



The Quarterly
Bulletin of the

CEAS

COUNCIL OF EUROPEAN AEROSPACE SOCIETIES

3AF – AIAE – AIDAA – DGLR – FSAE – FTF – HAES – NVvL – RAeS – SVFW – TsAGI



Issue 1 - 2010
March

© AIRBUS MILITARY 2009_A400M First Flight - Photo by R. Molinos / MANGO Producciones



C1 →

QUITE A DECISIVE STEP FORWARD

FOR THE A400M: ON 11 DECEMBER 2009

AT 13:02 UTC, THE PROTOTYPE MSN001 LANDED

BACK IN SEVILLE AFTER COMPLETING SUCCESSFUL

MAIDEN FLIGHT LASTING 3 HOURS 47 MINUTES

CEAS

WHAT IS THE CEAS ?

The Council of European Aerospace Societies (CEAS) is an International Non-Profit Association, with the aim to develop a framework within which the major Aerospace Societies in Europe can work together.

It presently comprises eleven Member Societies: 3AF (France), AIAE (Spain), AIDAA (Italy), DGLR (Germany), FSAE (Finland), FTF (Sweden), HAES (Greece), NVvL (Netherlands), RAeS (United Kingdom), SVFW (Switzerland), TsAGI (Russia).

Following its establishment as a legal entity conferred under Belgium Law, this association began its operations on January 1st, 2007.

Its basic mission is to add value at a European level to the wide range of services provided by the constituent Member Societies, allowing for greater dialogue between the latter and the European institutions, governments, aerospace and defence industries and academia.

The CEAS is governed by a Board of Trustees, with representatives of each of the Member Societies.

Its Head Office is located in Belgium:
c/o DLR – Rue du Trône 98 – 1050 Brussels.

www.ceas.org

WHAT DOES CEAS OFFER YOU ?

KNOWLEDGE TRANSFER:

- A well-found structure for Technical Committees

HIGH-LEVEL EUROPEAN CONFERENCES

- Technical pan-European events dealing with specific disciplines and the broader technical aspects
- The CEAS European Air and Space Conferences: every two years, a Technical oriented Conference, and alternating every two years also, a Public Policy & Strategy oriented Conference

PUBLICATIONS:

- Position/Discussion papers on key issues
- CEAS Aeronautics Journal
- CEAS Space Journal
- Periodic Newsletter on CEAS activities and general information

RELATIONSHIPS AT A EUROPEAN LEVEL:

- European Commission
- European Parliament
- ASD (AeroSpace and Defence Industries Association of Europe), EASA (European Aviation Safety Agency), EDA (European Defence Agency), ESA (European Space Agency), EUROCONTROL
- Other European organisations

EUROPEAN PROFESSIONAL RECOGNITION:

- Directory of European Professionals

HONOURS AND AWARDS:

- Annual CEAS Gold Medal to recognize outstanding achievement
- Medals in technical areas to recognize achievement

YOUNG PROFESSIONAL AEROSPACE FORUM

SPONSORING

THE CEAS MANAGEMENT BOARD

IT IS STRUCTURED AS FOLLOWS:

- General Functions: President, Director General, Finance, External Relations & Publications, Awards and Membership.
- Two Technical Branches:
 - Aeronautics Branch
 - Space Branch

Each of these two Branches, composed of specialized Technical Committees, is placed under the authority of a dedicated Chairman.

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EDITORIAL

THE A400M PROGRAMME AGAIN ON TRACK



Jean-Pierre Sanfourche
Editor-in-Chief,
CEAS Quarterly Bulletin

During the year 2009, there was great uncertainty as to the future of the A400M Airbus Military Transport. Would the first test flights be successful? And, if yes, would seven Partner Nations involved in the programme¹ and EADS/Airbus be able to reach agreement upon new contractual arrangements to rescue the development from the catastrophic situation into which the programme had fallen?

