CLEANSKY

Skyline

n°7

Bringing Sustainable Air Transport Closer

JUNE 2012

TOWARDS A GREEN BUSINESS AVIATION

CONTENTS

EVENT

Farnborough INTERNATIONAL AIRSHOW
9-15 JULY 2012

Clean Sky will have a stand in the Innovation Zone at Farnborough 2012 (9- 15 July), one of the world's most iconic global aviation event. It will exhibit open rotor mock-up, animation and simulation of natural and laminar wing assembly process, advanced turboshaft, etc. An information session on Call for proposals 13 will also be organised on 11 July (11.00-12.30), to allow potential applicants to meet Clean Sky representatives and discuss the content of this Call. Last, Clean Sky invited also ACARE on its stand, to present the new SRIA (Strategic Research and Innovation Agenda).

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'All Eastern countries should be interested to participate in Clean Sky if they would like to claim a specific interest in aeronautics at national / international level'

Catalin Nae

EDITO

At the core of the Clean Sky philosophy, the Technology Evaluator is meant to ensure an objective impact assessment of Clean Sky technologies, up to the global fleet level. As the first assessment was recently achieved, we initially intended to have this tool as a front page headline in this Skyline issue. However, we decided to give even more emphasis to it and facilitate dissemination by describing it in a detachable supplement to this issue of Skyline.

Eric Dautriat,
Executive Director of the Clean Sky Joint Undertaking

This assessment has been performed with aircraft models defined by the airframers - integrating data from the engine manufacturers - which provide inputs to tools operated by Research Organizations at airport and global fleet levels. It confirms the initial objectives of Clean Sky and shows, as a whole, across several categories of aircraft, an order of magnitude of 30% improvement in CO_2 and noise with respect to Year 2000 references. It also confirms that Clean Sky is the main contributor to reaching the ACARE targets. But this is still a partial result: evaluations for all three parameters: CO_2, noise and local air quality, for all market segments considered, will be finalized this year, included a refinement of the technological inputs and of the models. As a matter of fact, the success of Clean Sky projects is measured through two main parameters: Environmental benefit and Technology Readiness Level.

Providing evidence that Clean Sky is progressing along the right track is all the more necessary now that the preparation of Horizon 2020 has entered a very active phase. The assessment of any proposal for continuation of a Joint Technology Initiative like Clean Sky will obviously check first how the current generation is performing as a foundation for the next. Such confirmation will be provided, not only through the Technology Evaluator but also through the technical progress of our activities.

In this issue of Skyline, you will read about several examples of actual progress: two of them are highlighted by, respectively, Charles Champion, Senior Vice-President of Airbus for Engineering, the current Chairman of our Governing Board, and Catalin Nae, Director of INCAS in Romania, the current Vice-Chairman. We also wished to underline the Business Aviation case – a market segment not to be forgotten, and an active player in Clean Sky.

At the Farnborough Air Show, you will have the opportunity to know more about Clean Sky, if you visit our booth in the Innovation Zone and/or attend our info day planned for the air show on 11th July.

As everybody in the European research arena is expecting “simplification” from H2020, we have set an example with the possible continuation of Clean Sky: we just call it “Clean Sky 2”. Through different steps, including a public consultation and a formal impact assessment, the relevant proposal from the industry should be ready before the end of this year. Being part of the “Societal Challenges” pillar of Horizon 2020, it will address further high technological maturity and high societal impact. It will build on Clean Sky and aim for a high level of integration on flying test vehicles. It will also prepare for the next wave of technologies able to answer the still more ambitious targets of Flightpath 2050 and the upcoming ACARE Strategic Research and Innovation Agenda, for the environment and for other goals like mobility and safety. It will strongly contribute to the global leadership of the European aeronautical industry.

Clean Sky 2, building on a successful Public-Private Partnership, should still rely on the leadership of the major European aircraft and systems integrators, and be widely and efficiently open to competition through different kinds of Calls. The definition and prioritization of the projects should be objective-driven, for each of them to demonstrate its impact and its relevance. These projects should start when necessary along the Horizon 2020 period, from 2014 onwards. The participation of SMEs, a strong asset of Clean Sky, should be encouraged and enhanced. And of course, the lessons learnt from Clean Sky should drive the future Programme into more efficiency and effectiveness. The Joint Undertaking is engaged in this process, interfacing with the industrial leaders, the European Commission and many stakeholders, be they already involved in the current Clean Sky or not. I have no doubt that the case for Clean Sky 2 will convince the European Council and the European Parliament in due time.

INTERVIEW

WITH **CATALIN NAE**

Vice President Governing Board / General Manager INCAS - National Institute for Aerospace Research

Clean Sky was a very complicated process to put in place. A lot of people made a lot of effort to have this mechanism in place, with a lot of bureaucratic difficulties. Now we have a quite efficient instrument for a very complex type of industrial research. It is mature and has a high credibility among members. However, communication with the outside world should be enhanced so that major results are presented for best effect. And I do think this has to continue in Horizon 2020.

Can you describe your function, who are you representing ?

To introduce myself, I am the General Manager of INCAS – National Institute for Aerospace Research " Elie Carafoli", Bucharest, Romania.

I do not think I represent Eastern Europe in aeronautics. However, I am representing the Romanian aeronautical industry in FP-7, also in the new ACARE, since INCAS is the entity in charge of all major aeronautical projects in Romania, civil and military, both past and present.

Also, we (INCAS) are integrated in EREA – European Research Establishments in Aeronautics Association, together with DLR, ONERA, NLR, CIRA, INTA, FOI, VZLU, ILOT and here we are part of the east of Europe countries with aeronautical programs (VZLU – Cehia and ILOT – Poland). We try to integrate into the EU aeronautical industry.

