

# Skyline

n°4

Clean Sky newsletter

JUNE 2011



## *Clean Sky*

ECO-DESIGN & LIFE  
CYCLE ASSESMENT

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**CLEANSKY**

*Innovating together, flying greener*



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

*“Clean Sky has the  
potential to become a  
new model of Public  
Private Partnership”.*

## **Dear reader,**

Spring is usually the season of Annual Reviews for each Integrated Technology Demonstrator in Clean Sky. In two day meetings, the Joint Undertaking and experts, in particular from our Scientific and Technological Advisory Board, are given extensive presentations about the achievements of the previous year and the general progress. They make recommendations which are dealt with by the ITD Steering Committees. These reviews, along with more day-to-day contacts, are one of the important means to monitor the programme execution.

This year (the second series of annual reviews) shows significant progress in all areas. For instance, for the Smart Fixed-Wing Aircraft review hosted by SAAB in Linköping, a scale-one structural part of a wing in composite, in the framework of the laminar wing project which requires very tight manufacturing tolerances and smooth surface, was exhibited to the ITD participants and the reviewers. While for Eco-Design in Berlin, extensive work was presented, not only on the Life Cycle Assessment as explained further in this edition of Skyline, but also on a set of green technologies dedicated to decrease resources consumption and waste, and increase recyclability, for instance in the field of direct manufacturing or out-of-autoclave – on average, these technologies are meant to reach TRL 5 by 2013.

Concerning the Green Rotorcraft and the Technology Evaluator, outstanding results were achieved on the Phoenix simulation platform, which will be used for impact assessment of new technologies: more than 2500 helicopters with their associated performance data (trajectory, noise and fuel consumption) have been included in this database, in parallel with the inclusion of actual noise measurements acquired in 2010 over different flight tests campaigns. These annual reviews are dedicated to the ITD technical activities.

Another recent review aimed at the full scope of Clean Sky: the “First Interim Assessment” was performed by a panel of external experts appointed by the European Commission, as foreseen twice in the programme by the Statutes. This panel commended the JU and its stakeholders for the successful implementation, for the successful stimulation of developments towards environmental targets, despite the delays in the starting phase, for the wide number of partners, particularly SMEs, now involved in the Initiative. They consider that Clean Sky has the potential to become a new model of Public Private Partnership. Besides that, they made a series of recommendations in order to strengthen the programme management and reduce risks, with a priority given to keeping the schedule of the highest TRL technologies and the relevant large demonstrators.

This panel also recommended that external communication is enhanced in order to improve public awareness of Clean Sky. Our presence at the Paris Air Show with a “chalet” is one answer to this. In this chalet, we will organize roundtables about some of the main technology streams: future engines, airframes, systems, within and beyond the Clean Sky programme. Besides, we will take this opportunity to celebrate the 400th participant in Clean Sky – “participant” meaning both Members (committed for the full duration) and Partners (selected through our calls and dedicated to one or several precise topics). The selection of this 400th participant was just made during the evaluation of the last call to date, which is bringing now more than 100 new partners into Clean Sky... I will not disclose here the name of the company we will celebrate. Let's keep the suspense!

**Eric Dautriat**

*Executive Director of the Clean Sky Joint Undertaking*



*GRC Annual Review, Milano, 4-5 April 2011*

# From the desk of David Ewins

## The view from the STAB Chair



*“The STAB brings together many years of collected experience in aerospace matters - from industry, from government research laboratories and from universities”.*

### What is STAB?

Just one year ago, together with 10 colleagues from across Europe, I joined the newly-formed Clean Sky Scientific and Technology Advisory Board – STAB, for short. This group brings together many years of collected experience in aerospace matters – from industry, from government research laboratories and from universities: many, if not most, of the STAB members are recently retired from senior positions in these organisations. We have been assembled to provide the Clean Sky Governing Board, and its Executive Director, with an independent view on matters relating to the technical aspects of the Clean Sky Programme. The Board is charged with providing Comments and Recommendations on issues of concern to the Governing Board, or the Executive Director, or – indeed - to the Board itself. It is still early days, but the Board has quickly settled in to working very well together, in spite of – or perhaps because of – their rather diverse backgrounds.

