

Skyline

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Clean Sky newsletter

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Clean Sky

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CLEANSKY

Innovating together, flying greener

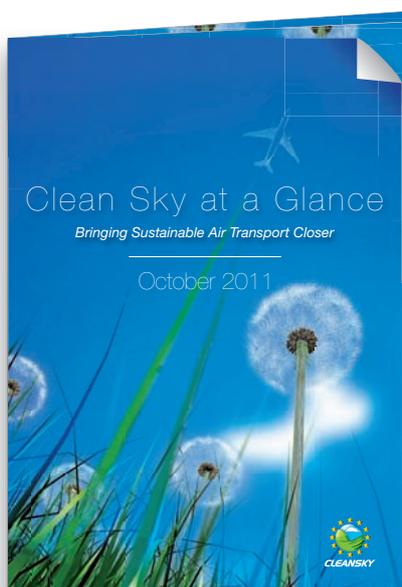


*Eric Dautriat,
Executive Director
of the Clean Sky
Joint Undertaking*

Clean Sky at a glance...

this is a seemingly impossible task, given the variety of technologies which are addressed in the whole programme. But this is what we have attempted to do, focusing on the key technologies, the larger demonstrators, and the environmental figures.

This results in a short document which is currently available on our Website, and which will be kept up to date. It includes a description of our major demonstrators with their target dates, as well as the concept aircraft we use in the models dedicated to the evaluation of the environmental impacts. It appears that the overall, gross objective of Clean Sky is in a range of 30% CO₂ reduction, referenced to aircraft flying in 2000. These figures are being refined and computed through the Technology Evaluator, which will provide its first assessment at the beginning of next year. It will allow us to have not only a forecast by aircraft type, but at airport and fleet level as well.



The flexibility of the JTI structure and JTI rules is of utmost importance for the efficiency of such an instrument. The real “simplification” is not to align all JTI rules in a same, rigid framework, but to allow them to take into account, in a pragmatic way, the reality of the industrial sectors: where is the research performed, how is the supply chain structured, where can SMEs and academia intervene in an optimal manner, ... In Clean Sky, the current structure with industrial leaders, active in the actual technological tasks and able to define well-focused topics for calls for proposals is key.

The technical content of the air transport system part of Horizon 2020, and of any kind of “Clean Sky 2” in particular, will stem from the next Strategic Research and Innovation Agenda that ACARE is currently working out. I have no doubt that original, offensive, bold proposals will come, including far-reaching demonstrators.

We are on track for achieving these targets. This is a condition for being able to address a possible continuation of Clean Sky, or, at least, the JTI concept, within Horizon 2020. In this Skyline issue, we welcome a contribution from Andras Siegler, Director of the Transport Directorate, DG Research & Innovation in the European Commission. We also included a quote from Michael von Gizycki, Secretary General of ASD, well-known in the air transport community, from a conference organised by the Sky and Space intergroup in the European Parliament and chaired by MEP Vittorio Prodi, on October 18th. All of them praise the Clean Sky “instrument” and regard positively such a continuation.

Two weeks earlier, the five JTIs organized a common event also in the Parliament, under the sponsorship of MEP Maria de Graça Carvalho. Altogether, we are leveraging a 10 billion € research and innovation effort in Europe. We have common, general features, we have a lot of cross-links on the administrative side and when appropriate, technical... we are united, and we are diverse.

But let's achieve what we are committed to in Clean Sky as it stands now. The motto of this “5 JTIs” event in the Parliament was: “Innovation in Action”. We have several accounts, in this Skyline issue, of our innovation, and our action – in particular, this time, with Universities and Research organizations. A good opportunity to recall that Academia account for 25% of the winning participations in our calls. It is also interesting to note that on average, each University is participating in two different topics. Sometimes many more. Universities, when they come once, often come back. They are welcome!

