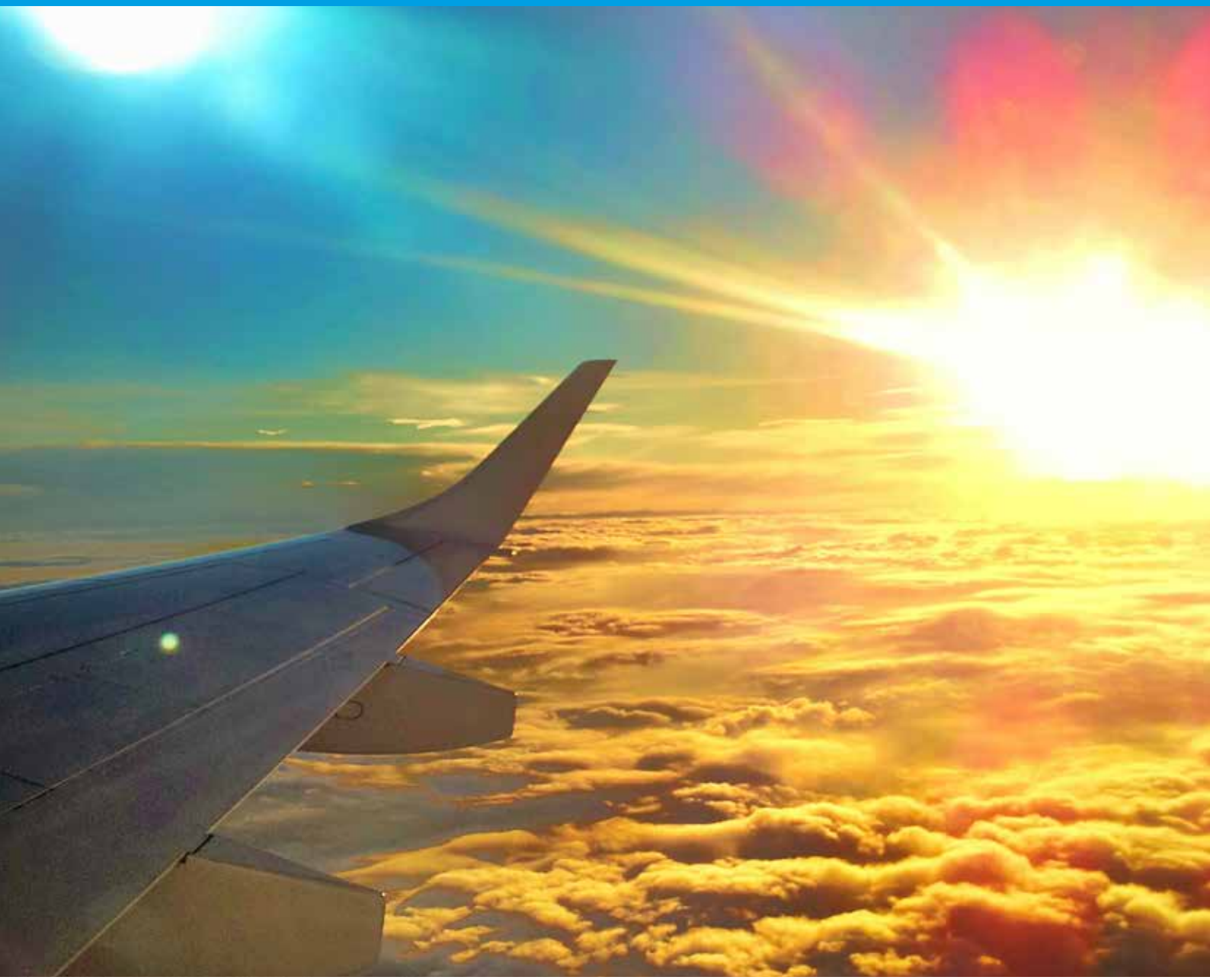
Clean Sky

Skyline

Innovation takes off

n° 17 | October 2015

Welcome aboard new members



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www.cleansky.eu

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EDITORIAL

Eric Dautriat
Executive Director
of the Clean Sky Joint Undertaking

At its July and September meetings, the Clean Sky Governing Board endorsed the Membership of all top-ranked applicants selected after the 1st Call for Core Partners, after a successful negotiation phase between the applicants, the Leaders' representatives and the JU team. No fewer than 75 new members have now joined the 16 leaders in one Call: more than the total number of Associates of Clean Sky 1. You will read more information in the relevant article ("Moving towards critical mass") but let me highlight at this point the role that Research Establishments and Academia will now be playing in close collaboration with the industrial leaders and other industrial members.

Contrary to Clean Sky 1, a majority of these winners are consortia, and most of them include a strong involvement of Research Establishments and Academia, who will benefit from about 40% of the funding devoted to this first set of new Members. This confirms a trend already initiated in Clean Sky 1, where 27% of the total funding is going to these not-for-profit organisations. Let's assume that the same rate will happen in Clean Sky 2: this means a rough order of magnitude of 450 m€. Research Establishments and Academia were very "responsive" in answering this call for Core Partners – and this is confirmed by the participation to the second call, which will go through its evaluation soon. This is fine and will strongly contribute to the knowledge base and the scientific innovation capacity the Programme needs. But such a volume of activity, which should be unrivalled in any other European programme clearly asks for – a pro-active involvement in the development of the Clean Sky 2 initiative, content-wise, when priorities and ways forward will have to be fine-tuned, revised, evolved, challenged. These new Members are full members, from which a visionary contribution to the Programme is expected, through the Steering Committees of the technological platforms (ITDs and IADPs in our awful jargon) and the Governing Board. The dedication of Clean Sky to high TRLs only is a simplistic view, as widely evidenced by Clean Sky 1.

Clean Sky is an industry-led initiative – and I'm proud of the efficiency of the demonstration-aimed momentum we have. This doesn't mean that non-industrial participants are just a "reactive" source of research capacity. I expect their initiative capacity to be amplified in Clean Sky 2. We need to achieve ambitious results and this cannot exist without Research Establishments and Academia. I want, not only the industry, but also these organisations, and SMEs as well, to consider Clean Sky as "their" instrument for Research. I have the ambition that Clean Sky, developing and maturing, becomes more and more the common house, in Europe, where the essential steps of cross-feeding between technologies, maturity levels, shorter and longer term, take place, and where every category of participants feels at home. Only then, will our excellent research turn EU aviation challenges into sustainable growth opportunities, as MEP Dominique Riquet rightly explains inside this issue.

In parallel to this first set of Core Partners, we also welcome the winners of the first Call for Partners. We received over 4 answers by topic, which is more than Clean Sky 1 but is still compatible with a satisfactorily high success rate for applicants. In total, here too, another 75 participants, approximately, are joining the programme, from 12 countries (we reached 24 in Clean Sky 1 after a few calls and we intend to do better…). This means that in total, we are more than 150 already. Not bad, one year after the start of Clean Sky 2.

