



Skyline

n°3

Clean Sky newsletter

MARCH 2011

Clean Sky

PAVING THE WAY FOR
CLEANER AND QUIETER
AIR TRAFFIC

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CLEANSKY

Innovating together, flying greener

Editorial



Eric Dautriat, Executive Director of the Clean Sky Joint Undertaking

Dear reader,

The preparation of the next framework Programme prompts reflection about the instruments of research, technology and innovation management. Clean Sky is still young, but we can outline the main features and assets of such an undertaking, not only from a theoretical standpoint, but also through the experience gained.

A workshop with around 30 aeronautical stakeholders was held in the Clean Sky premises at the end of January in order to brainstorm the possible continuation of a JTI concept for aeronautics within FP8. A report was issued, putting together a first set of reflections and some recommendations. Given the challenges that the aeronautical sector will be facing in the future, it was agreed that a JTI would be more than welcome in the future framework programme, in the same spirit as Clean Sky and building on Clean Sky's foundations.

The workshop recognized that such a JTI would be an essential instrument in the Innovation Union policy. Its remit would still have to be discussed – according to the High-Level Group “Vision 2050”, which will soon be released.

All five Joint Technology Initiatives are quite diverse concepts, beyond their technical content; the lessons learnt from each of them are different. Clean Sky's structure has been designed to fit the aeronautical sector, as regards Research and Technology: a direct, strong involvement of the industrial Primes,

a set of dedicated research organizations, a wide supply chain, a network of innovating partners – which Clean Sky strives to widen and improve.

However, the five JTIs are working together on a number of administrative aspects, with some common procurements, common framework contracts, and day-to-day cooperation, allowed by our co-location. We have just moved together to our final premises, in the White Atrium building, Avenue de la Toison d'Or in Brussels.

Of course, a prerequisite for having any aeronautical Joint Technology Initiative included in the next Framework Programme is to demonstrate the efficiency of Clean Sky, i.e. to deliver the expected technologies at the right level and in due time. The main demonstrators will be run, or will fly, rather in the period 2014-2015; but the progress of activities is evidenced through intermediate achievements.

In 2011, some important milestones and deliveries will be achieved, such as the selection of the configuration for the Open Rotor in-flight demonstration; the aerodynamic testing of Open Rotor propeller blades at high and low speed; “critical design reviews” (CDR) for several major demonstrators; the completion of the design and first tests of major parts like novel composite structures or engine parts; in-house testing of energy management equipment in order to prepare the system-level, integrated tests; etc.

Besides, three calls for proposals are planned in 2011; the first was already launched, our biggest (by budget) to date, involving 58 topics. As a result, the number of partners involved will keep increasing. We already have emphasized the excellent performance of SMEs with these calls: the proportion of SMEs in winners is 40%.

Given the “downstream” feature of Clean Sky, we also have a satisfactory record for universities, above 20%. It also appears that winners get a taste for Clean Sky and often become “recidivists”: in average, each partner is participating in 1,40 topics. The odds are that in future, participating or having participated in Clean Sky will be, in particular for an SME, a label.

Eric Dautriat

Executive Director of the Clean Sky Joint Undertaking

Cover page: numerical simulation to assess noise impact reduction potential for a police mission over Amsterdam.

The Clean Sky JU is now located in the White Atrium building, in the Louise area.

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From the desk of

Robert-Jan Smits, Director General for Research and Innovation, European Commission



Mr Smits, what are the main expectations from the Commission regarding Clean Sky both for 2011 and at programme completion?

The five existing Joint Technology Initiatives (JTIs) are essential for realising Europe's ambitions in effectively linking research and innovation and addressing societal challenges in a number of key areas, where Europe's competitiveness is at stake. These Public-Private Partnerships (PPPs) can help correct market failures, increase "efficiency" of public support in R&D, address gaps in innovation systems and better integrate industrial research. For this reason, the Commission looks forward to the completion of Clean Sky technical programme and a successful testing

of demonstrators, including flight testing, as foreseen in the work programme for 2011. Flight testing has taken place on first components which is encouraging. Clean Sky should go on establishing the relevant technologies for low environmental impact in line with the fleet renewal strategy by mid 2020.