In Clean Sky, the INCAS Cluster is based on INCAS as a research establishment and two manufacturing companies (ROMAERO and AVIOANE Craiova).

This cluster has been selected in SFWA as an associated member and INCAS has also been selected as a partner in CIRA Plus cluster in GRA. So INCAS has an important share of the technical activities in Clean Sky, and this is a very good example of integration from an Eastern European country in this project.

Starting from 2012, INCAS has a seat in GB, according to the rules, for 1 year. As a research establishment representative, I have been selected as vice-President, and this is a great honour and quite a challenging position, also taking into account that I am representing an Eastern European country.

In the recent years I have been involved in a lot of projects with partners from the EU aeronautical industry, including most of the Eastern European countries. I have a good knoweledgeof existing capabilities in this area, also direct connections and information from most of the industrial companies and research establishments. Together we try to make a joint policy towards EU partnerships. But I cannot say that I am representing east of Europe in aeronautics...

Why is it important for Eastern European countries to collaborate with the European programme Clean Sky? On which kind of 'topics' are they working?

To answer directly, I would say that all Eastern countries should be interested to participate in Clean Sky if they would like to claim a specific interest in aeronautics and/or aeronautical programs at national or international level.

From the beginning I would like to say that Eastern countries had a very positive opinion with respect to JTI Clean Sky. This is mainly because in aeronautics there has been a very pragmatic approach for L1 and L2 type of projects, with the Clean Sky JTI as a natural development. Countries with stronger aeronautical national programs (like The Czech Republic, Poland and also Romania) have supported the JTI because they already had projects and partners in line with it. Also, at industrial level, Eastern countries had very successful participation in the L2 project (CESAR) that prepared the introduction for Clean Sky, at least with respect to procedures and level of requirements.

When Clean Sky started the selection of members, each country put in place a specific strategy. In Romania we have adopted the cluster approach, participating to the selection for an associate position. Other countries considered they could be involved in CfP as individual entities (as in Poland and The Czech Republic). There are good and bad aspects to each strategy. However, all major Eastern industrial companies and aeronautical establishments in aeronautics had their chance to be involved in the technical activities (including the CfP mechanism).

The area for participation is a complex topic. Based on the information I have, most of the research establishments have been interested in low TRL activities, and this is normal. Most of the activities are linked

to previous projects where they have been already partners with major industrial partners (Airbus, RollsRoyce, Dassault, Alenia, SAAB, etc.) or together with other REs as ONERA, DLR, NLR. On the other hand, industrial companies from Eastern Europe tried to find CfP where they already had a contact/development as part of the supply chain, or CfP where they possess a specific expertise at medium TRL level. At this moment in Clean Sky, for me it is clear that SMEs from Eastern Europe have less chances for a successful CfP due to the requested TRL for the work and specificities asked by the topic managers/beneficiary. Therefore, I would expect to see less Eastern European success in the next calls.

The topics for Eastern Europe covered a broad range of technologies, from aerodynamics to new materials and manufacturing processes. This is work in progress, however I think they all achieved at least a very positive experience with respect to the industrial integration process. Of course, taking INCAS experience, I think Clean Sky contributed in a very substantial way to the methodology we use in order to mature TRL for a specific technology and how we should interact with industry at this level.

What kind of advice can you give to future partners (from the east of Europe) to participate in the Clean Sky programme?

It is difficult to give advice at this moment, taking into account the development of the work plan in Clean Sky and the CfP mechanism in place.

I would recommend that a potential candidate should try to be very well informed on the content of the CfP. It is important to have a global picture from all ITDs in order to identify where one has a potential contribution at requested level. Also, I think they should try to be informed on the global development of Clean Sky, to better focus their interest.

Then, of course I strongly advise partnerships between candidates from Eastern Europe countries. There are synergies one has to take into account in order to have a competitive proposal. I am convinced that some companies from The Czech Republic, Poland, Romania, Hungary, Slovakia and the Baltic countries have the required competencies in various degrees of excellence and, by joining in groups of 2-3 they will be able to win some of the CfP.

Are the companies creating jobs in this difficult moment of economic crisis? If yes, in which area?

Here I can say something about Romania. In our case, due to Clean Sky participation we have managed first of all to secure a large number of positions in research, at INCAS. Also, we were in a position to create another 10 positions for some of the activities where we wanted to develop new competencies.

At ROMAERO, a manufacturing unit, there is a large number of jobs secured due to the already started activities for BLADE demonstrator. Also, with respect to other demonstrators (biz-jet afterbody), at AVIOANE Craiova we have secured a significant number of jobs for the next 3 to 5 years. For manufacturing units creating new jobs is more complicated, due to legislation, but at least we can say that Clean Sky secured significant number of jobs with high technical skills.

I think this is a similar process in other countries. And this was possible due to the credibility of the JTI in the last 2-3 years.

Bizjets:

30 800 commercial aircraft
Included : 20 700 jets *

* Flight June 2011

32 000 business aircraft
Included : 18 500 jets

BUSINESS AVIATION: THE GROWTH FACTOR

The empennage shields the engine noise from the ground.

On Thursday March 29th, the Smart Fixed Wing Aircraft program reached a significant milestone with the go-ahead jointly given by the Clean Sky Joint Undertaking represented by Helmut Schwarze, SFWA Officer, SFWA management (Jens Köning, ITD coordinator) and the partners for the development of the aft body demonstrator (Dassault Aviation, RUAG, Fokker and Onera). Introducing innovative configurations to drastically reduce the community noise, this demonstrator is part of numerous activities of Clean Sky that will contribute to the emergence of a new generation of green Business Aircraft that will serve a sustainable, environmental friendly economic growth of Europe.