Such a start, confirming the appetite for Clean Sky across Europe but more importantly, the appetite for innovation, and the vitality of the aeronautical sector, gives us the necessary momentum for pursuing and strengthening our action in the essential field of the synergies with Structural Funds through cooperation with Regions. I have so far signed 4 Memoranda of Understanding, with Midi-Pyrénées, Andalusia, Catalonia and Romania. Some others will come very soon. And in all instances some pilot, concrete cases of complementary actions are cooking. I have no doubt that JTIs are the best instrument for implementing this H2020 / ESIF synergy policy; this should benefit the SMEs first, but not only – pending the policy and the targets of each Region. How do we approach this, how should it work, what cooperation scenarios are we putting together? Besides the explanations given in a dedicated article here, you can find more on our website right now – and we will improve the available information as we progress in the implementation, learning by doing.

I cannot end this editorial without coming back to the basics: Clean Sky 1! Now bearing fruit, with new integrated demonstrators being run each quarter. Two examples: the ATR-72 flight dedicated to the test of a fuselage composite panel, by Alenia Aermacchi in July, and the Geared Turbofan by MTU scheduled in November. Busy & exciting time!

Eric Dautriat

CS2 CALLS UPDATE:
Moving towards critical mass

Ron van Manen
Clean Sky 2 Programme Manager

At the time of our last update, the Clean Sky 2 programme was approaching its first anniversary [a first full year of operations]. We are now in a "perfect storm" environment of the most impactful period of the [first] Clean Sky programme's major demonstrators entering or nearing their moments of truth. As a consequence and in line with the Leaders' and JU's programme plan [we often refer to our JTP as the 10 year roadmap and master-plan]: the implementation of CS2 was envisioned to be phased, with a batch-wise approach to the boarding of Core Partners as well as of course regular and continued Calls for Proposals to enlist contributions and supporting research and innovations from the programme's Partner-level participants.

As we reported earlier this year [shortly before the summer], the first Call for Core Partners had drawn a healthy response from across the aeronautical sector, the public research organizations and academia. Excellent progress was made in the meantime and all topic areas where winners were announced have now led to new Members joining the Joint Undertaking in their role within these Core Partner areas. When counting each individual entity [i.e. all associated / affiliated participants involved in the proposals as consortium members and acceding to the JU and to the Grant Agreement for Members of the programme area concerned: an ITD or IADP], no fewer than 75 additional Members have joined the CS2 Programme effort, representing already, via one Core Partner call, 13 countries.

With the closing of the first Call for Proposals [Partners] in the spring and the successful completion of the Call's evaluation, the JU and the CS2 Leaders through their Topic Managers are now in the process of readying the winning proposals and applicants for the implementation of their Grant Agreements for Partners [often referred to as GAPs] with a target of bringing the Partners on board by the end of November. As a consequence almost 100 CS2 participating entities from no fewer than 24 countries in total including 18 EU Member States, 6 Associated Countries and Third Countries will enter these GAPs and start their technical activity as finalized in the grant preparation from winning proposal into the resulting GAPs.

Clearly, these statistics give us confidence that the broader aeronautical "family" and innovation eco-system across the EU and Associated Countries is finding its way and its place in the journey towards the CS2 high-level goals and objectives in the decade ahead.

Latest news on the Second Call for Core Partners

With the closing of the Second Call for Core Partner at the end of July - a call containing a further 17 topics – the JU is pleased to see that the Call has received great interest from 162 participants from no fewer than 18 countries represented in these applications. Each topic received proposals, the majority receiving several: one as many as six competing applicants [consortia].

> "With this important milestone in terms of programme ramp-up achieved, we are delighted to welcome our new CS2 Member-level participants!"

The JU is now getting the Evaluation of these proposals underway, and the completion of this Evaluation Phase is expected by the end of November. The Ranking will subsequently be confirmed and applicants will be informed about the outcome by mid-December.

List of Core Partners in CPW01

Core Partners and Affiliated Third Parties (ATP)	ITD/ IADP	Country
ADVANCED LABORATORY ON EMBEDDED SYSTEMS S.r.L.	[SYS]	IT
AERNNOVA AEROSPACE S.A.U. (ATP)	[AIR, LPA]	ES
- AERNNOVA ENGINEERING DIVISION S.A.U (ATP)	[AIR, LPA]	ES
- AERNNOVA COMPOSITES ILLESCAS S.A. (ATP)	[AIR, LPA]	ES
- AERNNOVA AEROESTRUCTURAS ALAVA, S.A.	[AIR, LPA]	ES
- INTERNACIONAL DE COMPOSITES SA (ATP)	[AIR, LPA]	ES
- FIBERTECNIC (ATP)	[AIR]	ES
- COMPONENTES AERONAUTICOS COASA, S.A. (ATP)	[AIR]	ES
- AEROMAC MECANIZADOS AERONAUTICOS SA (ATP)	[AIR]	ES

Core Partners and Affiliated Third Parties (ATP)	ITD/ IADP	Country
AEROSOFT	[REG]	IT
AEROTEX UK LLP	[AIR]	UK
ARTUS SAS	[AIR]	FR
BARCELONA SUPERCOMPUTING CENTER	[AIR]	ES
CENTRO ITALIANO RICERCHE AEROSPAZIALI SPA	[AIR, REG]	IT
CERTIA	[REG]	FR
CT INGENIEROS AERONAUTICOS DE AUTOMOCION E INDUSTRIALES SL	[AIR]	ES

Core Partners and Affiliated Third Parties (ATP)	ITD/ IADP	Country
DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV	[AIR, ENG, LPA]	DE
DSPACE DIGITAL SIGNAL PROCESSING AND CONTROL ENGINEERING GMBH	[SYS]	DE
FOXBIT	[REG]	IT
FUNDACION ANDALUZA PARA EL DESARROLLO AEROESPACIAL	[AIR]	ES
FUNDACION CENTRO DE TECNOLOGIAS AERONAUTICAS	[AIR]	ES
FUNDACION PARA LA INVESTIGACION, DESARROLLO Y APLICACION DE MATERIALES COMPUESTOS	[AIR, LPA]	ES
FUNDACION TECNALIA RESEARCH & INNOVATION	[AIR]	ES
GE AVIO SRL - GE AVIATION CZECH S.R.O. - POLONIA AERO SP. Z O.O. LABORATORIUM BADAŃ NAPĘDÓW LOTNICZYCH (ATP)	[ENG, FRC] [ENG] [LPA, FRC]	IT CZ PL
- GENERAL ELECTRIC DEUTSCHLAND HOLDING GMBH (ATP) - GE AVIATION SYSTEMS LTD (ATP) - GECP - General Electric Company Polska Sp. Z o. o.	[ENG, FRC, LPA] [ENG] [ENG, FRC]	DE UK PL
GKN AEROSPACE SWEDEN AB	[ENG, LPA]	SE
GOODRICH CONTROL SYSTEMS PRIVATE UNLIMITED COMPANY (ATP)	[SYS]	UK
GOODRICH ACTUATION LIMITED (ATP) - Goodrich Actuation SAS (ATP) - Claverham Ltd (ATP)	[SYS] [SYS] [SYS]	UK FR UK
HELLENIC AEROSPACE INDUSTRY SA	[AIR, REG]	GR
IMAST - DISTRETTO TECNOLOGICO SULL'INGEGNERIA DEI MATERIALI POLIMERICI E COMPOSITI E STRUTTURE S.C.A.R.L. - CNR - ISTITUTO PER I POLIMERI, COMPOSITI E BIOMATERIALI - ENEA - DIPARTIMENTO SOSTENIBILITÀ DEI SISTEMI PRODUTTIVI E TERRITORIALI	[REG] [REG] [REG]	IT IT IT
IMPERIAL COLLEGE	[AIR]	UK
INDUSTRIA DE TURBO PROPULSORES S.A.	[ENG]	ES
INSTITUTUL NATIONAL DE CERCETARI AEROSPATIALE ELIE CARAFOLI - I.N.C.A.S. SA	[FRC]	RO
INSTITUT NATIONAL DES SCIENCES APPLIQUEES DE TOULOUSE	[REG]	FR
ITALSYSTEM	[REG]	IT
ITI GESELLSCHAFT FUR INGENIEURTECHNISCHE INFORMATIONSVERARBEITUNG MBH	[SYS]	DE
MAGNAGHI AEREONAUTICA SPA	[REG]	IT
MEGGITT AEROSPACE LIMITED - PRECISION MICRO LIMITED (ATP)	[AIR] [AIR]	UK UK
MEGGITT A/S	[AIR]	DK