What is your opinion about the Clean Sky-type JTI structure? What can be expected for Clean Sky stakeholders, from the "simplification" process regarding Research funding?

The Clean Sky JTI is a PPP between the European Commission and Europe's aeronautics stakeholders. The idea is to bring together the best from the public and the private side with a long term perspective. Clean Sky involves presently more than 400 organisations from 24 countries and the supporting Joint Undertaking is now fully operational. We can already draw some conclusions for the future based on the way Clean Sky operates, also on basis of the draft-interim evaluation. On the simplification issue, we are working towards streamlining the procedural and administrative aspects of

the Framework Programme and the JTI concept in order to target research and innovation more effectively. By Commission Decision of January 2011, a set of short term simplification measures was introduced for participants of FP7. Further simplification will come with the Commission proposal for the Common Strategic Framework for research and innovation that will be adopted by year end.

Do you consider that the continuation of a JTI concept should be included in the next research and innovation funding Programme?

JTIs are a novel flagship initiative within FP7. They were set up to address sectors of major importance where Europe's competitiveness needs to be strengthened and for which the standard instruments of the Framework Programme were deemed not to be sufficient. The Commission is currently considering the lessons learnt, in the light of both the report of the High-Level Group of Industry Experts on Public-Private Partnerships in research and the interim evaluations of the JTIs. It will present its reflections on the way forward in the forthcoming Communication on Partnering in Research and Innovation.

Clean Sky welcomes applications from external experts

The Clean Sky JU is looking for independent experts to participate in the evaluation of its calls for proposals. Candidates with proven expertise in any of the technical fields of interest for Clean Sky are invited to apply.

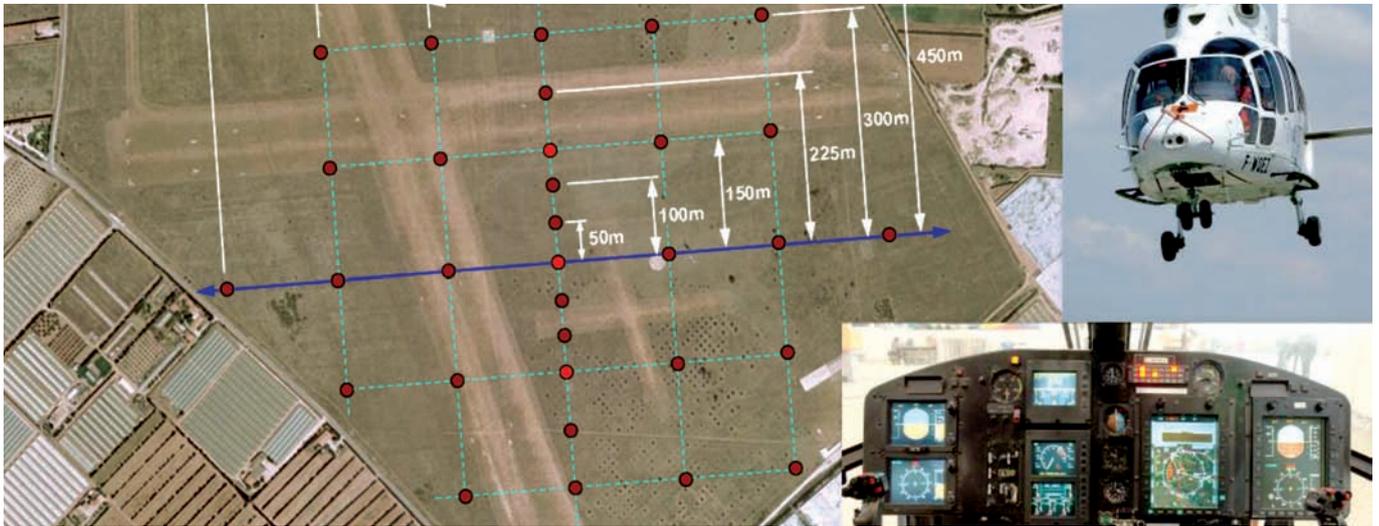
About the evaluation: Three calls for proposals are expected to be launched and evaluated in 2011. For each call, the topics are evaluated by a wide range of independent experts. The evaluations take place in Brussels or are occasionally held remotely. The evaluation process values transparency, confidentiality and high professionalism.

