 7 pillars:

- Pillar 1: NGF (combat aircraft) – Prime Contractor Dassault Aviation, Main Partner Airbus GmbH + Airbus SAU
- Pillar 2: NGF engine - Prime Contractor: Joint Venture SAFRAN AE-MTU, Main Partner ITP
- Pillar 3: Remote Carriers (RC) - Prime Contractor Airbus GmbH, Main Partner MBDA + SATNUIS
- Pillar 4: Air Combat Cloud (ACC) – Prime Contractor Airbus GmbH, Main Partners:, INDRA THALES
- Pillar 5: SIMLAB – Co-Contractors: Dassault Aviation, Airbus GmbH and INDRA.
- Pillar 6: Sensors – Prime Contractor INDRA (Spain) , Main partners : THALES, FCMS (German Diehl Consortium)
- Pillar 7: Stealth – Prime Contractor Airbus SAU – Main partners: Dassault Aviation, Airbus GmbH

The item 0: Phases 1B and 2 also include operations related studies to define the operational sytems of 2040. The studies are not included in a pillar but in what is named "Item 0". The latter also includes the interpillar coherence.

General considerations

The Phase 1B contract takes into consideration the speed at which technology is progressing, not only in combat aviation, but also artificial intelligence, data exchanges, combat cloud, electronic war and hyper-speed missiles. Artificial Intelligence (AI) is considered as a transversal pillar of the FCAS to be developed with the widest possible domain of utilisations.

The so-called "Air Combat Cloud" is deemed essential and a key enabler for the collaborative combat.

In September 2020, 5 architectures have emerged within JCS as the most promising ones. They will be the basis for the Phase 1B works. Their evaluation will be conducted with simulation tools (SIMLAB). The reflections about the operational concepts is somehow disconnected from the works directly related to the different demonstrators: NGF, HGF engine, remote Carriers, etc… but also strongly coupled: this "operational" work will help identifying new technology needs all along the demonstration phase and in return, phases 1B & 2 outputs will help consolidating the concept selection carried out in Item 0.

Concerning the overall FCAS management, the implementation of a highly structured industrial organisation has been set up, with a Prime Contractor and main Par-

Artist view of the Next Generation Fighter ©Dassault Aviation

The AI-based air defence network by 2040 will consist of a new generation of fighter jets accompanied by swarms of drones. A 'Combat Cloud' will then to ensure networking with other units on the ground and in the air.

tners appointed for each of the seven pillars while maintaining a fair overall industrial balance: as a matter of fact, a balanced and effective industrial cooperation is a key condition for success.

Q3 – *Could we review the major challenges to be taken up?*

A3 – It is impossible to answer this question in detail, it would be too long. Let me simply give you a brief summary.

Among major technology challenges

- NGF - The best possible compromise between stealth and manoeuvrability is to be found and validated. The test flight of a first NGF is expected to take place in mid-2027.

- NGF Engine: The new propulsion system development will be conducted through a series of technology demonstrators corresponding to the different parts of a jet engine (intake, compressors, combustion chamber, nozzle), in fact a development by parts.

- REMOTE CARRIERS (RC) - Two categories of UAV are to be developed: small and large. Swarming and manned-unmanned teaming will be the main challenges here. A first RC demonstration is planned to take place in 2027.

- AIR COMBAT CLOUD (ACC) – The ACC is conceived as a system including connectivity layer, communication services, computing resources and collaboration services, all based upon AI. First in-flight demonstrations are programmed for 2027.

- SIMLAB – The simulation laboratory bears very urgent and critical activities. It is based upon live virtual concept, the virtual reality concept ("digital twins"). Basic bricks already exist and the works are being conducted with 2023 as target for enter into operation.

- SENSORS – 15 demonstrators are being foreseen among which Radar, Electronic War, Optronics,... The overall concept is a series of sensors set in network, with highly performing data merging systems. A first in-flight demonstration of the series of sensors is planned to take place in 2027.

- STEALTH: Considerable advances had been achieved within the framework of the UCAV "nEUROn" programme in the recent years but it is mandatory to go significantly further for the NGF and potentially Remote Carriers.

Q4 – *What is the status of advancement of the DEMONSTRATOR PHASE 1B preparation?*

A4 - The negotiations with governments and industry are in process of conclusions and we will be preparing the presentation of the contract to the German Bundestag and to the French and Spanish Administrations for getting official political approval. Shortly after approval, the different contracts, already prepared, will be awarded.

Q5 –*Phase 1B covers 2021-2024, Phase 2 covers 2024-2027, what will happen next?*

A5 – Then we will go towards the SoS demonstration and the end the complete FCAS completion.

THE SOS DEVELOPMENT

The operational programme will be launched after completion of Phase 2 in conjunction with Phase 3 of the demonstration programme. It will start with the Preliminary Design Review (PDR) of the overall NGWS System of Systems (SoS). An architecture will be definitely selected and the allocation of performances as well as the interfaces will be set. Of the architecture finally chosen, all interfaces will be defined in 2028.

2040: COMPLETION OF THE FCAS PROGRAMME

At this date, the FCAS will replace the combat aviation of France, Germany and Spain in 2040. This will be a considerable step forward Europe's strategic autonomy.

Q6 - *Is it planned to enlarge the FCAS programme to new European countries in future stages (post-2026 after phase 1B completion)? And do you plan to develop synergies with European instruments of defence: EDF (Euro-*

pean Defence Funds), PESCO, ... Will you be in relationship with the EC, EDA , OCCAR, NATO Europe?
A6 – New potential partnerships will be decided in due time. Meanwhile, we will apply for European Defence Funds (EDF). We are currently setting the scope of EDF projects. There are many benefits:

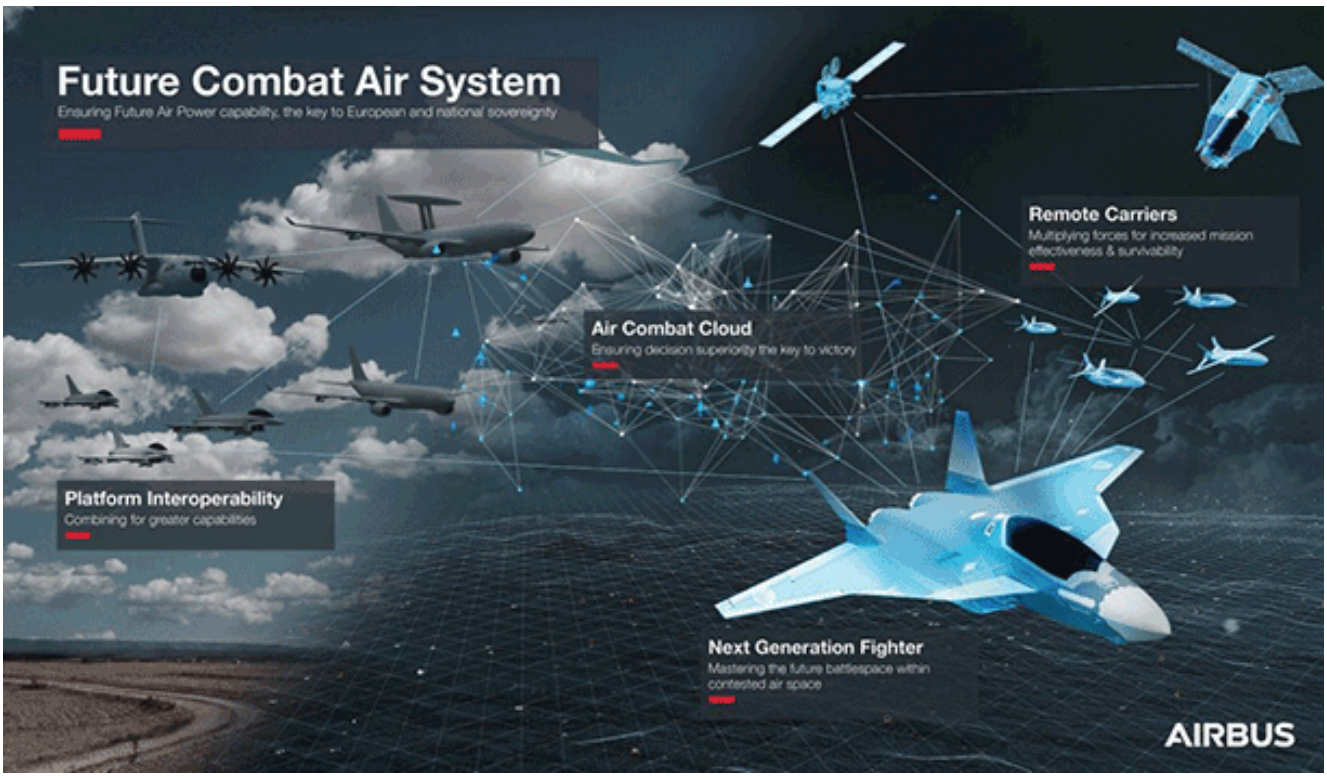
- Boosting the European Defence;
- Paving the way to new partnerships for NGWS;
- Building a true European innovative ecosystem.

Q7 – *Could you briefly present the structure and organisation of your FCAS Management team?*
A7 – The Framework Arrangement signed in June 2019 has set the governance of the project.

The Combined Project Team (CPT) acts directly under the command of the NGWS Steering Committee, which is the decision level. We are the implementing level of the project, which means that we represent the customer party in front of the Industry for the management of on going studies (Joint Concept Study, Phase 1A) and the negotiation of future phases (phases 1B and 2). Representing the customer means that the CPT is providing the companies with a single position, and not 3 national views. That's the crucial role of the CPT: harmonizing the different positions of Germany, Spain and France, in order to find the best acceptable consensus.

Within the CPT, there are 2 main divisions: The Programme Division which I led as Programme Director, and the Operational Division led by a French Air Force Colonel. The Programme Division is especially in charge of the management, negotiation and preparation of the contracts in close link with the French DGA. We are also responsible for the technical, financial and security matters.
The Operational Division is taking care of the good understanding and good consideration of the operational needs & operational requirements of the 3 PNs by all the stakeholders and first of them the Programme Division and the Industry.
Currently, 24 members are sitting in the CPT (13 + 5 + 6). And the target is to get 39 members by the next summer (including 12 DEU and 12 SP representatives).

Q 8 – *How would you like to conclude our interview?*
A 8 – NGWS is the way to maintain the edge of French and European Combat Aviation in the next decades and to bring us in a new era. The era of connectivity, data and artificial intelligence. It will foster new ways of working and new relationships with the innovative ecosystem.
I am confident we are at the start of an amazing challenge. An amazing adventure.



The four main components of the Future Combat Air system: NGF (New Generation Fighter – Remote Carriers – Air Combat Cloud – Platform Interoperability ©Airbus

MARS2020: A GIANT HISTORICAL SPACE MISSION

By Jean-Pierre Sanfourche

On the long way of Mars Exploration, which started in the 1960s, the extraordinary successful Mars2020 'PERSEVERANCE' mission marks a new step forward.

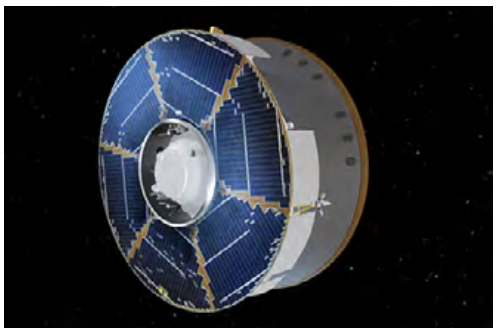
FROM LAUNCH TO LANDING ON MARS SURFACE

For more informations :
https://mars.nasa.gov/mars2020/timeline/overview

LAUNCH

The Perseverance rover was launched on 30 July 2020 at 11:50 UTC on an Atlas V-541 rocket from Launch Complex 41 at Cape Canaveral Air Force Station, FLO. Atlas V-541 is one of the largest rockets available for interplanetary flight.