Core Partners and Affiliated Third Parties (ATP)	ITD/ IADP	Country
NATIONAL COMPOSITES CENTRE OPERATIONS LTD	[AIR]	UK
NOVOTECH	[REG]	IT
POLITECNICO DI MILANO	[REG]	IT
OFFICE NATIONAL D'ETUDES ET DE RECHERCHES AEROSPATIALES	[AIR, LPA, REG]	FR
SC IAR SA GHIMBAV – BRASOV	[FRC]	RO
SICAMB SPA	[REG]	IT
SIEMENS INDUSTRY SOFTWARE NV - SAMTECH FRANCE SAS - SIEMENS SPA	[REG] [REG] [REG]	BE FR IT
TECNAM	[AIR]	IT
TESTING AND ENGINEERING OF AERONAUTICAL MATERIALS AND STRUCTURES S.L.	[AIR]	ES
THE UNIVERSITY OF NOTTINGHAM	[AIR, SYS]	UK
ULTRA ELECTRONICS LIMITED	[AIR]	UK
UMBRA CUSCINETTI SPA	[REG]	IT
UNITED TECHNOLOGIES RESEARCH CENTRE IRELAND, LIMITED	[SYS]	IE
UNIVERSITÀ DEGLI STUDI DI NAPOLI FEDERICO II	[REG]	IT
UNIVERSITÀ DEGLI STUDI DI PISA	[REG]	IT
UNIVERSITY OF SHEFFIELD	[AIR]	UK
UNIVERSIDAD POLITECNICA DE MADRID	[AIR]	ES
ZODIAC AEROTECHNICS SAS - ZODIAC CABIN CONTROLS GMBH (ATP) - ZODIAC AEROELECTRIC (ATP) - ZODIAC AIRCATERING EQUIPMENT EUROPE BV (ATP) - DRIESSEN AEROSPACE CZ SRO (ATP) - SELL GMBH (ATP)	[LPA] [LPA] [LPA] [LPA] [LPA] [LPA]	FR DE FR NL CZ DE
VIOLA CONSULTING SRL	[REG]	IT
VRIJE UNIVERSITEIT BRUSSEL	[AIR]	BE

Aerodays 2015 in London

The technical presentations of projects in collaborative research and in Clean Sky are organized in 9 parallel sessions, of which 3 are dedicated to Clean Sky (Clean Sky Forum 1, 2 and 3).

In the first session, 1A, which takes place in the afternoon of Tuesday 20th of October, the presentations are organised as shown below. The second dedicated session on Clean Sky takes place again in the afternoon of Tuesday the 20th, named session 2A, and presents some aspects of the Clean Sky 2 programme. The third session is 3B, on Wednesday 21st of October 2015 in the morning.

Tuesday 20 October

1:50 PM	1:50 PM	Morning
1A (large)	**2A (large)**	**3B**
Greening of Aviation	***Greening of Aviation***	***Greening of Aviation***
Clean Sky	**Clean Sky**	**Clean Sky**
Clean Sky Forum	Clean Sky Forum	Clean Sky Technical Forum
Manuela Soares - **EC**	*Marco Brusati*	*Geza Schrauf* - **Airbus**
Clean Sky impact on Aeronautical Research	The Clean Sky 2 Programme	Preparation of the Airbus A340-300 BLADE Natural Laminar Wing Flight test Demonstrator
Eric Dautriat - **Clean Sky JU**	*Ron Van Manen* - **Clean Sky JU**	*Jens Koenig* - **Airbus**
Overview of Clean Sky Technical Programme and Achievements to Date	The Clean Sky 2 Airframe Integrated Demonstration	Structural Design Of High Lift and Load Control and Alleviation Devices For a Natural Laminar Flow Wing
Giuseppe Pagnano - **Clean Sky JU**	*Bruno Stoufflet* - **Dassault Aviation**	*Yves Lemens* - **Siemens / LMS**
Eco-Design : Achievments and future Perspectives	The SYSTEME Demonstration Programmes in Clean Sky and Clean Sky 2	High-Speed Demonstation of Natural Laminar Flow Wing & Load Control for Future Regional Aircraft through innovative Wind Tunnel Model
Rainer Schweppe - **Fraunhofer**	*Gilles Poussin* - **Thales**	*Stephan Adden* - **IBK**
One The Way to Open Rotor Aircraft	The ENGINE Demonstration Programmes in Clean Sky and Clean Sky 2	Icing research projects in Clean Sky
Pierre Guillame **SNECMA**	*Jean-François Brouckaert* **Clean Sky**	*Markus Pfell* - **TWT** *Emmanuel Scolan* - **CSEM**

Tuesday 20 October

1:50 PM

1C

Greening of Aviation

Noise & Vibrations

Noise Reduction Technologies

Simon Weeks - **UK ATI**

Airframe Noise Reduction Technologies applied to High-Lift Devices of Future Green Regional Aircraft

Ignazio Dimino - **CIRA**

Full-scale Wind Tunnel Demonstration of Nose Landing Gear Low-Noise Technologies for Future Regional Aircraft

Deidre Savage - **Trinity College Dublin**

1D

Greening of Aviation

Design Tools & Production

Technology Assessment of Environmental and Economical Impact

Ron Van Manen - **Clean Sky**

Clean Sky Technology Evaluator

Ralf Berghof - **DLR**

Rotorcraft Noise and Emissions Reduction Process for Clean Sky - The Measurement of Success

Vassilis Pachidis - **Cranfield University**

1E

Competitiveness of Aviation Industry

Avionics

Advanced Avionics - Aid to Piloting

Martin Schofield - **UK ATI**

Real Time Adaptive Processing of Multisource Weather Data

Fabrizio Cuccoli - **RaSS CNIT**

1F

Greening of Aviation

Systems & Equipment

Towards More Electrical Aircraft

Marc Frevel - **Airbus** (DECLINED)

Smart Electrical Power Distribution Centre Evaluation of More Electrical Aircraft

Augustin Mpanda - **ESIEE-Amiens**

3:50 PM

2F

Safety and Security

Systems & Equipment

Novel Sensor and On-board Systems

Kyle Martin - **ASD**

Development of advanced modelling approaches for More Electric Aircraft Electrical Power Systems