### What does STAB do?

In the first year of operation, we have had 4 full Board meetings, as well as some smaller Working Group sessions reviewing specific issues on more detail. Perhaps most importantly, members of the STAB have participated as expert reviewers in all of the ITD Annual Reviews that have taken place in the past year and in doing so have become immersed in the detailed workings of all parts of the Clean Sky Programme. Eventually, it is planned for each Board member to participate in at least 2 ITD Reviews each year. This has served both to bring all the Board members quickly up to a high level of appreciation of specific subject areas and also to identify inconsistencies across the different ITDs. Already, a checklist of generic features which should have commonality across the different topics has been compiled, and new opportunities for inter-ITD interactions have been identified, and these have been quickly shared with the different consortia. A number of specific technical issues have been identified for more detailed review and we enter our second year with a number of subgroups working on these issues with a view to providing recommendations for further refinement of the overall programme.

David Ewins joined the STAB, and became its first Chairman, after a career at the interface between academe and industry in the aerospace and defence sectors. Based at Imperial College London for 40 years, with a specialisation in Structural Dynamics, he has worked throughout that period in close collaboration with industry. He has served on advisory boards in both industry and academe.

## High visibility for Clean Sky at Aerodays 2011



Visitors of Aerodays 2011 in Madrid showed a great interest in Clean Sky during the 3 days conference.

Clean Sky booth was extremely well attended, with Tom Enders (CEO Airbus), European Commissioners Maire Geoghegan-Quinn and Siim Kallas having a close look at the open rotor as well as at other mock-ups on display.

Further, Eric Dautriat, Executive Director of the Clean Sky JU, was invited as key speaker in the plenary session “Mastering the future in aeronautics”, together with John Tracy (Chief Technology Officer, Boeing) and Charles Champion (Executive Vice-President Engineering, Airbus).

In addition, two parallel sessions entirely dedicated to Clean Sky went into the more technical details of the future air transport system and the key technologies of future aircraft. They were both very successful with packed audience.

Last, Eric Dautriat accompanied Commissioner Geoghegan-Quinn and Spanish Minister of Research to visit EADS-CASA plant at Getafe, during which EADS involvement in Clean Sky was also presented.

This 6<sup>th</sup> edition of Aerodays confirmed the key role played by Clean Sky in the future of European aeronautics.



## Eco-Design for future aircraft

*Right from the initial definition, and throughout the lifecycle, Eco-Design is aiming at reducing the environmental impact of an aircraft.*

Aircraft industry naturally takes part in the collective effort to foster a sustainable development, especially given the increasing air traffic expectations. Very ambitious goals have been set in this area by the Advisory Council for Aeronautics Research in Europe (Acare), grouping all aviation industry stakeholders in Europe.

The life of an aircraft can be divided into four main phases: design, production, operation and end-of-life, when it is withdrawn from service. Each of these phases implies an environmental impact, involving raw materials, water, energy consumptions, solvents etc.

Eco-design means integrating the reduction of environmental impact throughout the product lifecycle, right from the initial definition. In former times, environmental impact was only considered after the design phase. Nowadays, environmental impact is a criteria to comply with, as much as it is with costs and performances criteria.

In an eco-designed aircraft, fuel consumption is of course the first area to be sized up. Both engines and airframe aerodynamics will undergo significant changes to lower fuel consumption. Other aircraft parts such as aircraft structure with all the systems, and fully equipped parts will also have to be analyzed and monitored to find a way of decreasing the overall environmental impact.

The structure of the future aircraft will have to integrate the following:

- Recyclable and recycled materials for a moderate lifecycle environmental impact.
- Clean, energy-efficient production processes.
- Protective coatings without hexavalent chromates or cadmium.
- Embedded sensors to locally monitor mechanical conditions, and therefore optimize the maintenance and the life of the product.
- Easy dismantling; materials could be easily differentiated to facilitate the sorting, the location and identification of challenging substances (if any) will be performed.