The answer to the first question is yes, since 11 December 2009, when the first A400M prototype known as MSN001 had landed back in Seville at 13:02 UTC after completing successful maiden flight lasting 3h 47 min. Following this promising step forward, the flight tests are progressing well and as early as 20 January, Chief Test Pilot Ed Strongman declared: "The aircraft is a delight to fly and there have really been no significant problems at all." In total by 9 March, MSN001 had logged 39 hours of flight and collected a lot of good data. Prototype MSN002 is joining the flight programme, being then followed successively by MSN003 and MSN004. This fleet will perform some 3,700 hours of test-flying until the end of 2012. The first results reported so far allow to state that technically speaking, the A400M is under control.

What about the second question? Since August 2009, intensive discussions have been taking place between Partner nations and EADS to try to resolve the funding crisis. It was only on last 5 March that in Leiden, both parties came to an 'In Principle Agreement'. There is no doubt that the first successful flight tests were a decisive factor for reaching this positive conclusion. In short, the Customer Nations agree to increase the price of the contract by €2 billion, waive all liquidated damages related to current delays, provide an additional amount of €1.5 billion in exchange for a participation in future export sales, accelerate pre-delivery payments in the period 2010-2014. EADS considers that this agreement provides a sound basis for a satisfactory evolution of the programme.

So, after a long period of serious concerns and doubts, it can be at last asserted that the "A400M soldier is saved".

This is quite an important event, for European defence above all: air mobility is vital in achieving the objective of getting people, equipment and supplies to any trouble spot with efficiency and rapidness, now it is extremely urgent to bring up-to-date our fleet of old and obsolete military air transport aircraft. Besides the

A400M is really a significant enabler of the Common Security and Defence Policy (CSDP).

This is also quite an important event for European aerospace industry, considering that the A400M generates a considerable amount of labour and constitutes a cornerstone of the European technological base, and that "the export potential is huge" according to EADS chief executive Louis Gallois. "I think we could reach 400-500 in the next twenty years", he said.

All these encouraging future prospects are the best reward which could be offered to all persons from different countries, involved in this challenging enterprise for six years.

1. The seven Partner Nations are: Belgium, France, Germany, Luxembourg, Spain, Turkey, United Kingdom.

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PERSONALITY INTERVIEW



Jean-Pierre Sanfourche, Editor-in-Chief of the CEAS Quarterly Bulletin has interviewed Pierre Froment, Vice-President, R&T for Equipment & System at Safran, about the importance of expertise in a high-tech industrial company and about the basic principles to be applied in human resources management in order to get the level of expertise necessary to successfully face competition. The results of this interview are reported here below.

Could you tell us about the importance of expertise in Safran ?

Before speaking about expertise, I prefer to start with technologies... You have probably noticed that the “corporate” presentation of Safran group is introduced by:

“Safran, an international technology leader”

That is to say we firmly believe that the first lever that differentiates us from our competitors is the mastering of technologies. Obviously, not just technology for the sake of it... but to offer higher performance for our customers, to face competition which always pushes you to a better offer for our customers. This means offering technology where it counts... But this technology has to be secured, matured enough for a smooth and seamless introduction.

And, if you just have a look at the areas where Safran has number one positions (Engines with CFM56 and helicopters turbo machines, braking with new carbon brakes, Helicopter Flight Controls, security and biometry technologies, etc.) all these successes rely on the technology the Group has been able to successfully introduce in these products.

As soon as you have set the objective - I should say this strategy - to be a Technology leader, you obviously have to understand the expertise which will enable this policy. This means knowing how to identify, manage, federate the population of experts who become the ‘heart’ of your engineering force.

What are the key reasons Safran has such a formal identification of ‘experts’?