Who can apply? Applicants representing small and medium enterprises, universities or research institutes are particularly encouraged to apply. The JU highly values a well balanced geographical coverage of the candidates. Applications are open to non EU citizens.

Interested? Register via the European Commission database CORDIS : <http://cordis.europa.eu/emmp7>
There is no deadline for registration.



the challenge of acoustic impact reduction for the next helicopter generation



Acoustic data acquisition for new flight procedures (EC155)

For the last fifty years, the acoustic impact of aviation on the population has been a permanent concern. Its reduction remains a crucial driver for aircraft design and operations. Clean Sky assigned to its members the challenge to halve the noise impact with the new fleet entering service in the 2020's, in line with ACARE (*Advisory Council for Aeronautical Research in Europe*) goals.

This must be achieved while pursuing the gas emission objectives: CO₂ cut by 50%; NO_x cut by 80%) and calls for difficult trade-offs. For instance, acoustics severely constraints the design of the Counter Rotating Open Rotor and its integration on the airframe, while this concept essentially aims at reducing gas emission (refer to Skyline issue n°2).

Helicopters and tilt-rotor vehicles must operate close to populated areas in order to provide urgent airborne service wherever needed. Obviously, the Clean Sky acoustic goal appears particularly relevant and challenging for them.

The helicopter acoustic sources are essentially generated by the main and tail rotor blades and become particularly annoying in specific flight conditions such as descending approach due the phenomenon known as Blade-Vortex Interaction (BVI). During take-off and level flight, the helicopter engines may

also contribute significantly to noise, depending on both their intrinsic construction and integration within the airframe e.g. the air intake design.

Efforts for rotorcraft gas emission reduction follow mainly a threefold strategy: rotor energetic efficiency; airframe drag reduction; mission profile optimisation. Concerning drag reduction, possible combinations of several technologies can produce a range of optimised integrated architectures for both the future helicopter and the tilt-rotor ERICA concept. For ERICA, technologies aimed at maximizing aerodynamic efficiency include for

instance wing-fuselage and wing-nacelle junctions, tail design, nose and landing gear fairings. Drag reduction generally do not interfere with acoustic optimisation but rotor or prop-rotor efficiency optimisation does, however.



The ERICA advanced tilt rotor concept



Drag reduction: engine exhaust optimization.



Before and beside Clean Sky, several technologies for quieter rotors have already been investigated, developed and flight proven. For the tail rotor, a quiet Fenestron™ (*shrouded tail rotor, developed by Eurocopter*) architecture is implemented on recent commercial models. Within Clean Sky GRC (*Green Rotorcraft Integrated Technology Demonstration*), electrical systems including light weight motors are developed that will enable future tail rotors of conventional or Fenestron types to be driven at variable speed independently of the main rotor bringing a significant favourable impact on helicopter acoustics.

GRC in brief...

- ✓ **Challenging objectives:**
26-40% less CO₂, 53-65% less NOx emission, 50% less acoustic impact
- ✓ **6 RTD projects focused on:**
rotor blades, airframe aerodynamics, on-board energy, Diesel propulsion, clean flight operations, ecologic design
- ✓ **Co-leadership** by
AgustaWestland & Eurocopter
- ✓ **23 Clean Sky Members:**
ITD leaders & Associate Members from industry, research institutes, SMEs grouped in a cluster
- ✓ **47 Partners** selected from the first seven Calls for Proposals; 40-50 more Partners expected to joint in the next Calls
- ✓ **Gross budget** 160 M€ (10% of Clean Sky budget)

Concerning the main rotor design, two complementary technology streams are conducted in parallel: the 3D optimisation of blade shapes and active control systems. The first stream was pioneered with the Blue Edge™ technology which mitigates the BVI phenomenon and was successfully flight tested. Blade optimisation beyond planform i.e. concerning twist and anhedral is further pursued in GRC, based on the most recent aero-acoustic simulation tools.