Serhiy Bozhko - **Univ. Nottingham**

2G

Competitiveness of Aviation Industry

Rotorcraft

Advanced Rotorcraft Technologies

Christina Garcia-Duffy - **UK ATI**

Light Helicopter Demonstrator with High Compression Engine

Alexandre Gierczynski - **Airbus Helicopters**

Eco-Fairs: Development of Thermoplastic Structural Fairing for Helicopters

Silvio Pappadà - **CETMA**

A Market and Operational Perspective on the Acoustic Benefits of Clean Sky Green Rotorcraft Technologies

Chrissy Smith - **AgustaWestland UK**

Wednesday 21 October

8:30 AM

3C

Greening of Aviation

Systems & Equipment

Innovative Cabin and Cargo Systems

Markus Christmann - **Airbus Group**

CS2 LPA Cabin & Cargo System Demonstrator Platform

Jens Koenig - **Airbus**

3G

Competitiveness of Aviation Industry

Structures & Materials

Advanced Manufacturing & Materials

Mark Summers - **UK ATI**

Laser Beam Welding of 3rd Generation Al-Li-Alloys for Fuselage Applications

Nikolai Kashaev - **Ist. Material Research**

Wednesday 21 October

10:30 AM

4B

Competitiveness of Aviation Industry

Propulsion

Key Engine Technologies

Jean-François Brouckaert - **Clean Sky**

Integrated CFD-Acoustic Computation Approach to the Simulation of Open Rotors

Thomas Deconinck- **Numeca International**

4C

Competitiveness of Aviation Industry

Flight Physics

Flow Control and Drag Reduction

Fassi Kafyeke - **Bombardier**

BUCOLIC - Characterization of Buffet on a Civil Aircraft Wing

Simon Lawson - **ARA**

4D

Competitiveness of Aviation Industry

Structures & Materials

Advanced Aerostructures

Alfredo Guemes - **Univ. Madrid**

Composite Fuselage One Piece Barrel : Integrated Development and Prototype Demonstration.

Marta De Pascale - **OMI**

Application of Structural Health Monitoring in New Aircraft Configurations

Zahra Sharif Khodaei - **Imperial College**

4G

Seamless and Efficient Mobility

Mobility & Operations

Small Air Transport Systems

Daniel Rohacs - **Univ. Budapest**

Small Air Transport Initiative in Clean Sky 2

Salvatore Mancino - **Piaggio**

3:20 PM

5B

Competitiveness of Aviation Industry

Propulsion

Engine Systems and Integration

Raffaella Di Sante - **Univ. Bologna**

CS - Composite Fan Blades for Large Turbofan Engines : Verifying and Manufacturing the Future

Justin Dalton - **Rolls-Royce**

Design of Experiments to OPTIMIZE Design Solutions for a Power Reduction Gearbox

Jose Amores - **DMP**

5F

Greening of Aviation

Maintenance, Disposal & Recycling

Innovative Maintenance and Repair incl. Recycling

Vassilis Kostopoulos - **Univ. Patras**

Sustainability in Aviation - The ENDAMI Eco Design Tool

Robert Ilg - **Fraunhofer**

Aircraft Metals Recycling : Process, Challenges and Opportunities

Torsten Müller - **Fraunhofer**

5D

Competitiveness of Aviation Industry

Structures & Materials

Morphing Structures

Arnt Offringa - **Fokker**

An Investigation of Shape Memory Alloys, as Actuating Elements, in Aerospace Morphing Applications

Dimitrios Karagiannis - **INASCO**

Thursday 22 October

9:00 AM

6B

Competitiveness of Aviation Industry

Propulsion

Innovative Engine Architectures

Keith Nurney - **Rolls-Royce**

Next Generation Ultrahigh Bypass Large Civil Turbofan : Technology Integration Challenge

Alan Newby - **Rolls-Royce**

6D

Competitiveness of Aviation Industry

Structures & Materials

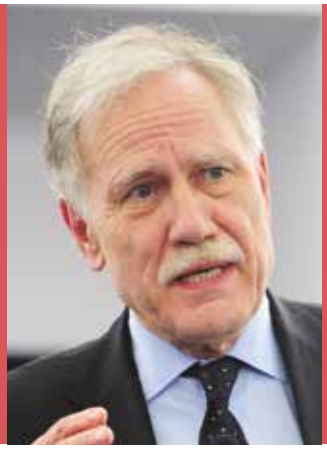
Innovative Aerostructures - from Concept to Manufacturing

Magnus Engstroem - **SAAB**

Automating Aircraft Assemblies with Tight Tolerances

Miguel Angel Castillo-Acero - **Aernova**

View from the European Parliament



Dominique Riquet
Vice-Chair of the Transport committee and Chair of the Long-Term Investment Intergroup in the European Parliament

The pace at which research and innovation in aviation has recently progressed would almost make one's head spin.

New design and engines have made our aircrafts quieter and less resource-consuming. Manufacturing processes are getting progressively more ecological as well as less costly, through the reduction of waste. The proportion of low-carbon fuels could amount to 40% by 2050 and we have seen the rapid development of alternative propulsion systems. The European Single Sky could soon become reality thanks to research efforts to rationalize air traffic management (main obstacles are now on the governance side, deriving from national conservatisms) and journey planning is more and more optimized through integrated ticketing systems. Finally, increasingly performing drones are now used in many sectors of the economy, from surveillance of critical infrastructure and rationalisation of farming operations to parcel delivery in isolated regions and media production. This might lead to the emergence of a big market and correlated growth opportunities for EU companies.

Through all these evolutions, far from burning our wings like an Icarus would do, we are, thanks to our scientists, tackling several challenges that the aviation sector currently faces.

At global level, for example, we are challenging the mitigation of the aviation sector's impact on the environment. We might be witnessing a change of paradigm here, by which the division between clean and dirty modes is not so clear-cut any longer, especially when we see the achievements also made by the car industry. This is very encouraging with the upcoming COP21, given that transport has usually been left aside from these negotiations and is the only sector, with construction, that has increased its emissions since 1990.

At EU level, congestion in an airspace where traffic is expected to double by 2030 could be avoided by the optimisation of routes, and we help our companies to be more resilient to the competition from other parts of the world through cost-killing. Of course, all these challenges are linked and addressing a problem sometimes helps resolve another one.

> "Let's help R&D turn EU aviation challenges into sustainable growth opportunities"

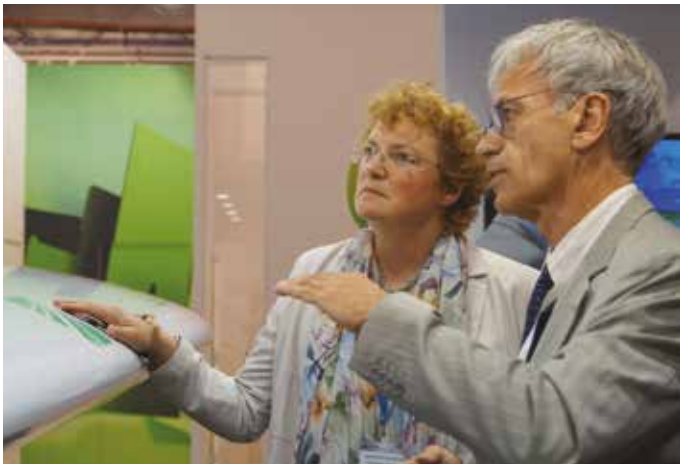
For all these reasons the European Parliament has always been very supportive to innovation and research in aviation. In April last year, we extended until 2024 two joint undertakings, SESAR (additional €1.585 billion budget) and Clean Sky (€4 billion), respectively dealing with the rationalisation of airspace control and the promotion of cleaner and quieter planes. In 2013, we adopted Horizon 2020 (€80 billion including a section on smart, green and integrated transport) and the Connecting European Facility (€26 billion for transport with funding foreseen for new technologies) which can further finance technological progress in aviation. Needless to say it was a big disappointment for our institution that money had to be taken from these two programmes to finance the guarantee fund of the European Fund for Strategic Investments, whose thematic scope is much broader, but we did whatever was in our power to reduce the amount in question (€5 billion in the end).