Far from a luxury reserved to extremely wealthy people (individuals account for less than 3% of business aircraft owners), Business Aviation has become in the last years a significant stakeholder in the European aviation market. Use of business aircraft now represents around 7% of IFR traffic in Europe with an average of close to 2000 flights a day well above charter and cargo average number of movements. In terms of economical importance, the business aviation sector contributed to a total of € 19.7 bn in annual gross value added to the European economy in 2007, with more than 164k jobs across the continent. In addition, Business Aircraft makes flying productive, offering flying offices services that are unmatched by commercial air transport : Business aircraft passengers even estimate the they are 20% more productive on the company aircraft than they are in the office. Alain Bouillon (Direction de la Prospective - Dassault Aviation).

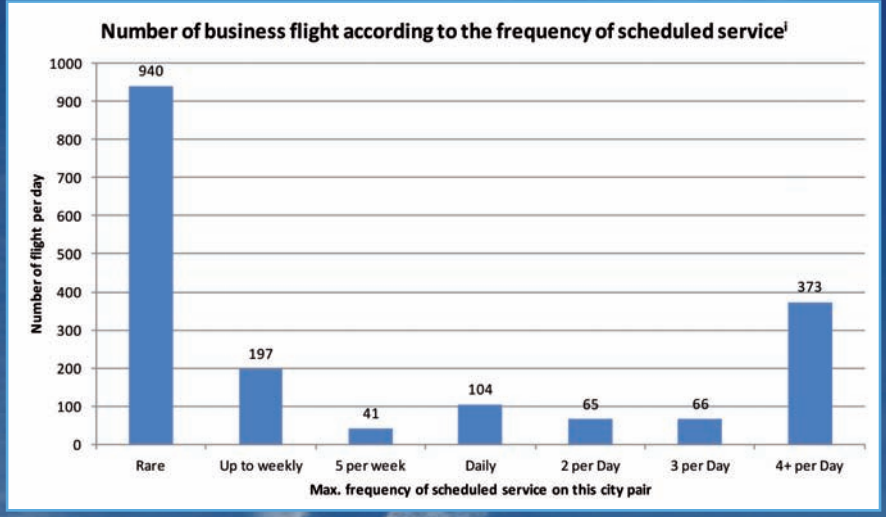
Opening places out of the main routes

Business Aviation primarily answers to the need of mobility from dynamic, active companies. It allows moving people and investments to European centers that are not efficiently well served by airlines. Indeed, Business Aviation flew in 2009 three times more European airport pairs than scheduled traffic (103 000 compared to 32 000[1]). On average every Business Aircraft operates to 25 different airports and half of Business Aviation departures are made from airport with less than 50 departures a day[1].

Business Aviation mainly operates unscheduled operations, organized around an on-demand model that efficiently complements the commercial aviation network which is focused on routes linking the Capital cities or main population centers. In more than 92% of the cases, the operators use business aircraft for one of the only 3 following reasons: to support efficient schedules, to reach remote locations, to make airline connections. Alain Bouillon (Direction de la Prospective - Dassault Aviation).

Flexibility : a key design driver for Business Jets

Flexibility is a key requirement. Business Jet users expect reaching far remote location with rough infrastructures, as well as operating from the heart of populated areas with stringent operational & environmental constraints. The "smart flap" concept to be matured within Clean Sky is among the technologies contemplated to design a performing aircraft in cruise with excellent low speed capabilities. Flexibility means also greening. Flying direct routes, business jets save fuel from unnecessary mileages and additional taxiing, take-offs and land sequences that connecting flights introduce.



Today, about 31 100 business aviation aircraft are flying all over the world. This is almost as many as commercial jet aircraft.


© Dassault Aviation

Clean Sky's concept aircraft provides a tentative view of the application of green technologies.

Towards a green business aviation

Greener aircraft in future are a necessity for a sustainable growth of aviation in Europe, and business aviation and commercial aviation share the challenging environmental goals of ACARE. But business aircraft have their specificities, linked to their specific modes of operation (mainly high level cruise, above commercial traffic, and operations from general aviation airports with short runways and possibly in dense urban environment) and to their small size in comparison to airliners. Specificities that lead to different cardinal points for design sizing and integration environment. Nevertheless, it is important to commit with the whole aviation community into common Research and Technology programs, to share cost and maximize the benefits from cross-feeding between the different aviation sectors.

Clean Sky is the perfect example of an ambitious demonstration program that serves common technologies developments for plural applications addressing a broad range of aircraft, future business jet or airliner. Examples are the advanced laminar wing to be demonstrated in Smart fix Wingor the transverse demonstrators like ECO DESIGN for the greening of the complete product life cycle, where most of material or production issues are common.

To some extend, the smaller scale of business jets makes them a cost efficient application case to demonstrate the integration of step change technologies. In 1985, the V10F was the first world certified jet with composite wings. It was a joint development between Dassault Aviation and Aerospatiale (which since turned into Airbus) which paved the way to the introduction of structural composite parts on today's aircraft like the wing box of the A380 or like the tail's wing box of the Falcon 7X.

© DR

Two Business Jet concept aircraft allow studying the integration of Clean Sky Technologies into viable conceptual configurations that will enable assessment of the resulting environmental benefits.