A lifecycle analysis application is the baseline to evaluate the environmental impact of a product, at all stages. During the design phase, this kind of assessment allows to anticipate

environmental impact, and to evaluate the relative influence of each phase in the lifecycle, for each part of the aircraft and then to perform sensible comparisons. It permits also to select or downselect one technology against another before freezing the aircraft definition.

In addition, aircraft virtualisation and simulation processes are helping during design and manufacturing phases. The traceability of materials and substances is also ensured for possible regulations to comply with when dismantling the aircraft. In this perspective, Product Lifecycle Management (PLM) for an eco-designed aircraft will also incorporate all materials and process data needed for the preliminary lifecycle analyses, to integrate environmental impact criteria together with performances and cost criteria.

### *Eco-design within Clean Sky*

In the frame of Clean Sky, the Eco-Design ITD - airframe part (Integrated Technology Demonstrator - EDA), is directly focused on the last ACARE goal: "To make substantial progress in reducing the environmental impact of the manufacture, maintenance and disposal of aircraft and related products".

On one side, it addresses the selection, development and demonstration of promising technologies and processes by focusing on the following challenges:

- To identify and mature environmentally sound ("green") materials and processes for aircraft production. This includes the optimal use of raw materials, decrease consumption of non renewable or hardly reusable materials, natural resources, energy, emission of noxious effluents, as well as avoidance of CMR compounds and application of future regulations;
- To identify and mature environmentally sound ("green") and processes for aircraft maintenance and use processes. In addition to the production phase, aspects like long-life structures or more "intelligent" products (e.g. using sensors) will be taken into account.
- To improve the field of end-of-life aircraft operations after several decades of operation, including reuse, recyclability and disposal issues.
- To provide means for an economic design process in order to minimize the overall environmental impact of aircraft production, use/maintenance, and disposal.



Eco-Design Annual Review, Berlin, 7-8 April 2011



On the other side, the new technologies are evaluated and monitored through system level activities: the eco-statement mainly based on Life Cycle Analysis (LCA), producing the life-cycle assessment. The LCA of a product is based on the representation of the aircraft life through a succession of unit steps at all level of the aircraft integration, from individual pieces up to the aircraft. Examples of such steps are machining, drilling of mechanical parts, assembly, painting, dismantling, etc. The LCA tools produce for each step the quantified environmental impacts by using a LCA database on processes and then the environmental impact results at each level of the product tree, up to the complete aircraft.

LCA tools already exist today and are used by other sectors such as automotive and maritime industry. Synergy with aeronautic is taken into consideration for the use of those tools and the development of a general LCA methodology. The databases used are specific to the industry sectors and a major objective of Clean Sky through the Eco-Design ITD is to build up such database for the aeronautic sector for the generation of LCA results for aircraft and helicopter.

As presently implemented, the general eco-statement logic is based on the definition of a limited number of typical aircraft parts to cover all technologies and processes encountered on aircraft. LCA are first performed on parts manufactured with current technologies and then are performed on the same parts but manufactured with new Clean Sky technologies. Comparison of results will produce an evaluation of benefits brought by the new technologies to be

matured at TRL 6 through on-ground demonstrations. LCA results on parts will then be extrapolated to evaluate life cycle environmental impacts at level of the overall aircraft.

The on-ground demonstration will address among others low energy curing, light alloys/green metallics, thermoplastic aircraft structure, bio and thermoplastic composite for interiors, material for electronics and composites for high temperature applications.

The engineering world is now entering into the Eco-Design era: all human products will be designed by taking into account the requirements of reduced environmental impacts all along the product lifecycle, from raw materials extract up to the product death.

In the frame of Clean Sky, EDA covers the development and demonstration of major pillars of this new approach for Aeronautic:

- New green technologies and processes to be used as the basis for the future aircrafts and helicopters.
- Engineering tools including LCA tools with a specific database for aeronautic processes.

After Clean Sky the European aeronautic industry will be armed to produce green new generation aircraft not only during operations but also during out-of-operation phases.