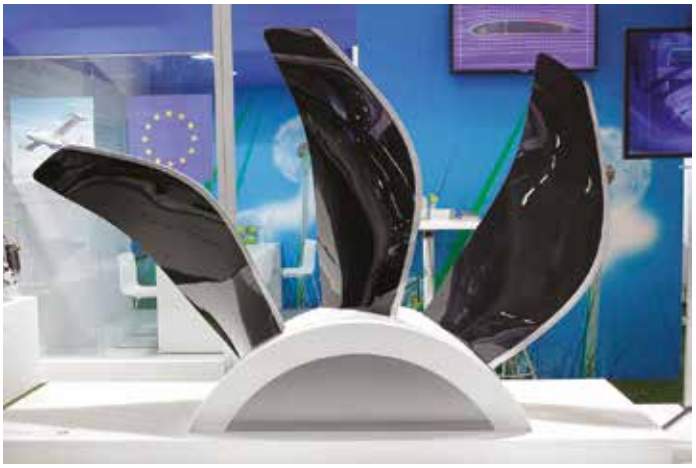
There are certain principles that seem highly essential to me when one speaks about EU legislation and R&D activities. Any legal framework should aim at creating a level playing field among the different actors and promoting the emergence of a market for such products while avoiding hampering innovation. We need to encourage risk while helping the transformation of fundamental research into concrete applications and the gathering of human and financial resources throughout Europe to help find a critical mass. Rules for any kind of public support should be clear and based on as easy procedures as possible, limiting delays which can be very costly for beneficiaries. Finally, I believe that if we are to promote private investment in such efforts, we must ensure that trust exists between the three sides of a triangle made by projects promoters, the financial sector and legislators. This is the objective of the intergroup on long-term investment I have helped to create in the European Parliament.

European Parliament

Clean Sky showcases at Le Bourget 2015

Clean Sky took part in the 51st International Air Show in Paris in June, showcasing cutting-edge technologies and presenting the results of the programme to date. Among the technologies exhibited visitors could see mock-ups of the Contra-Rotating Open Rotor, High Compression Engine, Droop Nose Mechanical Prototype and many others. Highlights of the event included different conferences, ranging from 'Propulsion Systems for Next Generation Aircraft' to 'Synergies between Clean Sky and European Structural and Investment Funds', featuring a series of notable speakers including Richard Parker, Manuela Soares, Eric Dautriat, Katia Reppel, Jean Tkaczuk, Dr. Marcello Amato, Dr. Franz-Josef Kirschfink and Marc Fabrequettes. At a round table, the topic of 'How to better involve students in Clean Sky' was also discussed, with the wider participation of university representatives.





The Clean Sky team was delighted to welcome visitors to the stand throughout the week-long event, including distinguished policy makers such as MEP Monika Hohlmeier, Deputy Director General for Research and Innovation Rudolf Strohmeier, President of the Midi-Pyrenees Region Martin Malvy, and Transport Director General João Aguiar Machado. Overall, the event was a great success.

Read more on www.cleansky.eu

Bluecopter demonstrator takes to the skies

Airbus Helicopters unveiled its Bluecopter demonstrator, the fruit of a smart combination of self-financed and national- and EU- (Clean Sky GRC) funded research, at a presentation at their facility in Donauwörth, Germany in early July. The Bluecopter presents of a number of new technologies, ranging from an advanced Fenestron® and improved rotor and airframe design to intelligent engine power management, all of which have been incorporated into one of Airbus's light medium twin-engine rotorcraft. The chief technology officer at Airbus Helicopters, Jean-Brice Dumont, described these technological improvements as "techno-bricks", adding that there was not much left unchanged on the original rotorcraft. Therefore the Bluecopter demonstrator is an important milestone towards achieving Airbus Helicopters' and Clean Sky's objectives of a cleaner, quieter and more fuel-efficient future for rotorcraft aviation.

So far, the Bluecopter has logged more than 28 flight hours in evaluations. Work started in 2009, and the demonstrator completed Clean Sky GRC-financed wind-tunnel tests in 2014 to assess the drag reduction improvements on a scaled-down model. The new technologies were then incorporated into the full-size Bluecopter demonstrator.

These new design features include a newly-developed five-blade bearingless main rotor system with BlueEdge™ style blades which have an increased diameter, a significantly reduced and variable tip speed (180 metres per second) and an improved distribution of twist along their length. There is also the first-time introduction of an 'eco-mode' for flight, meaning that one engine can be switched off during cruise in order to conserve fuel and thus reach the ambitious targets for reducing CO_2 emissions. It is, however, important to note that the 'eco mode' is based on an automatic control system that ensures safe operation of the aircraft.

The aerodynamic optimisation of the Bluecopter demonstrator was developed, assessed and built under the umbrella of the Clean Sky Green Rotorcraft ITD, which included the main rotor hub fairing, the engine side intake, the fairing of the landing gear and the aft body fuselage, in order to significantly reduce the aerodynamic drag of the fuselage, while simultaneously "raising the maximum payload and the passenger comfort", according to Airbus. Furthermore a passive

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optimised GRC-funded main rotor is currently being built and will be ground tested in Donauwörth. This rotor will be installed on the Bluecopter testbed in 2016. To go directly from CFD assessment through wind tunnel testing to flight testing on the Bluecopter demonstrator was and is a fantastic opportunity for the GRC programme. Airbus Helicopters are already anticipating the Clean Sky 2 endeavour to go for TRL6 testing in order to help overcome the "valley of death" between research and industrialisation.

A specially-designed empennage with a T-tail horizontal stabilizer has also been incorporated into the design. Furthermore, the noise footprint of the Bluecopter is reduced thanks to an acoustic liner integrated in the Fenestron®'s shroud and an active rudder on the tail fin.

Every minor detail has been taken into consideration: even the paint used on the demonstrator is environmentally friendly, making use of the latest water-based paint technologies.

Marius Bebesel, Program Manager Research & Innovation in charge of the Bluecopter demonstrator, said: "By bringing together the best of our company's innovation, we are opening the way for a new generation of rotorcraft that will have lower noise levels, burn less fuel and are more efficient to operate."

The demonstrator performed very well in its test flights: fuel consumption was down by as much as 40% and noise levels fell to around

10 decibel effective perceived noise (EPNdB) below International Civil Aviation Organisation noise certification limits. Bebesel added that this achievement puts Airbus Helicopters ahead of the rest of the industry with regards to noise, as the Bluecopter is between 3 and 5 EPNdB quieter than conventional helicopters.