- **The Low Speed Business Jet** brings the view of a «ultra-green» jet, aiming to integrate comprehensively the promising technologies for low noise and low emission. Key innovations are the low-drag laminar wing with optimized control surfaces, engine noise shielding by the empennage, and all electrical aircraft architecture.

- **The High Speed Business Jet** conceptualizes the long range, performing from both speed and emission perspectives, integrating in particular low drag technologies and smart flaps.

Innovation to maintain industrial excellence

European Business Aviation is dynamic, and is expected to grow further. European industry is very successful on the market, contributing to the balance of trade and European competitiveness, providing highly skilled jobs and innovation and sustaining a substantial research and development investment. In face of an increasing competition and the threat of new comers from emerging countries with low labor costs, it is of vital importance to keep an edge in term of innovation and to introduce first to market products. Ambitious research programs such as Clean Sky, which has demonstrated its ability to catalyze the European aviation research and development community towards future cost-effective and energy efficient products, are key to maintain European excellence.

[1] *EUROCONTROL data : Business Aviation in Europe 2009*

CLEANER, QUIETER

THE EXAMPLE OF THE SMART FIXED WING AIRCRAFT

Charles Champion,
Chairman of the Clean Sky Governing Board
Head of Engineering, Airbus SAS

The European Clean Sky research programme aims to develop technologies for cleaner and quieter aircraft in order to secure an innovative and competitive air transport system for the decades to come.

Clean Sky demonstrates and validates the technology breakthroughs that are necessary to make major steps towards the ambitious environmental goals set by ACARE to meet the Vision 2020. It is organised into six technical areas, called Integrated Technology Demonstrators (ITD), covering regional and larger passenger aircraft, rotorcraft, engines, operations and ecological design systems.

The Smart Fixed Wing Aircraft (SFWA) ITD, led by Airbus and Saab, focuses on the wing and engine of the larger passenger aircraft that represent the major proportion of the worldwide operating fleet. SFWA has two major objectives: an innovative "Smart Wing" design and integration of novel engine concepts.

A Benchmark for EU R&T

As co-leader and having a significant part of the Research and Technology (R&T) activities of SFWA as well as participation in three other ITD, the success of the Clean Sky programme is an imperative for Airbus. Investments in Clean Sky amount to €1,6bn shared between industry, research establishments and the European Commission.

However, Clean Sky is not just another element of the European R&T Framework Programme. The scale of investment and duration of the programme as well as the strong focus on the next generation of innovative products mean it has to be managed in the same way as a purely industrial programme. It is, in many respects, a whole new way of working.

Today, almost four years after the start of Clean Sky, all ITD are operating at full pace.

The Smart Fixed Wing Aircraft

The major innovations with "game changing" potential in SFWA are:

- The design and flight test of an all new natural laminar flow full scale wing with the aim to demonstrate technology readiness at operational conditions and answering the key questions of industrial viability. The target is to reduce wing drag by 25%, representing a drag reduction of 5% – 6% at the aircraft level.

- The integration and flight demonstration of the Contra Rotating Open Rotor (CROR) propulsion system with the target to exploit and remove potential "show stoppers".

Both technologies feature a huge number of critical challenges in operation, production and maintenance. Overcoming these challenges offers the potential to be main contributors to up to 30% fuel burn reduction compared to current short and medium range transport aircraft.

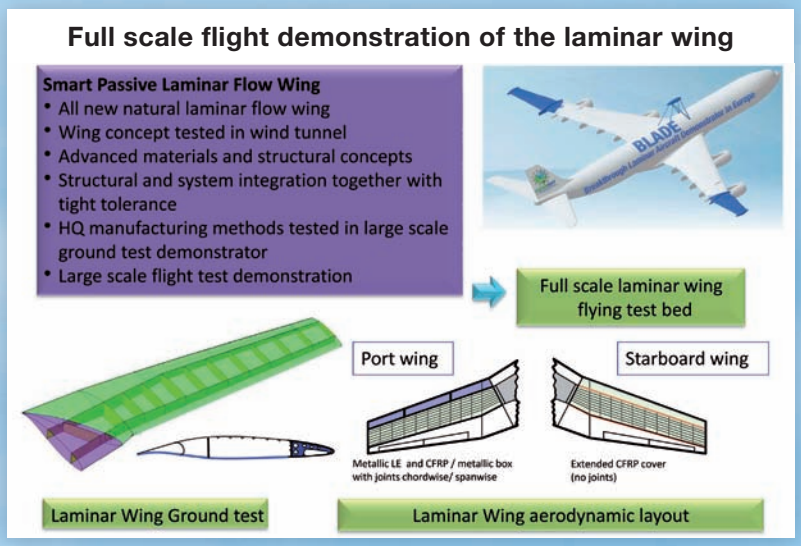
The only way to exploit, understand and find solutions for all these issues is through a series of large-scale tests on the ground, in wind tunnels, and through representative sized flight tests supported by sound analytical and numerical investigations.

Smart Fixed Wing Aircraft in brief...