Eric Dautriat

Executive Director of the Clean Sky Joint Undertaking

THERMOCS:

An innovative project on thermosetting resin

When composite materials technologies are applied to smaller vehicles, some unfavourable properties in different fields may require undesirable technical adjustments. Therefore, regional aircraft new technologies are required to retain all the promising weight savings of composite structure and in this direction an undoubtedly attractive opportunity is to improve the performances of composite materials by the introduction of dispersed nanoparticles that can give peculiar mechanical and functional properties to the resulting charged material.

To support this technology area in the Green Regional Aircraft (GRA) Integrated Technology Demonstrator developed within Clean Sky, a 10-months project has been completed by AIT / AMAT (Austrian Institute of Technology / Advance Material and Aerospace Technology), concerning the use of a nanocomposite material for primary structures of a Green Regional Aircraft.

The nano-filler modified matrix have a great potential to exhibit high performance in terms of thermal, mechanical and electrical properties.

The objective was to manufacture nanomodified resins to fulfil the requirements of the Clean Sky roadmap and particularly to determine the influence of the nanoparticle content on the mechanical, thermal, impact and electrical properties of the resin. The dispersion procedure was an important development step within this project.

AIT/AMAT has developed and mixed different class of nanoscale polymer fillers into an epoxy resin. In a first step, nanoparticles have been selected among nanoclays

(both cationic and anionic clays), ceramics (Boehmit, Alumina), carbon nanofibres (Vapour Grown Carbon Fibres) and multi-wall carbon nanotubes. 12 different types of resins have been produced in the first phase, with filler content varying from 0.1% to 15%.

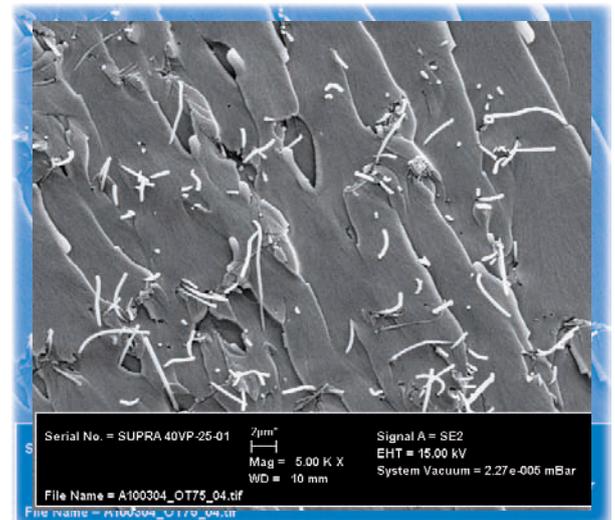
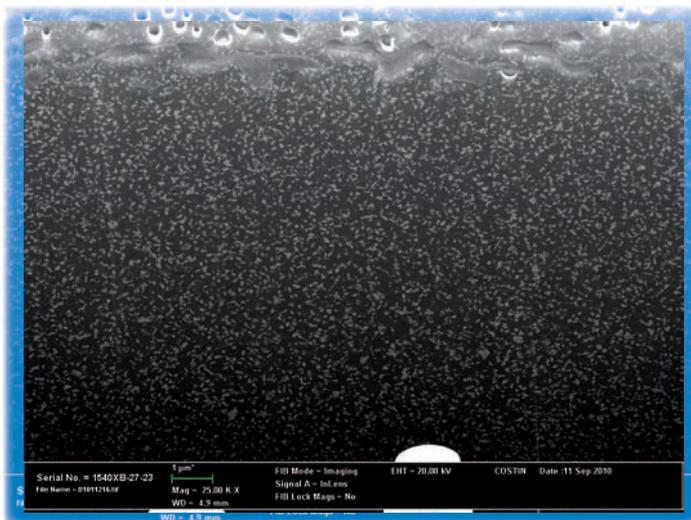
The following characterizations have been done: physical and morphological observations, thermal characterisation, impact test, mechanical test (bending and tensile modes) and the electrical resistivity.

Despite no nanoparticle type can improve simultaneously all physical properties, the following results have been obtained:

- The ceramic nanoparticles have the best performance in mechanics with poor impact and viscosity properties.
- The carbone nanotubes have a positive influence on the electrical resistivity and the impact strength.
- The vapour-grown carbon fibres particles have a very good improvement of the electrical conductivity but with lower impact resistance.