As I just said, the strategic axis of Safran development is to base our differentiation on the use of the most relevant and up to date technologies. But to face such a challenge, you need to keep, to protect a ‘core’ of key people, who understand the benefits and risks we have in these developments. If we do nothing, we cannot be surprised that, in order to develop their career, good engineers want to move to management, to commercial or others functions. This is a natural move, which is normal and healthy in any company: we appreciate that the managers have a technical background, with regards to the kind of products we deliver... but on the other hand, we must be able to retain, by attractive technical careers, the persons who have the profile.

Therefore, it becomes natural that Safran Group points the value of this expertise by a formal recognition of his human asset of ‘experts’. This is creating a strong community, a virtuous circle of recognition. This recognition is not only words, this means that their career progression is in line with those of the managers.

Now could you tell us more about the experts themselves, now?

The total workforce of the Group is about 57,000 persons, among which 15,000 can be considered part of the “engineering” workforce. Of these, we are considering 1000 as experts.

We have federated this population in two different ways:

- Expertise level , with three levels (Confirmed, Senior, Master);
- Expertise area, with around 25 different domains of expertise.

But the fundamental point is that this community is organised as a network, breaking the natural boundaries between all the companies and locations of the group. This is a key to improve the synergy, taking advantage of the “lessons learned” and sharing the experience. A network of experts has more value than the pure addition of individual expertises...

What is the “rationale” behind this classification of levels and domains?

We have decided to keep three levels of expertise, because it gives enough ‘progression’ capability, and is simple to manage. We could summarise by saying:

- A confirmed expert is one recognised as an expert by his peers. His field of action is mainly his own company. The management of this group depends on the different companies, even if there are general rules set at the corporate level. Even if it appears as the basic level for experts, this identification is extremely important, since it is among this population that will emerge the top experts we need for our group. This early detection has a great importance in the global process.
- A senior expert is recognised at a national level, and his field of action extends to the whole group. We identified around 230 experts having reached this level.
- A master expert is internationally recognized in his field; 70 of them reached this ‘top-level’.

The management of the two upper levels is done at the corporate level.

The domains’ classification is based mainly on ‘technology areas’, the interest being to share the knowledge between all the companies of the group by transverse networks.

What do you expect from your expert population?

I will start with “what an expert should expect from the Group?”, because rights and duties are to be contemplated simultaneously.

To be nominated as an expert is clearly a recognition of the importance of your knowledge as an asset to the company. Therefore, we are committed to provide our experts with all the means that facilitate the acquisition, the transmission and capitalization of this knowledge. For example, we have to protect them from being overloaded with tasks that, while seemingly important, may be performed by others. It is important that time is reserved for “freedom to think”...

OK, but these rights come with some duties, I imagine...

Yes, though I prefer the word ‘mission’ to duties... We usually highlight five aspects in this mission.

The very first one is relative to the capitalisation and transmission of knowledge. This recognizes that knowledge is an asset to the company, which needs to be managed with the utmost care. Transmission of knowledge must also be handled with care... Every time one of the experts goes into retirement, I always wonder myself: “have we done our best to “capture” his knowledge, to avoid any waste with this departure?”

But this is only knowledge management... The goal is to use this knowledge?

The second aspect is intelligence, and orientation of the R&T programmes. We consider that in order to efficiently harness intelligence on a given area, it should be managed by an expert of this area, so that relevant information can be selected at the source.

We need their expertise and their ability to detect the future possible ‘technology ruptures’ to elaborate the right strategy, then turn it into R&T plans. Maintaining our leadership in technologies is one of their key missions.

Have they a role outside of R&T?

The key role of our experts is to cover all the phases, from R&T to engineering, to industrialisation, to production. For example, all critical reviews during the development of a product are to be conducted with the assistance of relevant experts. Experts have as well the ability to solve complex problems on strategic programmes. The objective is obviously to secure the development by using their experience

and ‘lessons learned’. But this is not the only benefit: these reviews become the opportunity to transmit knowledge.

You mentioned five aspects, we are only at three... What else?

Innovation is one of these aspects, as well. Not to say that technology is the only engine of innovation, this is too limiting, but it is clear that the experts have to be one of the major actors of innovation, and be open minded to a lot of other inputs.