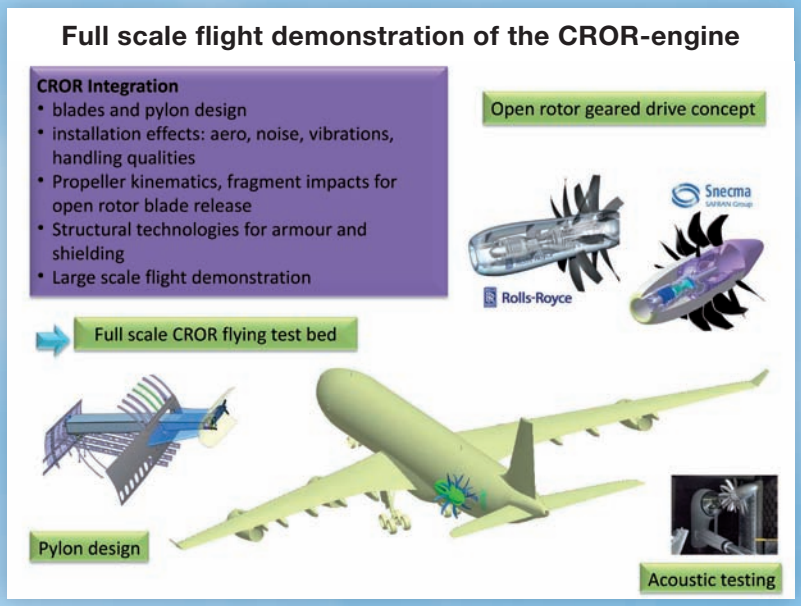
- **Challenging objectives**
  20% less fuel burnt; 20% less CO_2; 20% less NO_x; 10db less noise
- **Focussing on**
  Natural laminar wing – structures, systems, manufacturing operations
  Counter Rotating open rotor – noise, vibration, aerodynamic and blade design, handling, certification
- **Co-leadership by**
  Airbus and SAAB
- **12 Clean Sky Members**
  Launching members and associated partners from industry and research establishments
- **More than 200 partners**
  Selected through Calls for Proposals
- **Budget**
  €393m
  In the timeframe of the 7th EU Framework Programme

On track

All necessary results were achieved in autumn 2011 to start the detailed design for the Breakthrough Laminar Aircraft Demonstrator in Europe (BLADE). This will involve the testing of two full scale, smart, laminar wing elements mounted on an Airbus test aircraft. Two different structural designs for port and starboard wings will be manufactured and tested at all relevant cruise flight conditions.



Flight tests are foreseen in 2014. A key milestone will be reached regarding CROR and further decisions will be taken on the launch of the engine demonstrator flying test bed. In this major flight test a full size CROR demonstration engine is foreseen to be added to the rear fuselage section of an Airbus test aircraft and operated over a large range of appropriate flight conditions.



Both of these demonstration programmes are good examples of what Clean Sky has made possible. Tasks of this scale, complexity and breadth of engagement of partners would not have been conceivable in the classical Framework Programme research projects.

The Future

The High Level Group on Aviation Research estimates that to reach the goals set out in the Europe's vision for Aviation "Flightpath 2050", the total combined public and private funding could be greater than €250bn. For "Horizon 2020" this translates to a minimum of at least €500m per year of funding required for aeronautic specific research activities at EU level.

Aviation research at European level is of the utmost importance in achieving Europe's ambitious goals for 2050. It is the mean to facilitate the pooling and aligning of the required capacities and capabilities from across Europe.

To reach the 2050 level of ambition, the industry, SMEs and research establishments need to cooperate in the next European Financial Framework "Horizon 2020". This cooperation must be well structured to address the whole scope from basic aeronautic research to integrated innovation at the level of the entire aircraft and air traffic system.

Building knowledge, sustaining capabilities, accelerating innovation and ensuring safety and security is key for Europe. Continuous fundamental, basic and applied research, to stimulate the discovery of new technologies and the generation of new ideas for application in future products, as well as to sustain education and knowledge is essential.

The next generation of a Clean Sky joint technology programme needs to emerge, engaging and aligning all the stakeholders in the European value chain and facilitating technology integration aboard flying research test-beds.

This Clean Sky 2 will need to deliver innovative flight vehicle configurations and new integrated systems crucial to meet the challenges of maintaining European industrial leadership whilst at the same time protecting the environment. The increasingly complex and costly process of maturing and integrating new technologies and large advanced systems at whole aircraft level will require large-scale demonstrations and flight-testing.

European aeronautic research is an essential enabler for the future economic and ecological contribution of the European aviation sector, securing the sustainable mobility of its citizens and continued competitiveness. Clean Sky has proven to be an efficient instrument. We must build on this success and focus on the relevance of high technology readiness at large integrated system and aircraft level.

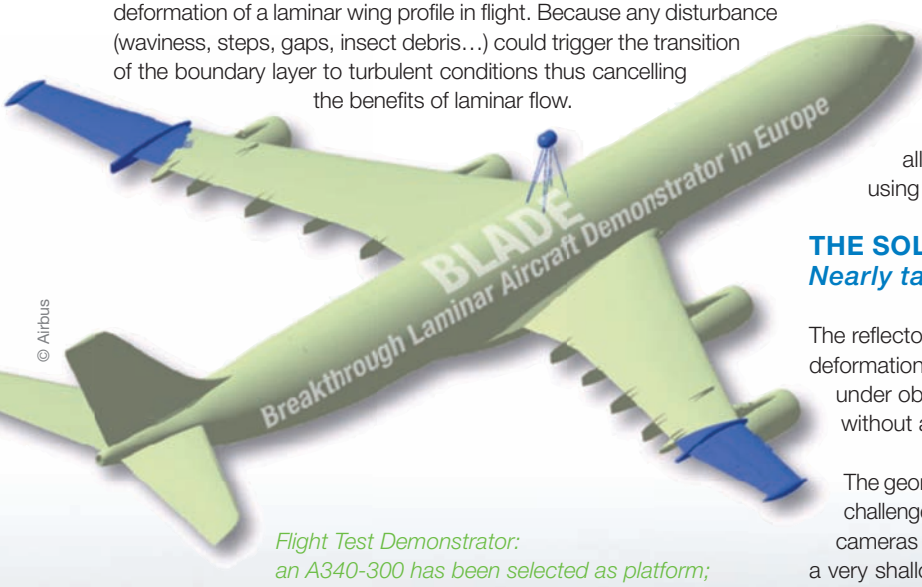
SUCCESS STORIES

FTI GROUP- WING REFLECTOMETRY

How would you measure in-flight tiny disturbances of a wing surface?