No nanoparticle type has been able yet to improve simultaneously all physical properties: this study paves the way for further developments which will have to consider hybrid solutions of different types of nanoparticles or layered approaches in order to optimize the influence of nanofillers.

The Austrian Institute of Technology won two other projects in Clean Sky, one as a coordinator, one as a participant.



Aeronautics Research in Horizon 2020



András Siegler,
Director,
European Commission

Horizon 2020

The Commission's proposal on the upcoming research and innovation framework programme is in its final phase of preparation. This is very much "work in progress" and a lot of changes are still possible. We expect that the College of Commissioners will endorse it on November 30th this year.

The Research and Innovation Commissioner, Mrs Mairé Geoghegan-Quinn, will present the proposal at the Innovation Convention on December 5th here in Brussels and then at the Competitiveness Council of Ministers on December 6th. This will be the beginning of the debate of the proposal which will take place in 2012-13 before the programme will be actually launched at the beginning of 2014. Its duration is 7 years.

As you may know, last February, the EU's heads of state and government called upon the Commission to bring together all EU research and innovation funding under a **Common Strategic Framework** to make it both more effective and impactful and easier to access for participants. Following an online competition, the Common Strategic Framework has been renamed **Horizon 2020**. We must now learn to talk about "Horizon 2020" and no longer "FP8" or "CSF".

What about figures? Within the Multiannual Financial Framework (MFF) proposal adopted in June, the Commission has proposed a total budget of **€80 billion** for Horizon 2020 (in constant 2011 prices), representing **an increase of some 46% for research and innovation**. This increase is one of the biggest in the whole Multi-Annual Financial Framework. This reflects the importance that the Commission attaches to the research and innovation at the European level. It is however too early at this stage to talk about the breakdown per theme.

We are now preparing to take the Commission's budget proposal forward through our legislative proposal for Horizon 2020, which will be adopted by the Commission on November 30th and then sent to the European Parliament and to the Council.

Regarding content: The proposal for Horizon 2020 elaborates three major objectives for research and innovation:



- **Excellence in the science base** – The aim here will be to strengthen the EU's world-class excellence in science by developing talent within Europe and attracting leading researchers to Europe.
- **Creating industrial leadership** and competitive frameworks to support and promote business research and innovation in key enabling technologies; services and emerging sectors with a strong focus on leveraging private sector investment in R&D; and, to address SME-specific problems.
- The third block '**Tackling societal challenges**' will respond directly to the challenges identified in Europe 2020. It will support activities across the entire spectrum from research to market. It is among these challenges that we find Transport under the title "**Smart, green and integrated transport**".

A key new feature of Horizon 2020 will be that for the first time EU funding for research and for innovation is put together into a truly integrated programme. The aim is to get more impact from every euro spent, and to radically simplify the complex landscape of funding programmes that currently exist.

Implementation will be simplified and standardised, with simplification covering both funding schemes and rules. Key aspects will include: a rationalised set of funding schemes, a single set of rules, earlier project start and major externalisation.



PPPs and JTIs

Public private partnerships will be expected to play an important role in implementing Horizon 2020, building on the experience under FP7. In the field of Aeronautics, we have of course the Clean Sky Joint Technology Initiative, which despite a slower than hoped for start has proved to be working well.

Within the wider context of aviation one should also mention the SESAR Joint Undertaking in charge of Air Traffic Management technologies under the Single European Sky policy of the EU.

Two weeks ago, on 6th October, at the JTI event organised in the European Parliament, my Director General, Robert-Jan Smits gave a positive signal for a possible continuation of the current JTIs in Horizon 2020.

However, continuation will be conditional on the assessment of the proposals on renewed JTIs according to several criteria that are being developed. Also, this does not automatically imply that each JU will pursue its mandate with the present remit only.

The widening of scope of the Commission air transport programme from aeronautics to aviation, in the light of the new Transport White Paper and Flightpath 2050 Vision for Aviation, will certainly need to be taken into account for a future JTI proposal.