And, last but not least, they obviously have a role in representing the company. Should it be in conferences, or at Standardisation Organisations, they have to use their communication skills to capture the right information, deliver the right message, which must be adapted to the audience (other experts, customers, journalists, etc.)

And in your view, what are – on top of obvious technical expertise - the major qualities of the experts?

Passion, first. Passion for their products, for their field of knowledge... Passion to transmit their experience... And aside passion, enough clairvoyance to aim the right level of our targets: high enough to be competitive... and not too high to ensure maturity of the products! These two characteristics may appear as opposite ... but humans are like that!



ABOUT PIERRE FROMENT

Education

- Ecole Polytechnique
- SUPAERO
- Ecole de l'air (Air Force Pilot Licence)

Positions

1981 – 1990: Flight Test Centre of French MoD

- Adaptation of weapons, countermeasures and various equipments on combat aircraft, transport aircraft and helicopters.

1990 – 2008: AIRBUS

- Flight tests of A340 and ATR 72
- Project 'FLA', now A400M
- Project 'AXXX', now A380
- Integration testing (System Test Benches & Iron Bird)
- System design & testing

2008-2010: SAFRAN

- Vice-President for R&T 'Equipment & System'

A400M: AN AIRCRAFT AT THE FOREFRONT OF TECHNOLOGY

By Mercedes Oliver Herrero and Mariana Fernández Renedo



Mercedes Oliver Herrero
Director General of the CEAS

In my new position of Director General of the CEAS and at the same time as an Airbus A400M developer, I am particularly pleased to provide the reader with some information about the A400M a few weeks after its successful first test flight on 11 December, and also at the time when an 'In Principle Agreement' has just been concluded between the seven partner nations of the programme (Belgium, France, Germany, Luxembourg, Spain, Turkey, UK) and EADS, which allows to resolve the financial issue. Now the programme is again on the right track: a very high satisfaction and a fair reward for the thousands of men and women from different European countries who for six years are accomplishing a remarkable work.

A European aircraft: historical background

The idea of creating a military aircraft tailored to the needs of today's armed forces was conceived in late 1982 by Aerospatiale (France), British Aerospace (UK), Lockheed (US) and Germany's Daimler-Benz Aerospace (DASA). The companies then formed a consortium called Future International Military Airlifter (FIMA), which later dropped Lockheed and re-named itself Euroflag in 1991 as the Europeans' interests did not coincide with those of the American company.

However, several more years passed until, in 1999, Germany, Belgium, Spain, France, Italy, Portugal, Turkey and the UK submitted a Request for Proposal (RFP) to which Airbus Military responded with an offer for a set number of aircraft, with specifications, several delivery dates and a fixed price.

On 21 December 2001, a preliminary contract was signed for a total of 197 A400Ms – the name by which the aircraft was to be known from then on. However, Italy had meanwhile dropped out, and Portugal followed suit two years later. The final contract for 180 aircraft was signed on 27 May 2003, with OCCAR ("Organisation Conjointe de Coopération en matière d'Armement" – the armaments cooperation organisation created in 2001 to manage colla-

borative defence projects) representing Belgium, France, Germany, Luxembourg, Spain, Turkey and the UK.

A great technological effort

If there is something we can highlight of the A400M are the numerous technical innovations comparing the existing aircraft in the market. These changes are made in areas that go from the airframe structure and materials to its aerodynamic design, its all new turboprop engine, its fly-by-wire controls or even, the advanced flight-deck.

30% of the structure is made of composites

One of the most amazing things included in this aircraft is that a thirty per cent of its structure is made of composites that help reducing structural fatigue and maximize the structural life. These composites are used, for example in the main spars of the wing. Also the tail, including the horizontal and vertical stabilizers and the control surfaces, is made of composite material, as well as the rear cargo door, the sponsons (undercarriage bays) and the propeller blades (with Kevlar shell). The extensive use of composite material enables the A400M to be much lighter, and effective when developing a mission.