Laminar Flow is a key technology to reduce aircraft drag and fuel consumption. This will reduce the carbon footprint of the commercial aviation. The European Commission has started as part of the Clean Sky Programme the Smart Fixed Wing Aircraft (SFWA) project, in which a consortium led by Airbus and Saab of more than 35 aerospace companies, has designed a new laminar wing. However, its application on commercial aircraft requires manufacturing to a very high standard ensuring a minimum degradation of the wing surface during flight. Therefore it is key to identify any deformation on the wing with the flight test demonstrator aircraft ("BLADE") during flight test phase.

In the frame of the Call of Proposal process in Call#7 the SFWA (Smart Fixed Wing Aircraft) consortium requested an industry response to support this project with a measurement system, which detect any deformation of a laminar wing profile in flight. Because any disturbance (waviness, steps, gaps, insect debris…) could trigger the transition of the boundary layer to turbulent conditions thus cancelling the benefits of laminar flow.



© Airbus

Flight Test Demonstrator: an A340-300 has been selected as platform; the outer wing (blue areas in the picture) will be replaced with the new laminar wing sections.

To test the principles the outboard 9 metres of the wing of the High Speed Flight Demonstrator, an A340-300, will be replaced with a new laminar profile.

THE CHALLENGE:
In-flight detection of changes to the wing surface down to 20 micrometres

To measure the minute disturbances of the designed wing shape in-flight, at high altitude and subsonic cruising speeds. However, like in any experiment the measurement method shall not affect the behaviour of the wing profile structure. Therefore FTI's wing reflectometry methodology will be developed to detect any local deformations of the laminar wing surface whilst airborne.

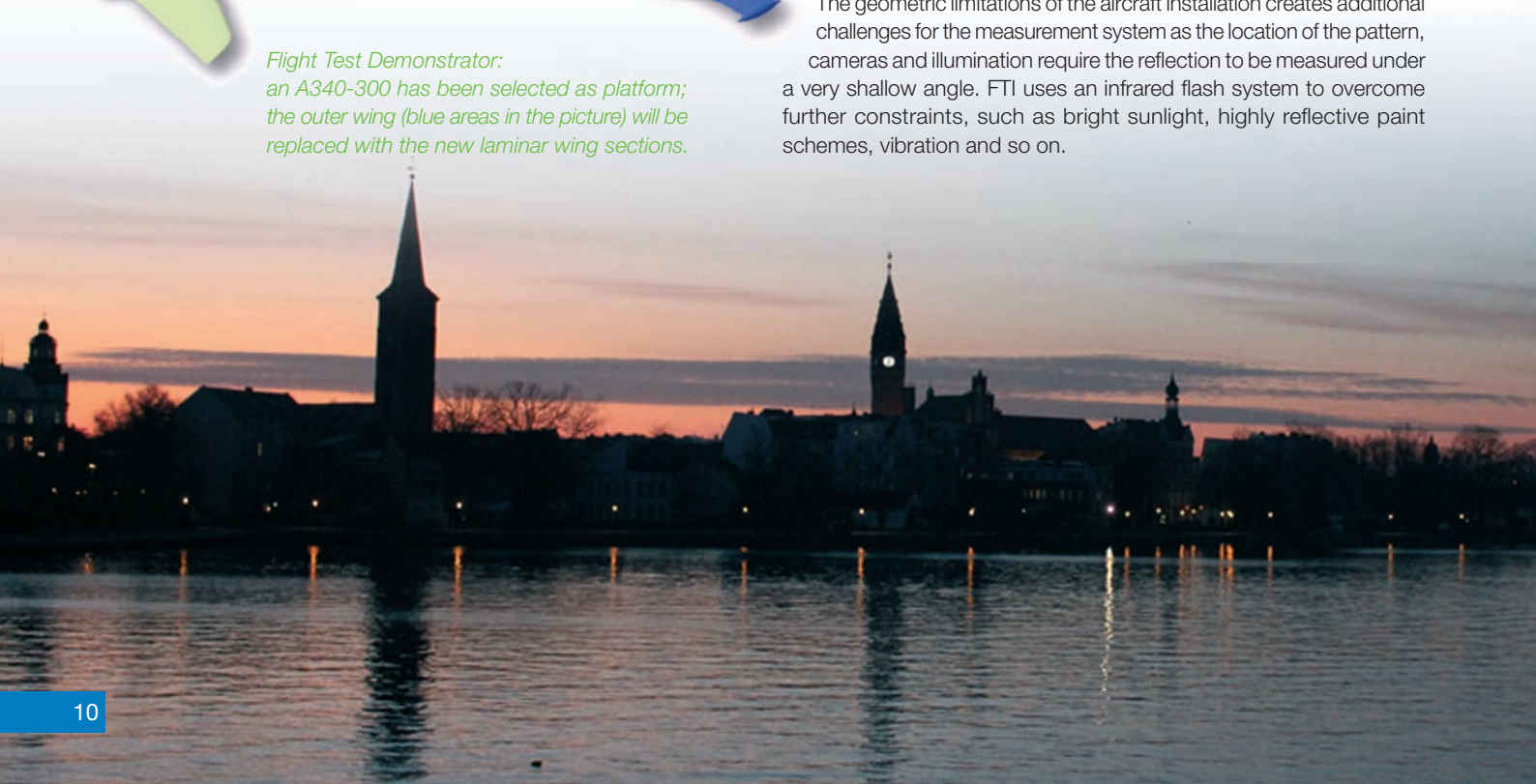
THE IDEA:
Physics -> optics -> reflectometry