The very positive outcome of the first interim evaluation of the Clean Sky JTI is already an excellent first step in this direction. I expect the first results of the Technology Evaluator very soon – this should be the next step to underpin any proposal for a prolonged and renewed JTI in aeronautics.

ACARE

Almost a year ago (12/2010) V.P Kallas and Commissioner Geoghegan-Quinn called a High Level Group on Aviation Research composed of 14 CEOs to establish a renewed vision for Aeronautics and Air Transport, beyond 2020. No more than 4 months later, a new vision called '**Flightpath2050**' was made public at the Aero-days at the end of March 2011. It was well received and broadly endorsed by the community.

Flightpath 2050 is an ambitious vision from the aviation community that wants to maintain leadership while answering Europe needs; it aims for a better mobility with a high levels of safety and security, a reduced impact on the environment (e.g. an ambitious target of -75% CO2 reduction between 2000 and 2050) and also looks into the needed research infrastructures and educational needs of tomorrow's engineers.

In view of initiating the work towards the goals of Flightpath, a new ACARE – Advisory Council for Aviation Research and Innovation in Europe – was kicked-off at Paris Air Show in June. The renewed ACARE does look into the entire aviation sector i.e. aeronautics and air transport and includes Innovation in addition to research.

The work on the new Strategic Research and Innovation Agenda to implement Flightpath 2050 has already started and at this time, 5 Working Groups including more than 100 stakeholder representatives initiated the work to reflect about the needed research and innovation actions. We expect that the new Strategic Research and Innovation agenda will be ready by next summer, on time to provide input for Horizon 2020 and its first work programmes. It would be also instrumental to set the clear scope for the next PPP in the field of aeronautics and air transport.



Michael von Gizycki,
Secretary General of ASD

"The fundamental importance of aerospace research should be acknowledged in the preparation of Horizon 2020.

The aerospace industry of Europe has a long successful track record in working with the various Framework Programmes since almost 20 years. Our industry has been able to organize itself within ACARE and draw up a strategic agenda for research with ambitious targets recently approved in the 2050 Flightpath document jointly endorsed by the Commission and industry. To meet these targets, industry needs clear visibility in Horizon 2020 and a robust budget to conduct the corresponding research.

The Framework Programme has demonstrated itself as an efficient complementary tool to what industry does at national level and by itself. Today, at EU level, Clean Sky is the best example of a successful Public Private Partnership. This concept needs to continue and must even be broadened in Horizon 2020.

Keeping our technological advance through increased R&D investment is the only way to -at least- preserve our current position".

Focus on Cranfield university, an academic perspective



The multinational CU
Clean Sky Team

Cranfield University (CU) is a wholly postgraduate university specialising in science, technology and management. CU's main goal is to conduct world-class rigorous research and academic teaching, both having a strong focus on the commercial and business needs of the industry. CU, through its strong links with industry and commerce, provides a liaison between pure academic research and real world industry problems.

In order to achieve these goals, CU brings a range of multidisciplinary skills in numerous fields such as aerospace, automotive, energy, environment, healthcare, manufacturing, security and defense. CU's mission is to transform the knowledge gained from academic research into ingenious solutions.

Involvement in Clean Sky

CU is proud to be an Associate Member in Clean Sky, contributing to both the Systems for Green Operations (SGO) Integrated Technology Demonstrator (SGO – ITD) and the Technology Evaluator (TE), as part of the Green Systems for Aircraft Foundation (GSAF) cluster.

The CU team working in Clean Sky comprises both senior and junior members of academic staff as well as several PhD and MSc students.

From trajectory optimisation ...

Within the SGO Integrated Technology Demonstrator, in the section devoted to the Management of Mission and trajectories (MTM), CU is leading the development of GATAC (Green Aircraft Trajectories under ATM Constraints) – a tool for multidisciplinary aircraft trajectory optimisation studies. In particular, CU is responsible for the development of various models in the framework, with a focus on optimisation techniques. CU is also leading the integration of the models within GATAC as well as the EU city pair trajectory optimisation studies.