CRUISE AND APPROACH



The cruise phase begins after the spacecraft separates from the rocket. The spacecraft departs Earth at about 39,600 km/h. The trip to Mars is about 480. 106 km and lasted approximately 7 months. During the cruise phase, the engineers performed correction manoeuvres to adjust the flight to ensure that the spacecraft will enter the mars atmosphere at just the right spot to land inside the Jezero Crater, the landing site which had been so carefully determined by the scientists.

ENTRY, DESCENT AND LANDING (EDL)

On 18 February 2021 Perseverance rover makes its final descent to Mars, which comprised 12 steps: Cruise Stage Separation at 20:38 UTC - Atmospheric Entry - Peak Heating - Peak Deceleration - Parachute Deployment - Heat Shield Separation - Radar Activation - Terrain Relative Navigation (TRN) Solution – Back shell Separation - Powered Descent - Rover Separation/Sky Crane – Touchdown at 22:55 UTC. The approach was called a 'Sky Crane manoeuvre' for lowering the rover on a tether to the surface during the final seconds before landing. The landing system included new high-level technologies, in particular the Terrain Relative Navigation (TRN) system.
The rover has landed on its predetermined spot with around 4 meters accuracy!
A microphone allowed engineers to analyse entry, descent and landing and could also capture sounds of the rover at work.

Watch online https:
//mars.nasa.gov/mars2020/timeline/landing/watch-online/

SURFACE OPERATIONS

After landing, the rover has a primary mission span of at least one Martian year (687 Earth days). It uses a depot caching strategy for its exploration.
The Perseverance rover long-range mobility system allows it to travel on the surface of Mars over 5 to 20 km. It carries a drill for coring samples. It gathers and stores the cores in tubes on the surface, using 'depot caching'. The latter is a new rover capability of gathering, storing and preserving samples, potentially paving the way to retrieve the samples and ferry them to Earth for laboratory analysis.

Perseverance will test a technology for extracting oxygen from Mars atmosphere, which is 96% CO2. It also monitors weather and dust.

In brief, there are four major scientific objectives:

1. *Looking for habitability:* to find rocks that form in or were altered by, environments that could have supported microbial life in Mars ancient past.
2. *Seeking bio-signatures:* to find rocks capable of preserving chemical traces of ancient life (bio-signatures), if any existed.
3. *Caching samples:* to drill core samples for about 30 promising rock and 'soil' (regolith) targets and cache them on the Mars surface.
4. *In view of future human exploration missions:* to test the ability to produce oxygen from the CO_2 Mars atmosphere.

ON 18 FEBBRUARY 2021 AT 20:55 UTC, PERSEVERANCE ROVER TOUCHED DOWN ON MARS

Front-Row Seat to Landing on Mars

Thrilling footage from Perseverance rover chronicles major milestones during the final minutes of its Entry, Descent and Landing on Mars on 18 February 2021. It can be seen how the spacecraft plummeted, parachuted and rocketed towards the surface of Mars.

Download Video :

https://mars.nasa.gov/news/8870/nasas-mars-perseverance-rover-provides-front-row-seat-to-landing

Official NASA Video, 22 February 2021

A first image of the surface of Mars

A high-resolution version of a video taken by several cameras as the Perseverance rover touched down on Mars.

THE PERSEVERANCE ROVER IN A FEW WORDS AND FIGURES

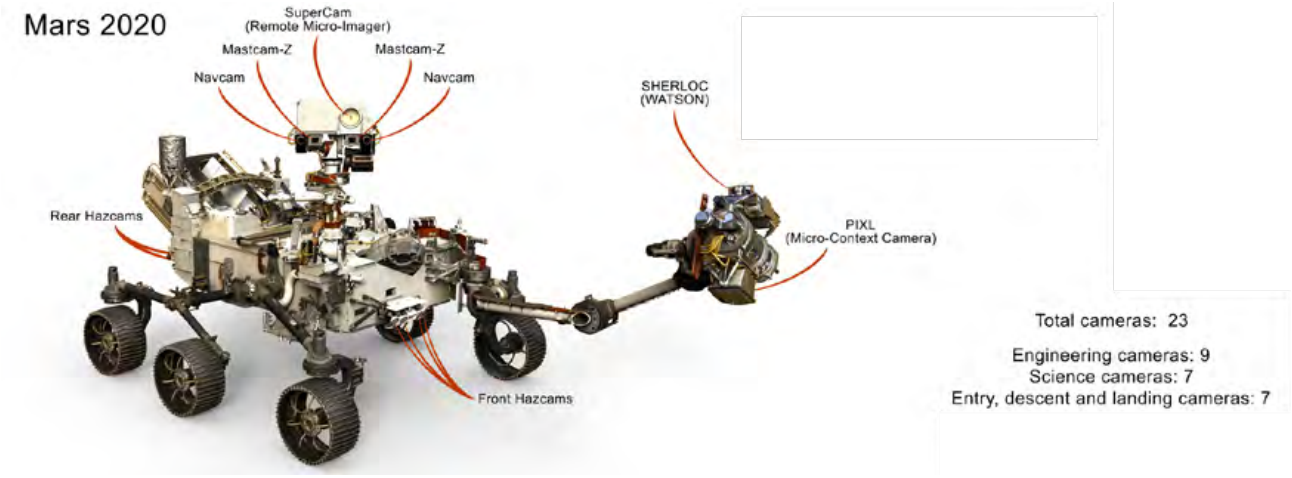
Front-Row Seat to Landing on Mars

Thrilling footage from Perseverance rover chronicles major milesto

View of Perseverance from the skycrane during landing

Other name(s)	Mars 2020 rover *Percy*
Type	Mars rover
Manufacturer	Jet Propulsion Laboratory
TECHNICAL DETAILS	
Length	2.9 m (9 ft 6 in)
Diameter	2.7 m (8 ft 10 in)
Height	2.2 m (7 ft 3 in)
Launch mass	1,025 kg (2,260 lb)
Power	110 W (0.15 hp)
FLIGHT HISTORY	
Launch date	30 July 2020, 11:50:00 UTC[1]
Launch site	Cape Canaveral, SLC-41
Landing date	18 Feb. 2021, 20:55 UTC[2]
Landing site	18.4447°N 77.4508°E, Jezero crater
Total hours	334 since landing[2]
Distance traveled	0 km (0 mi)[3] as of 23 February 2021
INSTRUMENTS:	EDL cameras • Hazcams-Mastcam-Z • MEDAMicrophones • MOXIE • Navcams • PIXL • RIMFAX • SHERLOC • SuperCam