These impressive results mean that the Bluecopter is certainly a landmark in innovation technologies for Airbus Helicopters and Clean Sky's GRC ITD. Airbus hopes in the future to apply the technologies which have been pioneered in the Bluecopter across their product line, creating a greener, cleaner future for the rotorcraft industry.

Clean Sky synergies with EU Structural Funds

Bruno Mastantuono
Legal Manager & Strategic Advisor, Clean Sky JU

It was in the early fall of 2014 when the Joint Undertaking (JU) initiated some first contacts with a few Regions in Europe to test their interest in discussing synergies. Less than one year later, the outlook is quite encouraging with the JU having signed 4 Memoranda with 3 Regions (Midi-Pyrénées, Andalusia and Catalonia) and 1 at national level (Romania) with more in the pipeline for the end of 2015.

The pilot phase is now able to start with some clear objectives, stimulating pilot projects to show concrete actions and evidence that synergies between H2020 and European Structural & Investment Funds (ESIF) are achievable and that the Joint Technology Initiatives (JTIs) can be an essential driver for that.

The JU is propsing to the Regions its "JTI dimension" and an indusotrial strategy through which stakeholders of all types may connect to the European aviation and the supply chain of its Members. The JTI has the ability to unblock the innovation potential which some Regions have in its area of activities and to underpin the efforts of Smart Specializations when able to contribute to the Programme strategy and overall objectives. This is now understood by the Regions and not necessarily only by those having a classic aeronautics vocation. It's a clear win-win strategy, complementing the Clean Sky 2 Programme budget with additional ESIF resources by linking Regional Plans to its strategy and by getting a significant return in terms of strategic positioning of their companies, all by achieving on both sides a leverage effect in the spending of European funding.

Clean Sky is able to involve a wide range of participants in Europe and is constantly looking for new capabilities and skills which may have a significant part in the Programme. Therefore it's clear that ESIF can play an important role in encouraging stakeholders of different types to join the Programme and extend its capabilities base. It's evident that the 'Smart Specialisations Plans', part of the ESIF Operational Programmes 2014-2020 of Member States (MS)/Regions, play a crucial role in supporting R&I with a significant number of Regions having placed aeronautics or correlated areas (transport, materials, CO2 reduction, etc..) in their priorities for financial support. The well-known 'Aero' Regions in Europe are certainly showing an interest in this but others also see the possibilities in testing the synergies action plan with Clean Sky to find out the level of interest and potential their companies have to get involved in the Programme and how they could be supported to gain competitiveness at European level.
One lesson learnt so far for the JU is that, when it's about synergies, a tailor-made approach is needed to cooperate with a MS or Region and that a one-size-fits-all approach would not have much of a result. An understanding of the regional context and its industrial base and flexibility in the approach are needed in the way a cooperation on synergies may be established depending on the strategy of the Region, its priorities and the design of its Operational Programmes. Regions do not need a special ESIF call for aeronautics to start a cooperation with Clean Sky; different ways to stimulate synergies may be found via both an upstream and bottom-up approach where inputs may be given by the regional aero cluster or other industrial base present in the area.

> "It's evident that communication plays a crucial role in the JU strategy on synergies."

The role of the JU Industrial Leaders is essential in this, from cooperating in the design of thematic objectives in synergy which may flow into a Regional call to the assessment of the complementary activities proposed by a JU participant with ESIF funding. This is essential to show that the JTI dimension is able to provide an industrial framework and that projects in synergy may find an industrial dimension and possible market uptake. This is an essential aspect of creating synergies with an added value and maximization of impact and to allow new technologies to flow into and contribute to the overall Programme objectives.

Moreover, two main features of our approach must be highlighted here. First, we target "complementary activities" and not the common funding of one project (despite this is now allowed through the new Regulations), for the sake of simplicity. Second, for the same reason, we organise ourselves in order to be able to live with the inherent asynchronicity of respective processes, in particular calls for proposals from both sides.

The timing for discussing synergies with MS and Regions is proving so far to be effective since not all have their Operation Programmes approved by the EC and the design of their funding schemes is in some cases still in progress; this allows the JU to encourage considering synergies and to be involved to some extent in their design. It is evident that the JU does not have resources to talk to all Regions in Europe, therefore an expression of interest from those considering this as strategic is well-appreciated at this stage to help the JU to identify those able to enter the pilot phase by end of 2015.

A Memorandum of Understanding between Clean Sky and the Andalucía region in Spain was signed at Paris Air Show 2015.

With the launch of the 2nd call for proposals at the end of July, the JU is now also allowing applicant Partners to add a separate set of complementary activities into their proposal which may be funded through ESIF; the same option was already in place in the Calls for Core Partners (for becoming JU Members). By also offering this possibility in the calls for proposals, the JU wishes to encourage applicants to a JU topic and in particular SMEs to "seize the

momentum", "think strategic" and to consider different forms of complementary funding for activities linking to the topic or the Programme in general. The JU will evaluate these activities and will award a 'JU synergy label' for them; this should create an incentive effect in the stakeholders and SMEs in particular to look at their Regional ESIF Plans and see how activities could be supported there. The expectation is that this will raise more awareness at ESIF Managing Authorities level, showing that Clean Sky and its label is seen by their stakeholders as a possible driver for entering the innovation chain and for linking to the European dimension. At the same time this will also allow a more upstream approach with applicants being able to propose areas not covered so far in the Programme.

It's evident that communication plays a crucial role in the JU strategy on synergies. With a very positive workshop organized at the Paris Air show last June, the JU presented its action plan on synergies and the different options. The planned publication of a guidance section on its website is a way to disseminate this as a strategic area of action of the JU.

And what about the way forward ? Continuing the interlocution with MS and Regions remains the priority to identify other actors able to enter the pilot phase, together with the necessary involvement of regional aero clusters and stakeholders at all level. Testing the first pilots and identifying the most effective way to reach synergies is the most important medium-term goal for the JU to show concrete results. Eventually, with the necessary political support at all levels, the JU should identify examples of best practices and stimulate more MS/Regions to join. By the end of the first pilot phase, the JU will hold a general reflection on its strategy and on the impact of this new area of activity.

More on our website : www.cleansky.eu

Biocomposites for aircraft applications

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The project "*Development of an innovative bio-based resin for aeronautical applications*" (BME CLEAN SKY 027), carried out by Budapest University and Technology and Economics (BME) in the frame of Eco-Design ITD in Clean Sky 1, aimed at the development of fully bio-based composites with high glass transition temperature (Tg). The challenge the researchers faced was to convert simple mass products, such as sugars, into high-tech composite materials fulfilling the demanding requirements of the aircraft industries.

MŰEGYETEM 1782

As a first step, completely new custom-made epoxy monomers were synthesized from sugar (glucose) as starting material. The structure of the novel molecules was tailored on the basis of epoxy resin structure-property relationships in order to reach high Tg and crosslink density. The synthesis was conducted according to principles of green chemistry, energy efficiency, environmental and health safety, and scalability. Four epoxy resin systems were fully characterized and one — based on glucofuranoside (GFTE) — was selected for up-scaling. By increasing the production rate, the synthesized epoxy monomer is a promising candidate to become a real industrialized matrix material for high-tech composite applications.

To find the most suitable reinforcement, in the second step the research team of BME compared a large variety of natural fabrics, including hemp, jute, linen and a hemp–linen mix with different weave. Based on strip tensile test results and availability, a plain woven jute fabric was chosen to reinforce the epoxy resin and improve mechanical properties to meet aerospace requirements.