Within WP3.1 of the SGO-ITD, CU has already delivered the following models (with specification documents):

- Turbofan equipped aircraft performance model (including performance on ground)
- Turbofan engine performance simulation model (for large aircraft)
- Turbofan engine emissions prediction model

- Turboprop equipped aircraft performance model
- Turboprop engine performance simulation model (for regional aircraft)
- Turboprop engine emissions prediction model
- Open rotor equipped aircraft performance model
- Open rotor engine performance simulation model

- Open rotor engine emissions prediction model
- Mission and trajectory model
- Airports and environs model
- ATC regulatory and operational constraints model

The development of additional models including a Contrails model is currently underway.

Within WP3.2 of the SGO-ITD CU has developed and performed rigorous benchmarking tests for a Non Dominated Sorting Genetic Algorithm

(NSGA-II) based optimiser in collaboration with Airbus France.

Additionally, CU has also developed a Tabu Search optimiser which is currently being tested and verified. CU has also led the integration of the optimiser and the various models within the GATAC framework, in collaboration with the other GSAF partners, and has begun performing real EU city-pair multidisciplinary optimisation studies. Currently an Amsterdam>>London multidisciplinary trajectory optimisation study is being performed.

... to performance simulation

In the context of the Technology Evaluator, CU has also been actively contributing to the development of a helicopter performance simulation framework for the Clean Sky Technology Assessments. The main work involves the definition of rotorcraft flight trajectories.

CU is responsible for the fuel burn and emissions calculations of rotorcraft (also actively contributing to the noise assessments) for the three levels assessed, Aircraft (mission) level, Airport (operational) and Air Transport System (global fleet) level.

So far, CU has defined more than 53 different rotorcraft trajectories for 5 geographic locations (heliports) in Europe namely Ciampino (Italy), Myttinge (Sweden), Arlanda (Sweden), Langenhagen (Germany), Den Helder (The Netherlands). In the context of the first TE Assessments, CU is to perform more than 150 trajectory calculations.

In brief ...

- ✓ 126 proposals submitted by universities, successfully selected in Clean Sky
- ✓ 62 universities involved in Clean Sky
- ✓ Total funding covered: 18.9 million euros

Interview



Andriaan De Graaff, Observer for the Clean Sky evaluation - 9th call for proposals

What is your background in aeronautics?

I have been working in aeronautics research for nearly 40 years of which I spend 32 years at NLR in the Netherlands in different management positions with an international flavor. For the last 6 years I have been working as an independent consultant for the industry, Dutch government and as a partner in different EU Framework Program projects. I particularly liked the Out of the Box and Create projects as these developed future concepts for air transport. This conceptual work has resulted in a number of new long term EU projects.

Have you been involved in Clean Sky?

Already in 2004 the discussion was started between the European industry and research establishments on a new Joint Technology Initiative. At that time we talked about a possible FLIP (Flexible Long term Integrated Program). Focus was on technology demonstration as these activities were lacking in Europe. Several proposals were collected and we selected the most promising ones in 2005. We then integrated these into a single large program with 6 separate parts: the Clean Sky program. I also started to set up a Dutch industry cluster that could participate in Clean Sky. My direct involvement with Clean Sky ended in 2008.

So, you support a JTI in aeronautics?

Yes, it is absolutely necessary to have a large scale demonstration effort in Europe. In the US, NASA has been running large scale demonstration programs for a long time and Europe should not stay behind.

Demonstration efforts - through so called level 3 projects like Clean Sky - stimulate the swift application of research in market products.

How do you see the future of Clean Sky?

I think it is important to continue Clean Sky in the coming years. New concepts and technologies will be developed that need to reach a high technology readiness level through demonstration in Clean Sky. The new Clean Sky initiative should be flexible in order to incorporate new topics as these mature.

What was your role in the latest evaluation of proposals for Clean Sky and what are the main conclusions in your report?