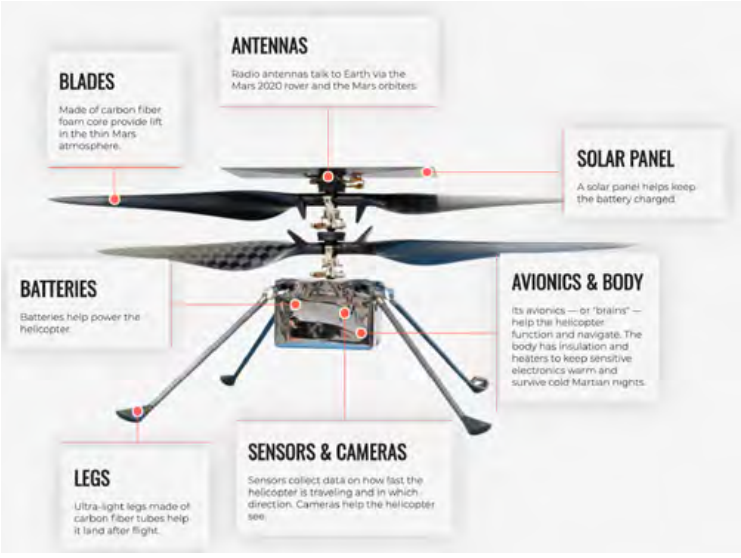
THE CAMERAS ON PERSEVERANCE



The Perseverance rover has several cameras:
- Descent image cameras to help landing
- Engineering cameras to serve as human eyes on the surface to drive around;
- Science cameras to perform scientific observations and help to collect samples.

Europe's Technology on board of Perseverance: SuperCam

Among science cameras there is SuperCam, a high-tech instrument including a camera two lasers and four spectrometers. It will determine fine scale mineralogy, chemistry, and molecular composition of samples encountered on Mars that could hold bio-signatures of past microbial life. It is capable of remotely clearing away surface dust and giving a clear view of the targets.
It has been conceived and developed by a consortium of French scientific research laboratories and CNES, the French Space Agency, is responsible towards NASA for all SuperCam operations. https://mars.nasa.gov/mars2020/spacecraft/rover/cameras/



Scheme of the robotic helicopter Ingenuity

INGENUITY

Ingenuity is a robotic rotorcraft which will be used to test the technology necessary to scout targets of interest on Mars, and help plan the best driving route for future Mars rovers. It will be deployed 60 days after landing of Perseverance, i.e. around 18 April 2021.

Type	UAV helicopter
Manufacturer	Jet Propulsion Laboratory
TECHNICAL DETAILS	
Dimensions	Fuselage (body): 13.6 cm × 19.5 cm × 16.3 cm (5.4 in × 7.7 in × 6.4 in)[1] Landing legs: 0.384 m (1 ft 3.1 in)
Diameter	Rotors: 1.2 m (4 ft)
Height	0.49 m (1 ft 7 in)
Landing Mass	Total: 1.8 kg (4.0 lb) Batteries: 273 g (9.6 oz)
Power	350 W
FLIGHT HISTORY	
Launch date	30 July 2020, 11:50:00 UTC
Launch site	Cape Canaveral, SLC-41
Landing date	18 February 2021, 20:55 UTC
Landing site	18.4447°N 77.4508°E, Jezero crater
INSTRUMENTS:	Inertial · sensorsLaser · altimeterNavcam × 2

JPL's Mars Helicopter insignia

ABOUT EUROPE'S PARTICIPATION TO THE NASA'S ARTEMIS PROGRAMME

WITH THE ARTEMIS PROGRAMME, NASA WILL LAND THE FIRST WOMAN AND NEXT MAN ON THE MOON BY 2024

• ORION

NASA's Orion spacecraft will serve as the exploration vehicle that will carry the crew to space, provide emerging abort capability, sustain the crew during the space travel, and provide safe re-entry from deep space return velocities. Orion will be launched on NASA new heavy-lift rocket, the Space Launch System (SLS) rocket.

NASA's Orion spacecraft at Kennedy Space Center

An artistic view of NASA's Space Launch System

• THE EUROPEAN SERVICE MODULE

The European Service Module (ESM) is the service module component of the NASA's Orion spacecraft, serving as its primary power and propulsion component unit until it is discarded at the end of each mission.

Its development was undertaken by ESA in 2013, based on the ESA's ATV (Automated Transfer Vehicle). It was delivered by Airbus DS in Bremen at the end of 2018.

The ESM supports the Crew Module from launch through separation prior to re-entry. It provides in-space propulsion capability for orbital transfer, attitude control, and high altitude ascent aborts. It maintains the temperature of the vehicle systems and components. It also can transport unpressurized cargo and scientific payloads.

European Service Module

Main figures related to the ESM:

• Total Launch Mass of ESM: 13,500 kg for the Lunar missions (Orion will weigh over 20 tonnes in total)
• Usable propellant: 8,600 kg
• Nitrogen: 30 kg
• Oxygen: 90 kg
• Payload volume: up to 0.57 m3
• Payload mass: up to 380 kg

The European Service Module is ESA's contribution to NASA's Orion spacecraft. It provides electricity, eau, oxygen and nitrogen, as well as keeping the spacecraft at the right temperature and on course.
This European Service Module will fly on the upcoming NASA's ARTEMIS Moon Missions.