### Main challenges (of EDA sub-project)

- Maturation of “ecologic” technologies and processes to reduce environmental impacts during out-of-operation phases,
- Define a way to introduce the ecologic performance into a design criteria in the same way that performances and cost,
- Development of engineering recommendations and tools for the aircraft design in aeronautic.

## Eco-Design in brief...

✓ **Challenging objectives:** Preliminary key parameters of EDA environmental objectives at the level of the product and for the out of operation lifecycle phases are as follows:

Environmental aspect	Type	Rational	Comment	Target
Process emission: e.g. CO <sub>2</sub>	Quantitative	ACARE, Emission trading	For each phase, sum of the total amount of the CO <sub>2</sub> emitted by all the processes (direct emissions and indirect emissions i.e. produced when producing the energy).	20% reduction
Hazardous material	Qualitative	REACH	Qualitative mark using the list of the substances used by the manufacturing of each material.	Compliance to regulations
Energy	Qualitative	Resource consumption	For each phase, sum of the total amount of the energy used by all the processes (energy direct and energy indirect i.e. required to produce the direct energy or recover by incineration for the end of life phase).	15% reduction
Recycling of material	Qualitative	Future regulation on recycling and waste management	Qualitative mark using 4 criteria: homogeneity, compatibility, capacity of segregation and recycling.	

- ✓ **2 sub-projects focused on:** airframe applications (EDA), small aircraft systems applications (EDS)
- ✓ **Co-leadership by** Dassault Aviation and Fraunhofer Gesellschaft
- ✓ **41 Clean Sky Members:** ITD leaders & Associate members from industry, research institutes, SMEs grouped in clusters
- ✓ **40 Partners** selected from the first seven Calls for proposals; 40 more Partners expected to joint in the next calls
- ✓ **Gross budget** 116 ME (around 7% of Clean Sky budget), 79 for EDA, 37 for EDS

# Clean Sky website: Total revamp

You probably noticed that the new Clean Sky website [www.cleansky.eu](http://www.cleansky.eu) went live just a few days ahead of the Aerodays 2011 in Madrid end of March.

This represents a major improvement in our communication towards our stakeholders, industry, research community, decision-makers and the general public.

The design is much more attractive and fully in line with the Clean Sky corporate housestyle.

But this revamp represents more than a face lift. Indeed, a

new Content Management System was selected to build and maintain the site. The navigation is more intuitive, with direct access to information on Calls for Proposals, Work undertaken, Deliverables and Media.

Furthermore, multimedia items (photosets, videos, animations...) will progressively enrich the site. And in the coming weeks, more interactive functionalities can be enabled (comments on articles, polls & survey, blogs, social media, etc).

Last, the website will be complemented with an e-campaigns tool to regularly update you on news and achievements.



# The Simet project

## Interview with Florent BIRLING, Project Manager at GTD Sistemas de Información (Spain)



The GTD development team.

*“In Clean Sky, you develop new R&D solutions that will have a final use in the industry. The Clean Sky projects are therefore more end user driven”.*

### Florent how would you define GTD?

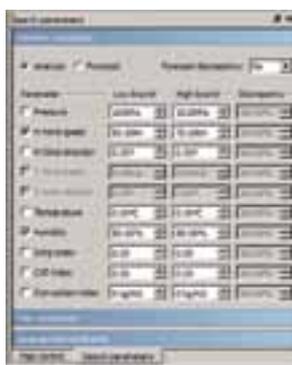
GT D is a leading Spanish SME providing software and system engineering in the space, aeronautics, defence and energy sectors. Over the last 20 years, GTD specialized itself in the development of critical software for the ground segments and for the embedded systems. Our developments cover a range of activities from control centres for the Ariane 5 launchers to the development of the Mission Management Computer for the A400M. In the last R&D projects, we focused in the processing of weather data and in the atmospheric awareness.

### What is your European R&D background?

We started to participate in European projects in 1998 with a project related to remote sensing and multi-sensors data fusion for the mines detection. Today, we are particularly active in the aeronautics sector with the participation in the FP7 Alicia project and in the energy sector with the FP7 HiPerDNO project. We have also participated in various ESA and ITEA projects. Our interest in Clean Sky was as a result quite straightforward.