In the third step the flammability of natural fabrics and bioepoxy resin was aimed to be reduced, therefore flame-retardant hardeners were synthesized and different types of eco-friendly flame-retardant surface treatments were investigated both alone and in combination. By applying phosphorus-containing flame-retardant curing agent and/or surface-treated jute fabrics, the developed fully bio-based epoxy resin composites can fulfil the strict requirements of aircraft interiors FST (Fire, Smoke and Toxicity) standards.

In the last step foam-core sandwich panel composites were manufactured from the sugar-based epoxy resin matrix. Test results to determine utility as internal floor panels demonstrated that the panels significantly outperformed the conventional synthetic matrix sandwich structures. The research work made feasible the preparation of natural fibre reinforced bioepoxy composites with 60 m/m% fibre content by hot pressing ensuring appropriate mechanical properties. Consequently the BME CLEAN SKY 027 has paved the way to use eco-friendly biocomposites in lieu of expensive carbon fibre-reinforced synthetic plastics in a variety of airplane interior applications.

The above-described innovation was implemented in an interdisciplinary cooperation of chemical and mechanical engineers within the Budapest University of Technology and Economics. *"BME-Clean Sky 027 - Development of an innovative bio-based resin for aeronautical applications" (Topic manager : Dassault Aviation)* was the second successful project of the same research team after *"BME-Clean Sky 032 - Resin, Laminate and Industrial Nanoparticles Concept and Application Industrialization" (Topic manager : Airbus Defence & Space).* During the 18 months of the project (2012-2014) the university itself as a single-member consortium reached TRL 4 level from the "idea". This was followed by the testing of the developed resin in industrial environment by Dassault Aviation. The resin was also applied on the mid-cabin cabinet EDA demonstrator (I2 demonstrator) target to future Falcon business jets. The proven concept of "aircraft made of sugar" was invited to the Clean Sky Forum Award Ceremony as it was selected as one of the 20 best projects from 481, and 3 best ones in "*Eco-Design*" category.

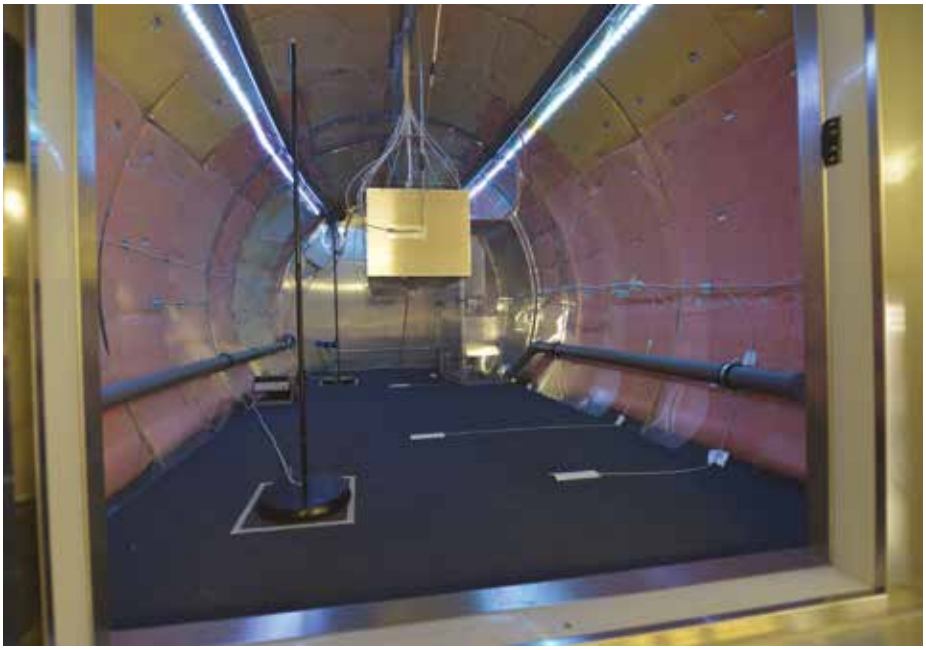
THERMAL TEST BENCH:
Modular climate test facility for aircraft and helicopters

Markus Siede
Group manager for aircraft and vehicle climate control systems, Fraunhofer Institute for Building Physics IBP

Aviation is currently undergoing an electrifying transformation – in the truest sense of the word. The vision is to design tomorrow's aircraft and helicopters to be free of any pneumatics or hydraulics. Instead, they will feature electric actuators and circuits as well as power electronics to cut down on the aircraft's weight and fuel consumption. Yet this trend towards an "all-electric" architecture changes the climate on board, since electrical and electronic systems usually generate much more heat in a small space than fluidics do. In addition, the environmental control system (ECS) requires less bleed air from the engines, meaning these can be designed to be more compact. But how will this switch to a new system affect the thermal situation in the aircraft under a wide range of conditions?

Since 2008, the Fraunhofer Institute for Building Physics IBP in Holzkirchen (near Munich) has been testing "all-electric" architectures and their effects on climate protection targets as part of the EU's Clean Sky project. The Thermal Test Bench was created within the Eco-Design® research activities, which are headed up by the Fraunhofer-Gesellschaft together with industry partner Dassault Aviation. This testing facility simulates the interior and exterior conditions of aircraft in flight or on the ground. One main purpose of the work with the Test Bench is to substantially improve thermal management and indoor climate in the cabin and in the cockpit; the focus is on optimizing the climate while using as little energy as possible. Researchers also use the Test Bench to investigate how to cool the new electrical and electronic components in an energy-efficient way. At the same time, they can test the electrical and electronic systems under any flight conditions without leaving ground.

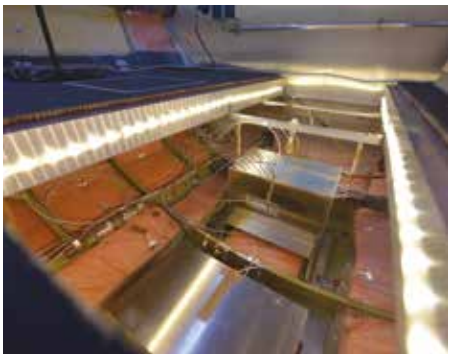
Fraunhofer IBP's flight lab is the only one of its kind in the world. It features a cooling system, heat exchangers, several simulation chambers, an aircraft calorimeter (ACC) for simulating extreme conditions, and the aircraft fuselage of a business jet (Dassault Falcon). The fuselage has been divided into three parts: a carbon cockpit, cabin, and aft tail section. This setup makes it possible to study individual test configurations in detail. All three fuselage sections are housed in a low-pressure tube 30 meters long (9.6 meters in diameter), in which flight conditions such as pressure differences or extreme high and low temperatures can be simulated. In their tests, researchers examine questions such as:



The cabin mock-up is equipped with measuring devices, equipment simulators, original equipment, a fuselage tank section. Integration of realistic cabin interiors is foreseen.

- What heat sources are created in the interior of the fuselage and where exactly are they?
- How do passengers, electronics and electrical systems affect the temperature and vice versa?
- Where does heat accumulate and what additional steps can be taken to cool these areas?
- Are electronic components at risk of overheating and failure?