• THE PHASE ONE OF THE ARTEMIS PROGRAMME COMPRISES 3 MISSIONS: Artemis-1, Artemis-2 and Artemis-3

• Artemis-1: expected launch November 2021

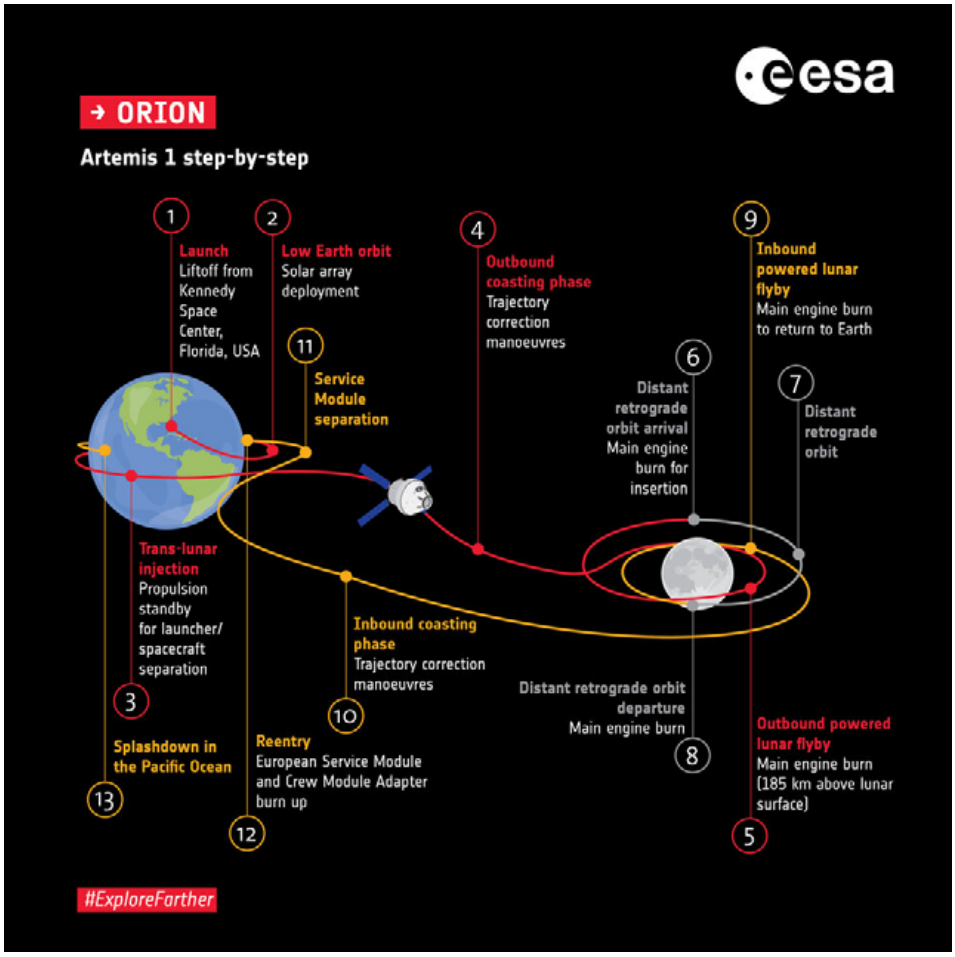
Called Artemis-1, the first mission for Orion and the **European Service Module (ESM)** will send the spacecraft beyond the Moon and back. It will not carry a crew but instead will be controlled from the ground. It will be the first integrated flight test of NASA's Deep Space Exploration System: the Orion spacecraft, the Space Launch System (SLS) rocket, and the newly upgraded Exploration Ground System at KSC.

Artemis-1 will be launched by the SLS from Kennedy Space Center (KSC). The spacecraft will enter into a Low Earth Orbit (LEO) before the rocket's upper stage fires to take it into a translunar orbit.

The spacecraft will perform a flyby by the Moon, using lunar gravity to gain speed and propel itself 70,000 km beyond the Moon almost 500,000 km from Earth, further than any human has even travelled.

On its return, Orion will do another flyby of the Moon before landing back to Earth. The total trip will take about 20 days, ending in a splashdown in the Pacific Ocean, without the ESM because it separates before and burns up harmlessly in the atmosphere.

Artemis-1 step-by-step



• Artemis-2: Expected launch August 2023

NASA's Orion spacecraft, powered by the ESM is an exploratory vehicle designed for longer duration flights beyond the Moon.

Following Orion's Artemis-1 during which the spacecraft will travel beyond the Moon, enter a distant retrograde orbit around the Moon and return to Earth unmanned, Artemis-2 will see a **crewed spacecraft** complete a slightly different path.

Artemis-2 will have a similar plan, but **with 4 astronauts**. Other additions in the crewed module include crew displays and full like support.

Like Artemis-1, Orion's second mission will be launched from KSC, currently scheduled for 2023. Once in LEO, the Interim Cryogenic Propulsion Stage (ICPS) will fire to insert the spacecraft into highly elliptical demonstration orbit around the Earth at its furthest point they will have over 2,200 km above the Earth. Whereas in the first mission the ICPS fired Orion into its lunar orbit, **For Artemis-2 it will be the European Service Module that will give the spacecraft its final push to inject into translunar orbit**.

The crew will fly Orion to 8,889 km beyond the moon before completing a lunar flyby and returning to Earth. The mission will take a minimum of 8 days and will collect valuable flight test .

• Artemis-3: Expected launch October 2024

It will be the last mission of Artemis Phase One and the second crewed mission of this Phase One. **It will land 2 astronauts on the surface of the Moon for about one week**. Mission's duration = 30 days.

J.-P. S. Summary written on the basis of NASA and Wikipedia information

TRAFFIC RULES ARE ALSO NEEDED IN OUTER SPACE

16. Feb 2021

Frank Löber – Consuting Service and Space traffic Expert at CGI ©CGI

Darmstadt, February 16, 2021 – So far at le ast, little has been done to impose order on spacecraft in space. But political and technological changes, as well as the introduction of mandatory traffic rules for vehicles in earth orbit, are essential for preventing devastating accidents in space, according to CGI (NYSE: GIB) (TSX: GIB.A).

A global system for regulating aviation has long been the status quo – prior to the Covid-19 pandemic, more than 200,000 aircraft flew every day. All of the world's countries are integrated into the system, which is designed to coordinate all flight movements in order to maximize safety.
Although this is a matter of course for air traffic, nothing similar yet exists for space. Conditions there are still like aviation in the Charles Lindbergh era, when no one could yet imagine today's crowded airspace. But conditions in outer space are now heading in the same direction, as the number of human made objects beyond the earth's atmosphere rapidly increases.