Active control systems offer the capability to combine rotor efficiency and acoustic benefits but their more complex

integration requires a long maturation cycle. The Blue Pulse™ technology currently under flight testing features trailing edge flaps and opens the way. In GRC, a dynamically twisting blade embedding distributed piezoelectric actuators and based on the Friendcopter IP (*Integrated Project, a Framework Programme 6 instrument for large projects*) concept is being designed, integrated and prepared for a full scale ground demonstration under representative loading conditions. The active Gurney flap also developed and demonstrated within GRC is a small control surface primary aimed at reducing the rotor power demand. It is also an enabling technology required to implement the dual speed rotor concept that offers a substantial noise reduction potential. Among enabling technologies for active control systems, the Piezo Power Supply is needed to drive piezoelectric actuators.

Hushing of turboshaft engines was addressed in the Friendcopter IP and earlier projects, with acoustically treated exhaust nozzles and air intakes. Within Clean Sky, these technologies are further integrated and matured toward demonstration configurations that offer an improved trade-off accounting for performance and airframe construction constraints.

Beside innovative technologies to be incorporated at design level, improved flight procedures using ad hoc guidance systems offer a fast track to quieter operations for the current fleet. Friendcopter, Optimal and NICETRIP IPs paved that way with significant contributions yet the maturity reached does not allow for their implementation. Friendcopter delivered the HELENA noise simulation tool. In Optimal, dedicated IFR helicopter trajectories within airport controlled areas were tested. NICETRIP simulated tilt-rotor specific take-off and landing trajectories. Now in GRC, all aspects of noise abatement procedures and fuel savings are integrated in a comprehensive approach aiming to provide on-board flight guidance means suitable for both IFR and VFR conditions, and to demonstrate their effectiveness in all operational environments including the Air Traffic Management as being developed in SESAR (*Single European Sky ATM Research*). Flight testing started in 2010 and simulation tools are being concurrently developed.

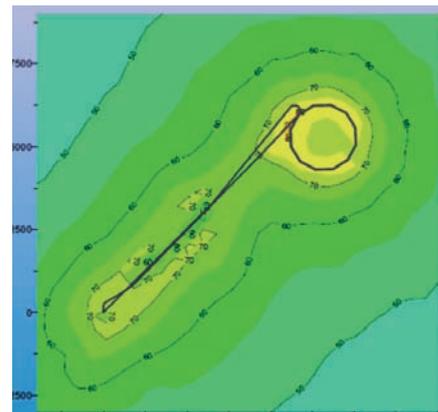
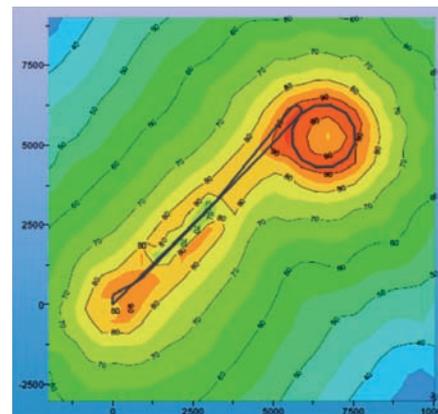
Main challenges

Halving perceived noise by 2020 as compared to the 2000 reference level is the objective assigned by ACARE in its strategic research agenda. Clean Sky will leverage existing matured solutions coming from other R&D programmes since 2000 to demonstrate a 10 EPNdB perceived noise level reduction, especially in the vicinity of inhabited areas. This demonstration will be performed in realistic operational conditions ensuring technology insertion at low risk on the next helicopter generation.

GRC participants are however fully conscious that the last decibels will be the hardest to gain. The environmental impact at mission and airport levels might be reduced by 50% or more accounting for the noise footprint reduction allowed by noise abatement procedures.

Phoenix-IESTA simulation – Amsterdam Police Mission n°2

- a) Baseline helicopter 2000
- b) Conceptual helicopter 2020+



Energy-Efficient Electrical Systems for the Green Regional Aircraft

PACE, a German SME, provides custom system architecture design software

More-electric systems are a key concept in the design of innovative, environmentally friendlier aircraft. In the Green Regional Aircraft ITD, the vital role of aircraft systems to the overall characteristics is reflected in the presence of a dedicated All-Electric Aircraft (AEA) domain.