In the ACC simulation chamber, which measures about 3.5 meters long with a diameter of some 3.5 meters, tests can be conducted at the kind of extremely low pressures encountered when flying at an altitude of up to 90,000 feet, where the air pressure is typically just a few hectopascals (millibars). Fraunhofer IBP researchers can investigate the effects of thermal shock (a sudden fall in temperature) or rapid decompression in the cabin. For example, they can analyze what happens when air suddenly rushes out due to damage to the fuselage – all while remaining safely on the ground.



Equipment simulators underneath the floor of the cabin.

The Aircraft Calorimeter provides extreme environmental conditions including thermal shock and rapid decompression.

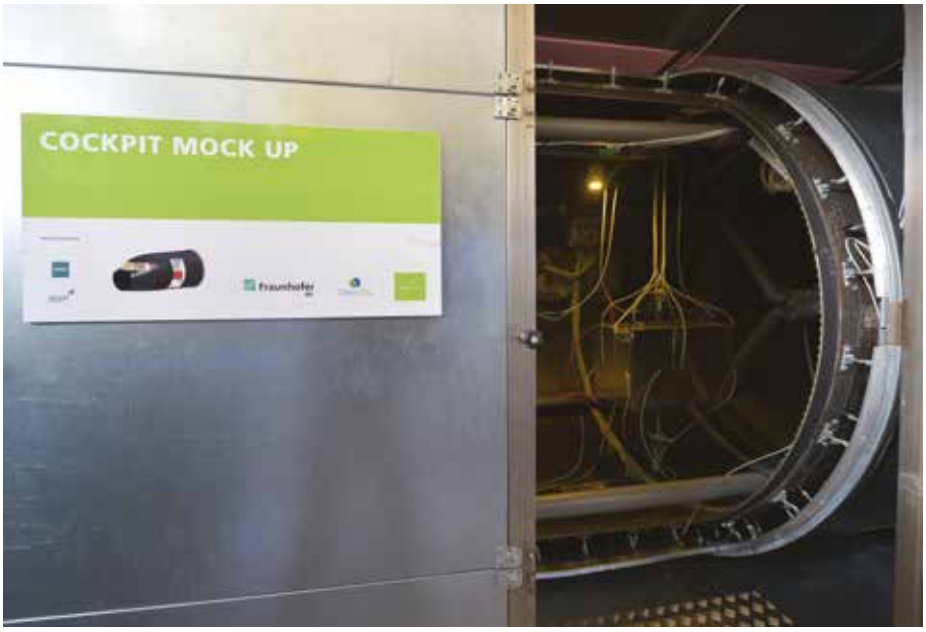
The flight lab's high-performance air treatment unit plays a leading role in the tests. It cools the outer skin of the fuselage down to as low as minus 55 degrees Celsius. Thanks to this unit, the Thermal Test Bench can simulate a long-haul flight at an altitude of 10,000 meters, even over arctic regions. Temperature and humidity in the cabin and cockpit are generated by another, smaller unit, which works in a range of up to 70 degrees Celsius. It also allows the researchers to simulate the effect of desert climates on an aircraft that is sitting on an airport runway.

Using these highly detailed test facilities, the scientists can determine for example if and how new power electronics perform under virtual flight conditions, including extreme situations such as the simulated failure of a component. Safe on the ground, they can run various "worst case" scenarios and learn whether the electrolytic capacitors of an electronic control unit can withstand extreme low pressures – or explode. One positive aspect of the Thermal Test Bench is that it helps protect the environment: not only does it make it easier to develop the "green" aircraft of the future, it also considerably reduces the number of flight tests. This aspect is in keeping with project partner Dassault Aviation's ecological development principle.

Manufacturers of small business jets aren't the only ones who can use the thermal test bench to improve cabin climate and thermal energy management. In building the Thermal Test Bench, Fraunhofer IBP and its partners chose a modular system that makes it possible to integrate structural components from many kinds of aircraft – from business jets and helicopters to large commercial airliners.

In addition, Fraunhofer IBP has in recent years developed a thermal model that it was able to validate using the Thermal Test Bench. Using this tool, the scientists can enter data (such as geometry, ventilation and heat parameters) and then in a very short time forecast the overall level and distribution of temperatures in a room (such as the cabin) with a high degree of accuracy. But the system is not limited to calculations based on the aircraft model at hand (Dassault Falcon). Geometry data of any aircraft can be translated quickly into a thermal model thanks to the Thermal Model Generation Tool. First, scientists enter the key design specifications from a CAD system, such as an aerospace manufacturer's digital mock-up. Next, they can generate the model and clarify important questions regarding temperature development while still in the design stage. For example, when the thermal elements of a helicopter are to be designed, Fraunhofer IBP can use its Thermal Model to calculate on the computer whether it is possible to, say, achieve bearable room temperatures in the helicopter cabin at an altitude of 6000 meters.

Markus Siede coordinates the Cleans Sky activities on the Fraunhofer Thermal Aviation Benches.



The carbon cockpit mock-up is ready for further measurements.

Clean Sky Green Regional Aircraft Flying Demonstrator takes off

The 'green' ATR72 prototype, part of the Green Regional Aircraft ITD, had its first successful test flight on 8 July. In this Flying Demonstrator, an entire (aluminium) section of the upper fuselage was replaced with an innovative composite panel. A layer to provide additional acoustic damping is embedded in this panel, as well as two different technologies for Structural Health Monitoring (SHM). The flight tests are part of the further technology maturation of the design and manufacturing of advanced composite panels, to prove the CFRP material feasibility and its benefits by insertion on future regional aircraft products. The flight test targeted ambitious environmental goals with expected benefits on weight, internal noise, assembly costs and structural health monitoring capability. The flight test program is expected to last 6 flights.

The Flying Demonstrator has been conceived by Alenia Aermacchi in cooperation with ATR, who performed the installation of the composite panel into the ATR 72-600 prototype testing aircraft. Fraunhofer Gesellschaft provided optical fibres and piezo electric sensors/actuators for the in-flight measurements.

The successful flight showed the real progress accomplished in introducing large pieces of innovative materials in regional aircraft. The outcome opens the door to further improvement to the environmentally friendly planes people expect.

Upcoming events

Clean Sky

The 2nd Call for Proposals is now published. More Calls to come

The Second Call for Proposals is now published. The deadline for applications is **18 November 2015**. The budget is **€57,950,000** and there are **64 Topics**. Next Call for Proposals is planned to open on 14 January 2016 and will be supported by two Info Days across Europe.

On **15 October 2015** the 3rd Call for Core Partners will be launched. It will be open until 28 January and people interested can get additional details at an Info Day in London on 11 November 2015.

Innovation in Action at the European Parliament in December

Once again this year, from 7-10 December, the European Parliament will host a series of events, presenting the different JTIs and their activities. As an addition to the Clean Sky stand that will be found in the lobby of the parliament, there will be interesting conferences where different technologies will be presented. **To stay updated – follow www.cleansky.eu**

The Clean Sky Forum will take place in Spring 2016 in Brussels, Belgium. The event will be attended by high-level European and national policy makers, Clean Sky participants from industry, SMEs, research centres, universities, and stakeholders of the air transport community. They will be discussing the new ground being made in technologies, partnerships and innovation chains.
For more information, programme and registration visit www.cleansky.eu

Clean Sky

The Clean Sky Forum will take place in Spring 2016

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