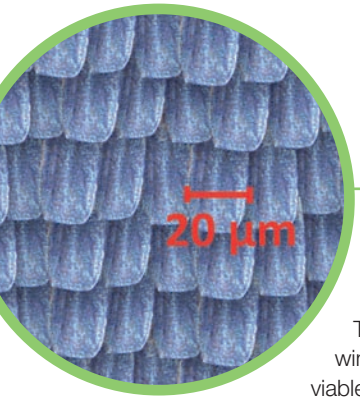
Who has not marvelled at those beautiful photographs of a mountain range reflected in a smooth lake? Reflectometry takes this scenic picture a step further. Reflectometry is an optical measurement method, which allows the calculation of the shape of a reflective surface using the deformation of a known reflected pattern.

THE SOLUTION:
Nearly tangential reflectometry

The reflectometry measurement is based on the measurement of the deformation of a pattern after nearly tangential reflection on the surface under observation. The set-up allows the installation on an aircraft without affecting its aerodynamic and structural characteristics.

The geometric limitations of the aircraft installation creates additional challenges for the measurement system as the location of the pattern, cameras and illumination require the reflection to be measured under a very shallow angle. FTI uses an infrared flash system to overcome further constraints, such as bright sunlight, highly reflective paint schemes, vibration and so on.





THE WING REFLECTOMETRY PROJECT: *Proven concept*

The concept was proven during two test campaigns, performed on-site at Airbus Toulouse. Furthermore a full scale wing mock up was constructed in Berlin (Wildau).The test results have demonstrated that reflectometry is not only a viable solution but it offers an accuracy significantly better than the required 0.02 mm.

test campaign: pattern reflection on wing surface

Project challenges

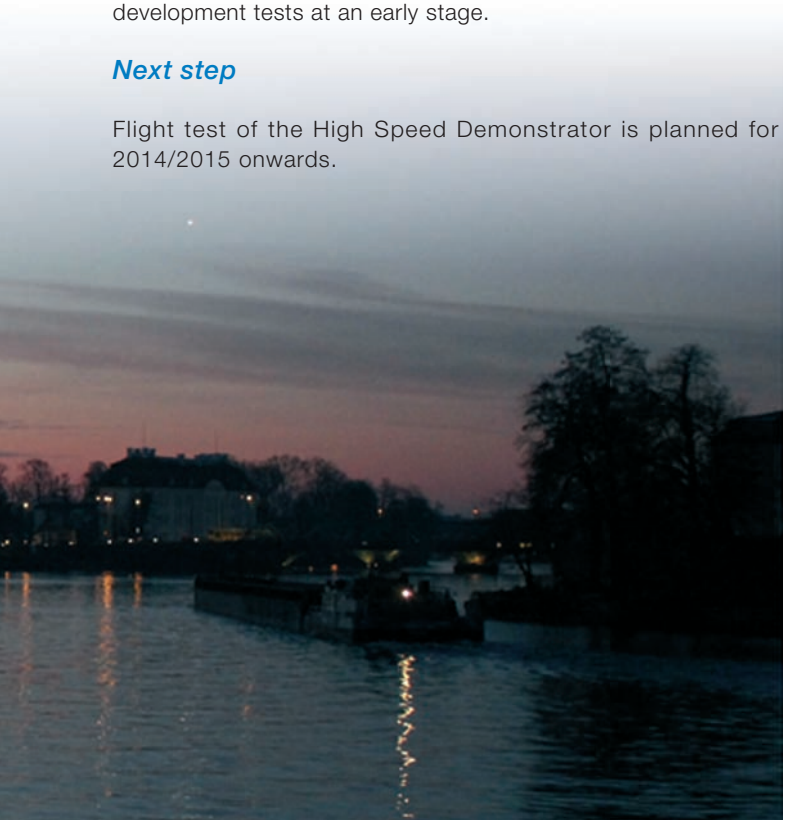
The new shape of the optimal laminar wing has a specific curvature and only limited space to integrate the reflectometry components such as cameras, pattern and illuminators. In addition the latest developments in aircraft painting are applied as well. These two factors further challenges the application of reflectometry. Till now the project has focussed on establishing and validating solutions to these challenges.

Project status

The system architecture and the location of the system components (cameras, illumination and controller) are almost finalised. The pivotal component of the reflectometry system is the image recognition and processing software. Here the full scale mock-up at FTI has proved to be a great benefit as it has allowed us to perform the development tests at an early stage.

Next step

Flight test of the High Speed Demonstrator is planned for 2014/2015 onwards.



PROJECT FACTS:

Call: FP7
Topic: Smart Fixed Wing Aircraft (SFWA) WP 3.1 BLADE.
Project: wing reflectometry (in flight monitoring of a wing surface with quasi tangential reflectometry.
Duration: 34 months.
Start: February 2011.
SFWA High Speed Demonstrator: A340-300
Task: Measurement of the surface deformation of the wings during flight.
Main expectation on the project: Validation of reflectometry for in-flight dynamic monitoring of micro waviness of aerodynamic structures.
For wing design: Assist in the validation of design and simulation tools.

IMPORTANT NOTE:

We will be represented at this year's ILA Berlin Air Show (11.-16.September 2012) with two exhibition booths (Hall 2 and 3) to showcase our latest developments.