Last April, we kicked off our second project called Neural to evaluate the potential benefit of neural networks for improving the performance to the data access of the FMS.

### What are you developing in the Simet project?



We have developed an indexed weather repository with several years of atmospheric conditions related to wind, pressure, temperature, humidity and other variables. With this solution you can easily search the atmospheric scenarios you need and send these conditions to your simulator. The final user, Thales Avionics Toulouse, will then be able to develop new mission and trajectory systems that will reduce the emissions and the noise through better aircraft trajectory optimisation.

### Are other SMEs involved in Simet?

The Simet consortium is composed of a public organism Météo France and 3 SMEs. The other two SME's cooperating with GTD are

Atmosphere and USE2ACES. Atmosphere is based in Toulouse and completes the weather expertise in our consortium. USE2ACES, formed by test and airline pilots based near Amsterdam adds crew expertise and supplies operational points of view. What do you like in the Clean Sky initiative? Compared to other European frameworks projects like FP7, in the Clean Sky initiative, you develop new R&D solutions that will have a final use in the industry. The projects are therefore more end user driven, thanks to the follow-up of the ITD Managers.

The Clean Sky calls for proposals are generally smaller than the FP projects and offer therefore more possibilities for an SME to build a consortium and coordinate a project.

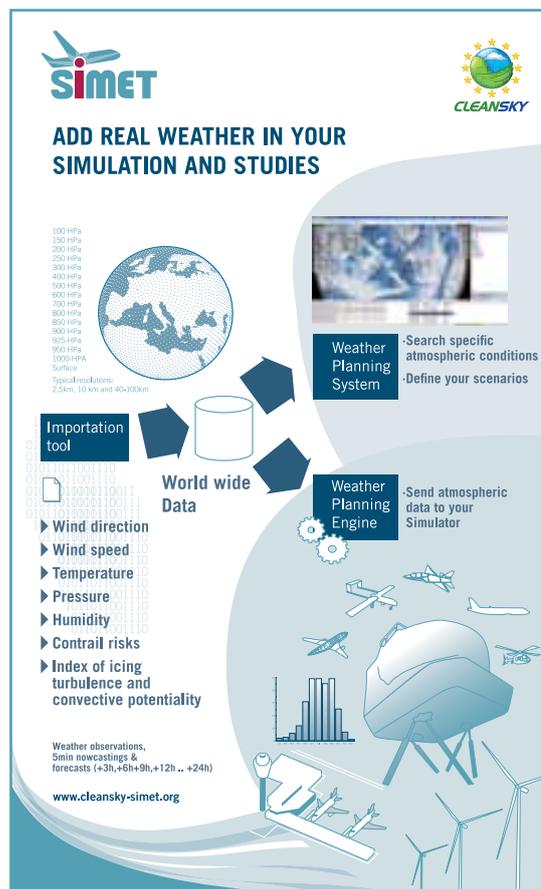
### Do you foresee further exploitation of your development?

Yes, we think that the weather solution developed in Simet allows to go further to a product, and such a potential product is generating a lot of interest in the simulation market. We have therefore presented our solution last May in Cologne at ITEC, the biggest European simulation exhibition. The feed-back of the end users, distributors and simulator owners was very positive and encouraging to update our solution to a commercial product.

For more information:

<http://www.gtd.es>

<http://www.cleansky-simet.org>



# Short news

## Forthcoming events:

- International Paris Air Show, 20-26 June, Paris [www.cleansky.eu](http://www.cleansky.eu)
- Clean Sky Info day, 5 June, Dublin [www.cleansky.eu](http://www.cleansky.eu)
- Clean Sky Info Day, 13 July, Ankara [www.cleansky.eu](http://www.cleansky.eu)
- Clean Sky Conference, 12-13 September, Warsaw [www.cleansky.eu](http://www.cleansky.eu)
- SAE AeroTech Congress & Exhibition, 18-21 October, Toulouse [www.sae.org/events/atc/](http://www.sae.org/events/atc/)
- CEAS, 24-28 October 2011, Venice <http://www.ceas2011.org/home.html>



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