© AIRBUS MILITARY 2009 _ A400M First Flight - Photo by R.Molinos / MANGO Producciones

11 December 2009, 13:02 UTC, the A400M prototype MSN001 took-off from Seville for its first test flight.

Aerodynamic improvements

On the other hand, the aerodynamic improvements include the reduction of air turbulence by having shaped the sponsons, allowing the paratroopers to jump simultaneously through the two dedicated side doors or through the ramp.

A 12-wheel main landing gear

Also to facilitate the tactical operations the A400M incorporates a 12-wheel main landing gear linked to an efficient shock-load absorber which enables the A400M to land on short, soft and rough airstrips.

Despite the aircraft is able to carry heavy loads (up to 37 tonnes, which can include helicopters, rescue boats...), it



© AIRBUS MILITARY 2009 - A400M First Flight - Photo by S.Ramadier / AIRBUS Operations

The A400M prototype MSN001 during its maiden flight on 11 December 2009.

still can develop military or humanitarian missions that require landing and taking off on unpaved fields as the structural weight and fuel consumption have been reduced.

New design engines

But one of the most important innovations in the A400M is the insertion of the new design engines. They consist on three-shaft turboprop engine with eight bladed propellers and EuroProp International (EPI), a consortium comprising Rolls Royce, Snecma, MTU and ITP, develops them.

These four 11,000 shp TP400 can cruise at altitudes as high as 37,000 ft at speeds between Mach 0.68 and 0.72. This will permit the aircraft to fly above turbulent weather conditions and to be integrated into the commercial aircraft airspace.

The contra-rotating arrangement of the propellers, which turn in opposite directions, allows a structural weight

reduction. The arrangement preserves the symmetry of the aircraft when the four engines are operating, and reduces the adverse yaw in case of an engine failure.

Fly-by-wire control systems

Apart from that the A400M has two independent fly-by-wire control systems that give the aircraft not only excellent handling qualities - such as "direct lift control" for easier air-to-air refuelling manoeuvres but also expanded flight envelope protection - such as safe manoeuvring up to 120° in roll, with no limit in pitch, and with roll rates up to 35° per second.

A new simplified cockpit

Finally the new simplified cockpit reduces the workload of the pilot and include among other things, Head-up Displays; Enhanced Vision System; Automated Centre Gravity calculation; Automated Defensive Aids Systems; Simple Emission switching; uncluttered screens; Automated Tanker and Receiver fuel control; and an auto Fuel Tank Inerting system.

• **All this demonstrates that the A400M is a state-of the-art aircraft and a great engineering effort and it is not only capable of doing more with less but also perfectly suitable with the Armed Forces requirements.**

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Assembly Hall

ORDERS SIGNED BY THE PARTNER NATIONS WITH OCCAR IN MAY 2003

• BELGIUM	7
• FRANCE	50
• GERMANY	60
• LUXEMBOURG	1
• SPAIN	27
• TURKEY	10
• UK	25

Total	180
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SOME FACTS AND DATES

- For its first flight, on 11 december 2009, the first prototype 'MSN001' took off at a weight of 127 tonnes, carrying 15 tonnes of test equipment including 2 tonnes of water ballast, compared with its maximum take-off weight of 141 tonnes. it has flown at the type's maximum operating speed of 555 km/h, maximum mach number 0.72 down to the stall warning, and at an altitude of more than 30,000 feet. it has operated extensively in both direct and normal control laws, and in different configurations.
- Tuesday 9 march 2010: 'MSN001' landed in toulouse airport, in a direct flight from seville. it is heavy instrumented with 22 tonnes of flight test instrumentation. its new home is hangar M90 in airbus saint-martin du touch premises, where will continue with the flight test campaign. so far, 10 flights and 40 hours of flight had been made.
- End of march 2010: the second prototype 'MSN002' will make its maiden flight. It will remain in seville.
- The third prototpe 'MSN003' is being assembled in the final assembly line in seville and will fly around the middle of 2010.
- By the end of 2010, the fourth prototype 'MSN004' will join the fleet.
- Total test-flying: 3,700 hours until the end of 2012.
- Type certification is due at the end of 2011.
- A national entry into service by the end of 2012.