Some 2,800 functioning satellites are currently orbiting the earth, more than ever before. It would be nearly impossible to imagine everyday life without them, since they play vital roles in telecommunications, navigation, environmental monitoring and efforts to respond to natural disasters, among other things. And the number of satellites and the services they enable is rising constantly with the increasing digitization of technology. This trend is no longer being fueled exclusively by established organizations such as NASA and the European Space Agency (ESA); private companies are also entering the fray. SpaceX, for example, has launched its Starlink project with the goal of building a network of thousands of small satellites to provide broadband Internet access to large parts of the world. Blue Origin is another example.
"The risks may still seem negligible right now, but in fact the accelerating growth of the satellite population has already created an urgent need for action," says Frank Löber, CGI's Director of Consulting Services and a space traffic expert at CGI in Darmstadt. "The European Space Agency alone already has to carry out collision avoidance maneuvers every month to prevent accidents. Worldwide cooperation is crucial for preventing collisions and large-scale accidents in space in the long run."
According to CGI, there is an urgent need to establish a global space traffic management system – analogously to the existing, reliably functioning air traffic management system that is accepted by all of the earth's nations. It should not only target satellites and spacecraft, but also space debris. "In connection with the support CGI has provided to space agencies over the past few decades, we have been able to experience first-hand the challenges associated with the accumulation of space debris," says Löber. "With projects and IT consulting work, we're already helping to mitigate the problem and arrive at a workable international solution."

First and foremost, the technological prerequisites must be met. This includes developing a global communication network, standardizing file formats, interfaces and communication protocols, setting up data links to all relevant observation platforms and databases, and implementing cybersecurity measures. Countries and private companies that are active in space also have to make a commitment to connecting to this IT network and applying the associated standards and protocols.
Besides addressing the technological issues, it's therefore also necessary to clarify the legal situation. Although more than 100 countries have ratified the Outer Space Treaty, there are still a number of countries with their own space laws. Yet in the long term, space traffic can only be effectively managed on the basis of unambiguous, internationally accepted legislation.
A global strategy, coordination and standardization can make it possible to view spacecraft, satellites and their paths and greatly facilitate communication between the responsible parties if two objects look likely to collide. "Unfortunately, we are still a long way from that," says Löber. "In many cases, space agencies and satellite operators often still have no choice but to identify satellites by searching the Internet and then communicate with their operators by email or phone. This situation will be untenable over the medium and especially long term; unless it changes, major accidents in outer space are waiting to happen."

PRESS CONTACT

CGI Deutschland B.V. & Co. KG
Sabine Ernst
Media Lead Deutschland
T: +49-151-16360469
sabine.ernst@cgi.com
https://www.cgi.com |
https://www.de.cgi.com

PR-COM
Andrea Alton
Senior Account Manager
Tel. +49-89-59997-705
andrea.alton@pr-com.de
www.pr-com.de

THE EREA BEST PAPER AWARD

THE TRADITIONAL EREA ANNUAL EVENT WAS HELD ON 16 NOVEMBER 2020

On 16 November, the EREA representatives welcomed about 80 participants from the European Parliament, European Commission, and National and regional Ministries as well as representatives from industry and research organisations.
The keynote speaker was Carlos Pires, member of Commissioner Mariya Gabriel's Cabinet.
The panel discussion focused on climate-neutral aviation in 2050 and how that can be achieved with the European Commission.

THE EREA BEST PAPER AWARD

EREA and its institutes are home to Europe's best and brightest over 16,000 professionals work on innovation every day. To celebrate this talent, each year EREA awards the best paper written by EREA collragues.
This year at the Top 3 we find:

1. **Majd Daroukh, Cyril Polasek and Alain Chelius, from ONERA (France)**, with 'Shock wave and radiation from a turbofan engine under flow distorsion'

2. **Philipp Bekemeyer, Matteo Ripepi, Ralf Heikrich and Stefan Görtz from DLR** (Germany), with 'Non-linear Unsteady Reduced-Order Modelling for Gust-Load Preditions'

3. **Etienne Terrenoire (ONERA France), Didier Haglustaine (University Paris-Saclay France), Thomas Gassner (International Institute for Applied Systems Analysis (IISA Austria) and Olivier Penahoat (Safran Aircraft Engines France)** with 'The Contribtion of Carbon Dixide Emissions to Future Climate Change'
Here below is the abstract of paper n° 1.

SHOCK WAVE GENERATION AND RADIATION FROM A TURBOFAN ENGINE UNDER FLOW DISTORTION

M. Daroukh, C. Polacsek,† and A. Chelius‡
ONERA–Paris Saclay University, F-92322 Châtillon, France

This paper presents aeroacoustic investigations on a full-scale ultrahigh-bypass-ratio engine with inflow distortion at transonic conditions. Computational fluid dynamics (CFD) simulations are first realized to compute the shocks in the vicinity of the fan. These shocks are then radiated in the near field thanks to computational aeroacoustics (CAA) simulations. The chaining between CFD and CAA simulations is done by injecting the shocks in terms of usual conservative variables using a nonreflecting boundary condition. The CAA solver is based on the nonlinearized Euler equations, which allows definition of the CFD/CAA interface close to the fan where the propagation of shocks is highly nonlinear. Both shock generation and propagation mechanisms are investigated, and the effects of inflow distortion are highlighted by comparison with a baseline case without distortion. The flow distortion is shown to be responsible for a modification of shock amplitudes along the circumferential direction. Thus, azimuthal modes appear in addition to the rotor-locked mode present without distortion. A particular feature of the studied configuration is the presence of a supersonic flow region in the bottom part of the nacelle. This supersonic pocket blocks the shocks in the lower half of the nacelle and modifies the angle at which they leave the nacelle in its upper half. Consequently, the far-field radiation (obtained using Kirchhoff's integral method) is mainly oriented skyward and toward the side of descending blades. Acoustic power estimates are provided to quantify these effects.