ABOUT FTI GROUP

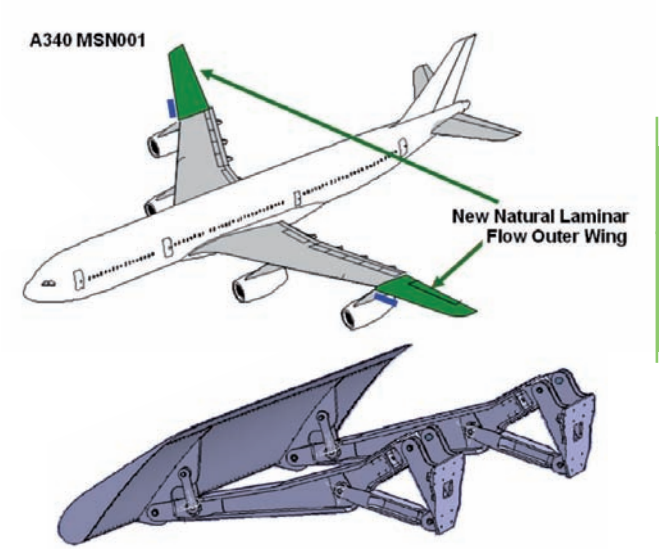
www.ftigroup.net

The origins of FTI Group lay in flight test instrumentation. The development of test systems and simulation are still a core part of our company. As an aircraft systems provider our main area of expertise is in the development of software, digital image processing and video monitoring systems for the aerospace market. In the past 10 years we have been involved in various aerial refuelling projects, including the conversion of the Airbus A310 civil airliner into the Multi Role Transport Tanker, design and supply of an upgraded MRTT Video Surveillance and IR Illumination System.

> **CONTACT PERSON:** Ute Frank

SUCCESS STORIES

THE KRUEGER FLAP



Example of one of the two Krueger flaps (below), designed and manufactured by ASCO Industries for flight testing on a modified A340-600 by Airbus (above).

ASCO, a privately owned Belgian aerospace company incorporated in 1954, is today the leading specialist in the design and manufacture of high lift devices for all aircraft platforms over 50 seats.

This position has been achieved through continuous evolution towards full supply chain integration from design to the final delivery of a product.

In recent years, ASCO has intensified its Research and Technology activities, in preparation for future challenges and is participating in several projects in the framework of Clean Sky.

For ASCO, Clean Sky represents a unique and particularly interesting platform because the end targets of Clean Sky in terms of environmental footprint reduction are clearly defined, thereby allowing a specific and industrially relevant step change in making today's aviation greener.

Furthermore, the cooperation within Clean Sky is of strategic importance as it provides a platform to directly co-develop technologies together with Original Equipment Manufacturers (OEM's).

This is the case for the DEAMAK program, for which ASCO designs and manufactures two Krueger Flaps for Airbus that will be flight-tested on a modified A340-600.

A Krueger flap is a component situated on the leading edge of the wing in order to generate more lift, needed for take-off and landing of the aircraft, moments when the aircraft is flying at lower speed.

Most commonly, high lift devices are deployed in and out of the wing via a 'gliding' movement using actuation mechanisms, whereas a Krueger flap rotates around a fixed hinge point and has a circular motion during deployment.

Slats, flaps and Krueger flaps are so-called 'high-lift devices' and only used for landing and take-off flight phases. The rest of the time, slats and flaps are firmly retracted against the fixed wing and Krueger flaps even disappear completely in the wing.

The Krueger flap by itself is not new. It was invented by the German engineer Werner Krueger in 1943 and it is used on leading edges of big aircraft close to the fuselage.

However, the novelty of its use for the current project stems from its implementation on the green wings of the future that use a very specific airflow - called laminar airflow- that keeps the air gliding smoothly over the wing for as long as possible, the laminar wing.

As a Krueger moves entirely via the lower part of the wing and leaves the upper wing skin un-altered, it allows for a clean upper wing surface without steps or gaps that could disturb the laminar airflow.

Classical slat system with actuation system visible:

Alternative Krueger system, entirely deployed via the bottom of the wing.

The laminar airflow deminishes turbulence, hence drag, thereby reduceing the aircraft's fuel consumption. A 6% fuel saving per flight is envisaged through the use of such a laminar wing.

ASCO is proud to participate in the DEAMAK project, which contributes to the research for greener aviation. ASCO will continue its efforts to actively participate in initiatives that push technology and product development for a more environmentally sustainable future.

The advice ASCO
could give to potential partners of Clean Sky:

1) Budgets for Calls are provided in the respective Call information. However, do not try to consume all of it and **set up a lean budget** preferably under the target as proposals are selected– for comparable quality- on a competitive basis. This is often overlooked.
2) **Do not be deterred by the size of Clean Sky and its administrative obligations.** Although there is a certain level of administration required, you work with tax payer's money and you would probably request the same reporting if it was yours. Some people find it difficult to work with the required EC reporting tools. It takes some time to get familiar with them, but most things are difficult before they become easy.

ABOUT ASCO

www.asco.be

Asco, incorporated in 1954, is a proven technology specialist and supply chain integrator in design, development, precision machining, processing, and certified assembly of complex high strength metallic aircraft components (high-lift devices, landing gear components, and engine attachments).
Asco is headquartered in Zaventem, Belgium with operating subsidiaries in Germany and Canada combined with service offices in Brazil and the US. Today, the Asco Group employs 1,300 people. Its worldwide, 100% Aerospace, customer base includes most aircraft manufacturers as well as many related Tier-1 and Tier-2 suppliers.

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