CLEAN SKY JU IS FLYING SOLO

On 19th November 2009, the Clean Sky Joint Undertaking was granted administrative and operational autonomy from the European Commission. The Joint Undertaking manages the Clean Sky Joint Technology Initiative (JTI) that will develop breakthrough technologies to significantly improve the impact of the air transport on the environment. Since the official date of set up of this Clean Sky JTI in February 2008, operation of the Clean Sky JU was carried out by the European Commission during this interim period. Thanks to its autonomy, Clean Sky JU is henceforth able to implement its own budget and execute its own work plan.

WHAT IS THE CLEAN SKY JTI?

The 'Clean Sky' Joint Technology Initiative¹ (www.cleansky.eu) (CS) is a unique public private partnership aiming to develop environmentally friendly technologies impacting all flying segments of commercial aviation with the aim of contributing to the ACARE targets for reduction of emissions and noise in Air Transport in Europe.

The Clean Sky JTI is organised in 6 Integrated Technology Demonstrators, each led by two founding members and active through a matrix structure.

gurations and the integration of technologies developed in the other ITDs;

- the Green Rotorcraft ITD [Augusta Westland (I, UK), Eurocopter (F, D) - budget = €155 M] targeting innovative technologies – rotor blades, motor with reduced noise, airframe drag minimization, diesel engines, electrical systems, flight trajectories -;
- the Sustainable and Green Engines ITD [leader: Rolls-Royce (UK), Safran (F)-budget = €422 M] to integrate low noise technologies and light low-pressure systems, high-efficiency, low noise NOx emission and lightweight – new configurations such as open rotors or coolers;
- the Systems for Green Operations ITD [leader: Thales (F), Liebherr Aerospace (D) – budget = €305 M] focusing on aircraft electrical equipment and systems architecture, thermal management, 'green' trajectories and improved on-ground missions and operations;
- the Eco-Design ITD [leader: Dassault Aviation (F), Fraunhofer Gesellschaft (D) – budget = €146 M), dealing with the life cycle of materials and components, concentrating on issues such as optimal use of raw materials, reducing the use of non-renewable materials natural resources, energy, noxious effluent emission and recycling.



THE TECHNOLOGY EVALUATOR

A technology Evaluator (TE) led by Thales Avionics and DLR is at the core of Clean Sky to assess and evaluate the performance and the environmental impact of these technologies.

The Technology Evaluator will establish a network within a virtual simulation laboratory which combines the competence of the aeronautical research and industry at European level. It will act as a unique knowledge-sharing collaborative network of expertise (see illustration p. 9).

CLEAN SKY JTI: ONE OF THE LARGEST EUROPEAN RESEARCH PROJECTS EVER

The total budget amounts to €1.6 billion over the period 2008-2013 of which half is contributed by the European Commission,