• *Research Engineer, Department of Aerodynamics, Aeroelasticity, and Aeroacoustics; majd.daroukh@onera.fr*
• *Research Engineer, Department of Aerodynamics, Aeroelasticity, and Aeroacoustics; cyril.polacsek@onera.fr*
• *Research Engineer, Department of Aerodynamics, Aeroelasticity, and Aeroacoustics; alain.chelius@onera.fr*

Published in AIAA journal
Vol. 58 n°2 - February 2020

THE BEST PHD AWARD 2020 OF THE CLEANSKY ACADEMY

The Award is part of the Clean Sky Academy, a Clean Sky initiative whose goal is to strengthen the link between academia and inspire young engineers to cast their eyes towards innovative solutions for greener aircraft.
In 2020, the best PhD Award has been officially presented online at the prize-giving ceremony held on 6 October.

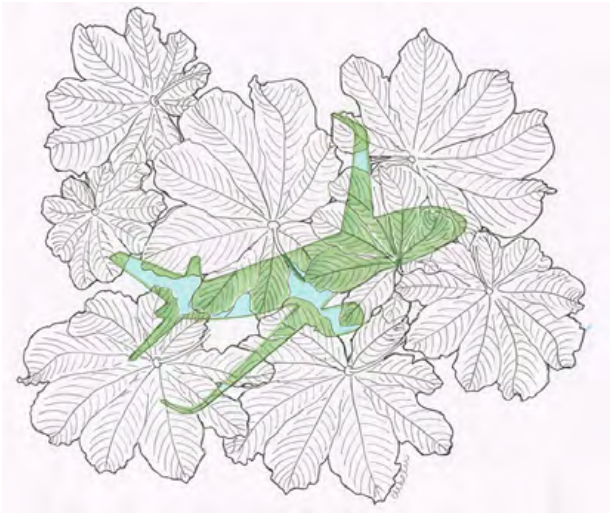
SAVE THE DATE: CLEAN SKY'S SPRING EVENT

22 April 2021
Online

Clean Sky's Spring Event will be coming to you in a digital format on 22 April 2021! Featuring contributions from leading experts from the aviation industry, academia, research centres and SMEs, we expect lively discussions about the future of sustainable aviation. Save the date and stay tuned for more!

YOUNG INNOVATORS TAKE CENTRE STAGE AT CLEAN SKY'S BEST PHD AWARD 2020

06 October 2020



Today, representatives from the aviation industry, academia, research institutions, SMEs and the public sector gathered online to celebrate the brilliant young minds of three innovative students who won **Clean Sky's** prestigious **Best PhD Award 2020**.

Each year, the Award recognises PhD candidates whose work reflects the values of Clean Sky and will bring us closer to achieving Clean Sky's ambitious goal: **climate-neutral aviation by 2050**.

Dr Hossein Balaghi Enalou was awarded first prize for his innovative work on the *"Electric Power Transfer Concept for Improved Performance of Multi-spool Turbofan Jet Engine"*, while **Dr Fedor Fomin of Helmholtz-Zentrum Geesthacht (HZG)** came second, with *"On the fatigue behaviour and modelling of fatigue life for laser-welded Ti-6Al-4V"*. Third place went to **Dr Pedro Magalhães de Oliveira** of the **University of Cambridge** for his thesis: *"Ignition and propagation mechanisms in kerosene spray flames"*.

All three prizewinners are "moving the needle forward" – as **Grazia Vittadini**, the **Chief Technology Officer** at Airbus put it – towards sustainable aviation. Enalou's new engine model, for example, showed a significant improvement in engine performance, resulting in a fuel consumption reduction of up to 2% and surge margin increase up to 5%.

"It's very important to recognise the talent of our young scientists and they serve as an inspiration for the community," said **Patrick Child, the Deputy Director-General of the European Commission's Directorate-General** for Research and Innovation. "Today's students are tomorrow's scientists and engineers."
"Young innovators have a huge role to play in sustainable aviation," said **Clean Sky's Executive Director Axel Krein**, before wishing them a "smooth flight" onwards on their career path.
All three of the students said that strong links between their universities, research institutions and the aviation industry were key to their success. Dr Fedor Fomin stressed that the close collaboration that he experienced between his university and the aviation industry enabled him to tackle real-world challenges. "It helped us to solve industrial problems from a research perspective," he said.
According to several of the panellists and prize-winners, Clean Sky is the ideal vehicle through which to channel innovative research in sustainable aviation thanks to its public-private structure.

"Clean Sky Joint Undertaking has had a leading role in pushing the boundaries of sustainable aviation since its creation," said **Dr Magalhães de Oliveira**.

"The aviation community is a close family, and Clean Sky provides a great platform to bring students and researchers on board," said **Prof. Andreas Strohmayer, the Head of the Department of Aircraft Design, University of Stuttgart and Chairman of the European Aeronautical Sciences Network (EASN).**

"Clean Aviation is THE R&D flagship!" declared Grazia Vittadini, referring to the potential successor of Clean Sky. She believes that a collaborative approach, like the one taken by Clean Sky, is needed to drive sustainable aviation innovation forwards.

"Nobody will manage on their own, no company, no nation. We cannot achieve these feats without a multilateral approach together with our European partners. The budget currently allocated to Horizon Europe could be more ambitious," she said.

Michel Peters, CEO of Royal NLR and Chairman of the Association of European Research Establishments in Aeronautics (EREA), said that open innovative environments should become standard. "There should not be any barriers between industry and researchers," he said. "We should challenge the young people – with moonshot programmes!"

The Clean Sky Best PhD Award is an initiative of the **Clean Sky Academy**, which aims to encourage young engineers and innovators to come up with solutions to the challenges of sustainable aviation. The Academy was represented by Dr **Jean-Francois Brouckaert of Clean Sky and Joris Melkert of TU Delft**. Both congratulated the winners on their well-deserved Awards.

"The goal of the Clean Sky Academy is to stimulate young innovators," said Melkert. "If we do not invest right now, we will have a problem in the future."