The AEA team's task is to evaluate all pneumatically or hydraulically driven systems installed in today's regional aircraft as to their potential for being replaced by more energy-efficient electrical versions.

To avoid the common pitfalls of optimising system components in isolation of the total system, i.e. design inconsistencies or unforeseen behaviour in the integration phase, the AEA team has taken a holistic approach to systems architecture design.

A holistic approach to aircraft systems architecture design eliminates the risk of design inconsistencies and errors in the integration phase.

Systems architectures are modelled, analysed and sized at the level of the aircraft ensuring a reliable prediction of the systems' impact on the aircraft's key performance parameters early in the design process.

The enabling technology has been developed by German software provider PACE Aerospace Engineering & Information Technology



GmbH, a Berlin-based SME specializing in turn-key and custom software solutions for aircraft and engine manufacturers, civil and military operators, maintenance services and leasing firms.



Managing director Alexander Schneegans believes the decision to use PACE software was clinched by the superior flexibility of their products: "Our business strategy is to

offer highly extensible solutions which can be easily customised to very specific needs", he explains. "The software developed in the context of Clean Sky is based on our standard product for conceptual aircraft design, to which we have added a functional layer for systems architecture design. In combination, they provide systems engineers with an integrated design environment to explore their ideas."

Most of the functional extensions are geared towards a further detailing of the preliminary aircraft model. They provide, for example,

a component catalogue for all systems under investigation, a compartment editor and an easy-to-use, graphical approach for setting up architectures, which significantly increases the number of design alternatives that can be examined.

After more than a year in the Green Regional Aircraft ITD, PACE's development work is done – time for a final assessment: "From our SME standpoint, the JTI has proved a very efficient platform; from the Call for Proposal and the selection process to the finalisation of the project we were positively surprised, in particular given the scale of this programme. We also enjoyed the sense of cooperation among the members of the Green Regional Aircraft ITD we worked with", says Alexander Schneegans. "As an SME, we greatly benefit from participating in this research effort, because it gave us an opportunity to develop an innovative product with great potential in the wider aerospace industry."

More information about PACE is available from the company website www.pacelab.com



Clean Sky, on open club

24 countries involved

> 40% of SMEs selected

377 winners selected in two years

Some average figures

8 calls already launched

22,5 M € in value for each on average

38 topics per call on average

3 to 4 calls per year

Up to 75% of funding rate

Calls for Proposals

Not less than 25 % of the EU funding to the CS JU must be allocated to Partners selected via Calls for Proposals. Topics are defined by each ITD: they aim at widening the participation to Clean Sky to valid organisations, also outside the aeronautical supply chain.

Partners selected via Calls for Proposals are funded in compliance with the upper funding limits set in the Rules of Participation of the 7th Framework Programme (currently at 75%).

What is peculiar for Clean Sky Calls for Proposals is that the content of the activities is much more focused, i.e. they are topics and not research themes, with limited duration and specific expected targeted results (at a higher Technology Readiness Level than upstream research projects). The topics are defined by the Topic managers of the ITDs and checked by the Project Officers at the Clean Sky Joint Undertaking (JU).

Another difference from collaborative research calls is that the budget is defined by the topic value, and not by the maximum funding; this to allow a wider participation from all types of entities, independently from the actual eligibility for funding.

Furthermore, a single entity can present proposals, with no need for a consortium to be created.

Differently again from Collaborative research, there is always one winner per topic, provided suitable proposals are submitted and positively evaluated.

Response to the five Call for Proposals of 2010

A total of 150 topics were published in 2010, in the different calls as in the table above. The average response in the year is confirmed at about 2.5 proposal per topic, i.e. more than 350 proposals in total.

With respect to the first two calls in 2009, a significant improvement has occurred concerning the eligibility aspects, mostly due to the incorrect value of proposals; after the call 3 (first call of 2010) less than 1-2 proposal per call was declared ineligible due to value higher than the threshold stated in the published topic.

Another ineligibility which was clarified in 2010 concerned the involvement of affiliates of members of the ITD issuing the topic.