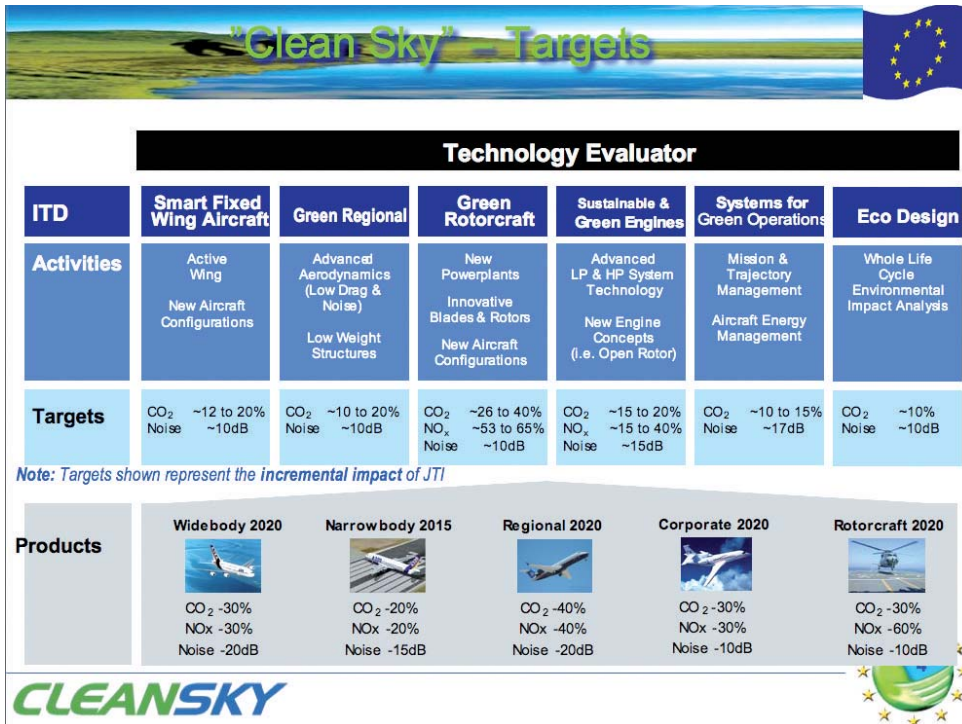
in cash, and half by the European Aeronautics industry, in kind, as follows.

- the SMART Fixed Wing Aircraft ITD [leader: Airbus(F, D, UK, E), SAAB (SE) - budget = €393 M] targeting active control technologies for the wings as well as on the new aircraft configurations to be integrated in an optimal manner to these new types of wings;
- the Green Regional Aircraft ITD [leader: Alenia (I), EADS CASA (E) - budget = €174 M] relating to green regional transport planes, targeted on lightweight configurations and technologies using intelligent structures, silent confi-

- Overall EC Contribution = €800 M [Members: €600 M (ITD leaders €400 M + Associates €200 M) + Partners: €200 M];
- Industry = €800 M.

This public-private partnership will speed up technological breakthrough developments and shorten the time to market for new solutions tested on Full Scale Demonstrators. In addition, it will encourage the participation of small and

1. The 'Clean Sky' Joint Undertaking was established under Council Regulation (EC) N° 71/2007 of 20 December 2007 (OJ L 30, 04.02.2008).



medium-size enterprises (SMEs).

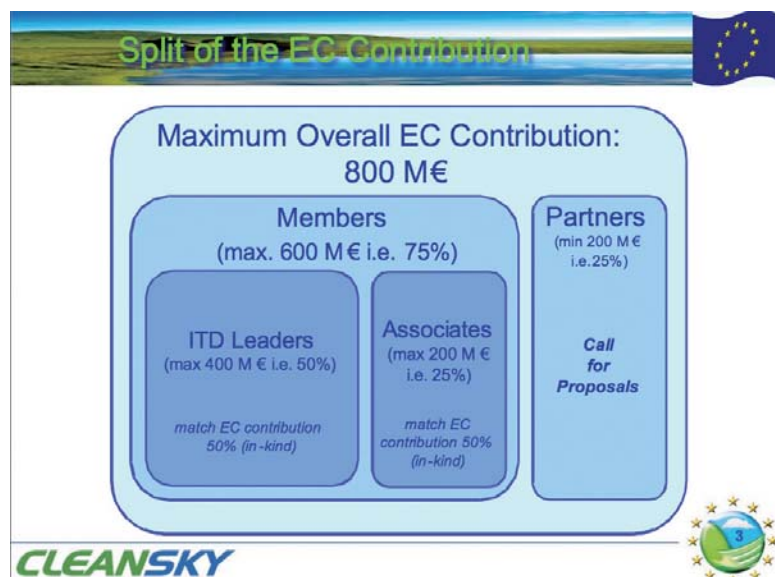
JTI: a major element of the FP7

So, Joint Technology Initiative is a major new element of the EU's 7th Research Framework Programme (FP 7) and the approach proposed by the JTIs signals a real change in how Europe promotes industry-driven research, designed to establish European leadership in certain technologies that are strategic to Europe's future.