2021

AMONG UPCOMING AEROSPACE EVENTS

APRIL

07-10 April – IndoAerospace – **INDO AEROSPACE 2021** - 7th Indo Aerospace Expo & Forum – Jakarta (Indonesia) – Jakarta (Indonesia) – POSTPONED TO 02-05 NOVEMBER 2022 – https://indoaerospace.com

12-14 April – 3AF – **55th International Conference on Applied Aerodynamics** - Poitiers (France) – ISAE-ENSMA – 86961 Futuroscope Chasseneuil – www.3af.fr – www.aerosociety.com/events/

12-16 April – EUROTURBO – ETC14 – **14th European Conference on Turbomachinery – Fluid Dynamics and Thermodynamicss** - Gdansk (Poland) – https://www.euroturbo.eu - https://www.euroturbo.eu/review-platform/index.php/ETC/14

13-21 April – ICAO – **ICAO DRONE ENABLE SYMPOSIUM 2021** – ON LINE – https://www/icao.int/Meetings/Pages/upcoming.aspx

19-22 April – CEAS/ESA – **2nd International Conference on High Speed Vehicle Science & Technology – HiSST** - Bruges (Belgium) – Oud Sint-Jan – POSTPONED TO 19-21 MAY 2022 – https://atpi.eventsair.com/

21-24 April – AERO – **AEROFRIEDRICHSHAFEN** - Leading Show for General Aviation – AERO e-flight-expo - Friedrichshafen (Germany) – POSTPONED TO 14-17 JULY 2021 – https://www.aero-expo.com/aero/en/index.php

22 April – **Clean Sky – Clean Sky Annual Spring Event** - ON LINE DIGITAL FORMAT – Keynote speeches and Panel Discussions – www.cleansky.eu

26-30 April – IAA –**7th IAA Planetary Defence Conference 2021** – VIRTUAL EVENT – https://iaaspace.org/event/ – https://atpi.eventsair.com/

MAY

09-14 May – ESA – **Space optic Instrumentation Design and Technology –** Course – Poltu Quatu (Italy) – https://atpi.eventsair.com/

12 May – RAeS – **Team Tempest – The Future Combat Aircraft –** Lecture 19:00 – 20:00 local time – VIRTUAL On Line via ZOOM – By Michael Christie, director Future Combat Aircraft, BAE Systems – RAeS/HQ – www.aerosociety.com/Events

17-21 May – ICAO – **HLSC2021 –** Third High-Level Safety Conference – Montréal (Canada) – ICAO/HQ – https://www.icao.int/Meetings/Pages/upcoming.aspx

18-20 May – NBAA/EBAA – **EBACE 2021 – European Business Aviation Conference & Exhibition** – CANCELLED – https://ebace.aero/2021

18-20 May – SAE International – **EInnovations in Mobility Aerospace Digital Event** – https://www.sa.org/attend/innovationsinmobilty-aero

18-20 May – ESA/SatCen/EC JRC – **Big Data From Space 2021** – From Insight to Foresight - VIRTUAL CONFERENCE – https://www.bigdatafromspace2021.org

31 May **- 02** June – Elektropribor – **ICINS2021 - 28th Saint Petersburg International Conference on Integrated Navigation Systems** - Saint Petersburg (Russia) – 30, Malaya Posaskaya – https://www.elektropribor.spb.ru/en - https://acanud.ru/en/events/list

JUNE

01-03 June – ESA – **5th Cube Sat Industry Days 2021** – ON LINE CONFERENCE – https://atpi.eventsair.com/

02-03 June – FSF – **BASS 2021** – Business Aviation Safety Seminar – VIRTUAL EVENT - https://flightsafety.org/event/bass-2021

07-11 June – AIAA – **2021 AIAA AVIATION Forum** – Washington, DC (USA) – Marriott Wardman Park Washington - https://www.aiaa.org/aviation

11-13 June – ICCIA – **ICCIA2021 - 6th International Conference on Computational Intelligence an Applications** – Xiamen (China) – Huaquio University – iccia@zhconf.ac.cn – www.iccia.org

15-17 June – 3AF/SEE – **ETTC'21 – European Test and Telemetry Conference 2021** – Toulouse (France) secr.exec@3af.fr

20-24 June – EUROMECH – **EFMTC2021** – European Fluid Mechanics and Turbulence Conference – Zurich (Switzerland) – https://euromech.org/

20-25 June – ESA/ICATT – **11th International ESA Conference on GNC and 8th Internal Conference on Astrodynamics Tools and Techniques** – NOW VIRTUAL – ON LINE CEST Time Zone - https://atpi.eventsair.com/

21-27 June – GIFAS/IPAS – **International Paris Air Show** – Le Bourget (France) – CANCELLED – Next IPAS in 2023 - https://www.siae.fr

AMONG UPCOMING AEROSPACE EVENTS

JULY

04-09 July – EUCASS/3AF – **EUCASS/3AF CONFERENCE** – Lille (France) – POSTPONED TO 03-08 JULY 2022 - https://www.eucass.eu/

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

14-17 July – Aerofriedrichshafen – **AERO2021 – SUMMER EDITION 2021 –** 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

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

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 – Glasgow – VIRTUAL – www.aerosociety.com.events/ - https://www.rotorcraft-forum.eu/

OCTOBER

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

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

26-28 October – CANSO/EUROCONTROL – **World ATM Congress 2021 –** ATM congress and Exhibition - Madrid (Spain) – IFEMA Feria de Madrid – 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

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

06-09 December – SESAR – **11th SESAR INNOVATION DAYS** –Budapest (Hungry) – https://www.sesarju.eu

2022

JULY

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

AerospaceEurope Conference2021

CALL FOR ABSTRACTS

CEAS
Council of European Aerospace Societies

HOSTED BY:

PSAA

3R triptych: Restore, Rethink, Redesign

digitalization
artificial intelligence
more electrical aircraft
hybrid propulsion
alternative fuels
H2 propulsion
design of the future aircraft

WARSAW, POLAND | 23-26 NOVEMBER 2021

CO-ORGANISED BY:

CEAS
Council of European
Aerospace Societies

PSAA

Warsaw University of Technology

Łukasiewicz
Institute of Aviation

aec2021.meil.pw.edu.pl