Briefing to experts at evaluations

The experts (internal and external) selected for the evaluation of the proposals, are briefed at beginning of the evaluation; each time some new detail is provided to help them perform the judgement in the most efficient way, while guaranteeing the fair and consistent process.

So while explaining each time the Rules for participation, the structure of the proposals and the 6 criteria to be applied, the lessons learned from previous evaluations are presented with examples and references to actual cases of redress, due to inconsistent scoring and comments in the evaluation.

This approach, together with combining some senior experts with the new ones, provides a balanced and effective process throughout the evaluation.

Evaluations outcome

By referring to all 7 calls launched by Clean Sky (so also including results from calls 2009-01 and -02), this graph provides the statistics per country in terms of presence in winning proposals:

Independent observers

To ensure a high degree of transparency, the CS JU invited three different observers in 2010, one for the first two calls (Mario Carbonaro), one for the third and fourth calls (Fulvia Quagliotti) and one for the last call (Peter Hecker).

Each observer had full access to all stages of the evaluation and to consensus meetings. His/her Evaluation Report is available on the website (<http://www.cleansky.eu>).

Grant Agreements

Negotiations with the projects selected for funding in the third Call for Proposals (first of 2010) started before summer 2010 and are in progress. The same applies for Call 4 (second call of 2010), whereas the Call 5 negotiations have started at the end of the year.

Since Call 5, a dedicated Negotiation Kick-off meeting involving the winners of the topics and the related topic managers is held by the JU after about 4 week after evaluation, in order to expedite the dialogue between the future partner and the topic manager, and the preparation of all documents needed for the signature of the Grant Agreement for partners.

Austria: AT; Belgium: BE; Bulgaria: BG; China: CN; Czech Rep.: CZ; France: FR; Germany: DE; Greece: GR; Hungary: HU; Ireland: IE; Israel: IL; Italy: IT; The Netherlands: NL; Norway: NO; Poland: PL; Romania: RO; Spain: ES; Sweden: SE; Szwiterland: CH; Turkey: TR; United Kingdom: UK

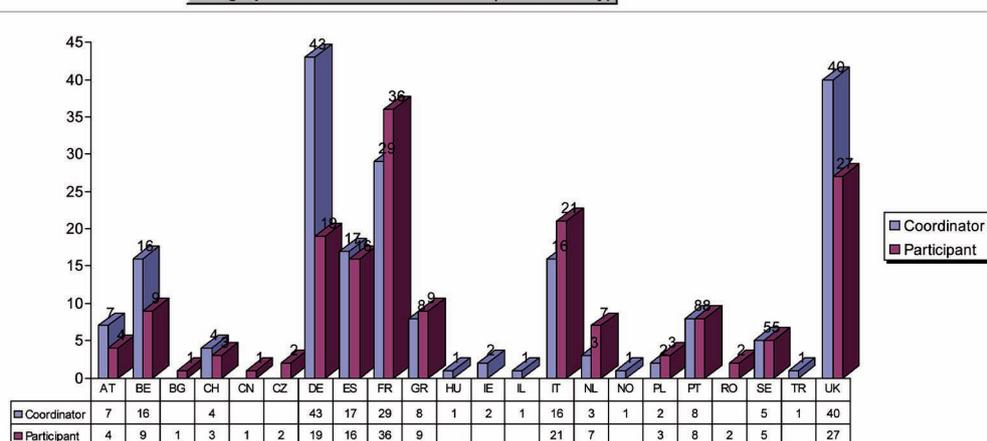
Planned dates for the calls in 2011:

Call 8 (2011-01): publication:
10 February
closure: 3 May

Call 9 (2011-02): publication:
28 April
closure: 28 July

Call 10 (2011-03): publication:
13 July
closure: 13 October

Geographical Distribution - all Calls (Winners only)



Clean Sky, a Joint Technology Initiative

Laminar wing

Fuel burn

Technology evaluation

Life cycle assessment

Demonstrators

Low drag

Noise reduction

Thermal management

More electric

CO₂ reduction

Mission management

Recycling

Energy management

innovative rotor blade

NOx reduction

Turbofan

Geared fan

Open rotor

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**New postal address as
of 16th January 2011
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