I was asked to observe the evaluation process during 19 to 23 September and suggest improvements to it. My conclusion is that the whole evaluation process in Clean Sky is executed in an efficient, professional, fair and impartial way. It meets the highest standards. Each project is evaluated by two independent experts and two experts assigned by the respective ITD leaders. In general, the conclusions of all evaluators matched, so that consensus could easily be reached. I made a recommendation that in some cases the text in the call for proposals could be clearer. I also noted that some contract have a very limited money value. Project volume and the cost of the evaluation and the monitoring of the project should be in a reasonable balance however. **In general the evaluation process is excellent and can be an example for others to follow.**

A hot summer start for Clean Sky at the International Paris Air Show

Clean Sky participated to the 49th edition of this major aeronautical event, one of the largest worldwide event dedicated to the aviation and space industry. Clean Sky was present with a chalet to increase its visibility and also to welcome members, partners, stakeholders and the more general public interested in aviation and the environment.

Throughout the week, several thematic round tables were organised in the chalet on most interesting topics such as Flightpath 2050, eco-design, future engines, future green aircraft and rotorcraft, green systems... with packed audience. Last, a specific session was dedicated to students.

The round table "Flightpath 2050", focused on the renewed ACARE vision on Aeronautics through to the middle of the century drew a full attendance.

Clean Sky also invited 40 students to discuss the greening of aeronautics.

A "sunny impulse" for Clean Sky

The Solar Impulse team, Bertrand Piccard and its pilot André Borschberg, paid also a special visit to the Clean Sky chalet. During



a press briefing, André Borschberg stated "Solar Impulse does not carry passengers but messages and shall become a source of inspiration for Clean Sky and the entire industry".

Solar Impulse team was impressed by Clean Sky comprehensive and global approach that is summing up the environmental benefits achieved by a broad range of technologies to reach a very ambitious objective. "There is no magic solution. All initiatives are welcome to contribute, all together to cleaner skies: 20 times 2% reduction makes 40%" added Bertrand Piccard.

Short news



Joint Technology Initiatives in action at the European Parliament

Europe's five Joint Technology Initiatives: ARTEMIS (embedded computing systems), Clean Sky (aeronautics and air transport), ENIAC JU (nano-electronics), FCH JU (fuel cells and hydrogen) and IMI (innovative medicines) highlighted last 4-6 October at the European Parliament the first achievements of their €10 billion research and innovation programmes.

The first results emerging from JTI-funded projects highlight the success of this novel and unique model of public-private partnership (PPP) and its capability to boost innovation in key sectors for European competitiveness, job creation, and quality of life.

Between them, the JTIs have a **total budget of €10 billion**, around a third of which comes from the European Commission, with the rest leveraged from industry, research and the EU Member States. The JTIs are investing these funds in ambitious research and training projects that bring together experts from academia, small and medium-sized enterprises, industry, and other groups. As such, they cover the full innovation chain.

During a dedicated Clean Sky thematic session, MEP Vittorio Prodi, Chairman of the European Parliamentary 'Sky and Space Intergroup', commented on the progress made and congratulated the public private participants.

At the closing press conference, Mrs Maria da Graça Carvalho MEP, Robert-Jan Smits Director-General, Directorate-General Research & Innovation and Zoran Stančić - Deputy Director-General, DG Information Society & Media, commented the progress to date with the JTIs and congratulated the 5 JTIs with strong performances and their high potential for ground-breaking achievements.



On behalf of Clean Sky, Ron van Manen addressed the panel and assembled press, highlighting the progress made so far in Clean Sky and the strong case for continued public-private partnership in aeronautics, illustrating potential demonstrated to date within Clean Sky with the examples of 'open rotor', 'composites' and 'laminar wing' technology projects and demonstrators.



M. Prodi made it clear that continuing the investment in aeronautical capability and competitiveness must remain a priority for Europe



MEP Maria Da Graça Carvalho, host of the Joint Exhibition, stated: "Innovation is crucial for growth and creation of jobs in Europe. JTIs are powerful instruments to bring knowledge into the market in Key Technologies".



Robert-Jan Smit gave on behalf of the European Commission a positive signal for a possible continuation of the current JTIs in Horizon 2020, last 4th October.

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