SOME RECENT NEWS

THE NEW EUROPEAN COMMISSIONERS WITH WHOM SCIENTIFIC AND TECHNICAL AERONAUTICS AND SPACE MATTERS WILL BE DEALT WITH DURING THE PERIOD 2010-2014:

- Maire **Geoghegan-Quinn**, European Commissioner for Research, Innovation and Science
- Siim **Kallas**, European Commission for Transport
- Janez **Potocnik**, European Commissioner for the Environment.



ACTIVITIES TO BE CARRIED OUT BY PARTNERS VIA CALLS

These activities will be an essential part of the core R&D activities of Clean Sky. Currently, the JU has launched its 3rd call for proposals. This call covers 45 topics with total available funding up to 12.4 million euros.

Deadline for submitting proposals: **27th April 2010, 17:00 Brussels time.**

For detailed description of the work topics and information on how to submit your proposal, please consult: www.cleansky.eu

Article written by Jean-Pierre Sanfourche in collaboration with H el ene Barbier, Communications & SME Officer, Clean Sky JTI. helene.barbier@cleansky.eu

At top management level are

- Chairman of the Governing Board: Marc Ventre
- Executive Director: Eric Dautriat
- Chairman of the National States Representative Group (NSRG): Jim Lawyer

AIRFRAME IMPROVEMENTS AND CLIMATE IMPACT

During the CEAS 2009 European Air and Space Conference held in Manchester, 26-29 October 2009, a Special Session, conducted by the RAeS on 28 October, dealt with the subject 'GREENER BY DESIGN'. Within this framework, Jenny Body, Government Relation Manager, Airbus, Europe, presented a paper on the topic 'Airframe improvements and climate impact'. Here below is a summary of the latter.

DRASTIC FUEL BURN IMPROVEMENTS OVER TIME

In the last 40 years, commercial aviation has achieved, in terms of Relative Fuel Burn per Seat, 70% reduction, so 70% fuel burn reduction and 70% CO₂ emissions reduction.

VISIONARY ENVIRONMENTAL TARGETS REQUIRING FURTHER STEP CHANGES

The objectives fixed by the ACARE (Advisory Council for Aeronautics Research in Europe) at a 2020 time horizon are: 50% reduction in CO₂, 50% reduction in perceived noise (noise reduction at source, operational procedures), 80% reduction in NO_x. These severe specifications require a perfect coordination of Aircraft manufacturers, Engine manufacturers and Air traffic Management actors: this is precisely the missions of 'CLEANSKY' and 'SESAR' Joint Undertakings led by the European Commission.

KEY PRODUCT OBJECTIVES FROM MARKET NEEDS

- There are three essential objectives to be achieved:
- Affordability and Productivity, which require reduction of % Direct Operating Cost (DOC), thanks to decrease of fuel burn together with reduction of Direct Maintenance Cost (DMC), dispatch reliability 100%, step-change in Turn Round Time;
 - Passenger Appealing, with more comfort and additional services differentiation;
 - Environment Friendly, implying reduction of Effective Perceived Noise in Decibels (EPNdB), night operations, emissions -50%, green manufacturing and recycling.

AIRCRAFT TECHNOLOGIES DELIVERING IMPROVED EFFICIENCY

If we consider the main components of an aircraft - structures, aerodynamics, systems, engines - , it is clear that the overall fuel burn potential is not the sum of the individual technologies: it depends in fact upon the configuration of this aircraft and the integration of those in it.

MATERIALS

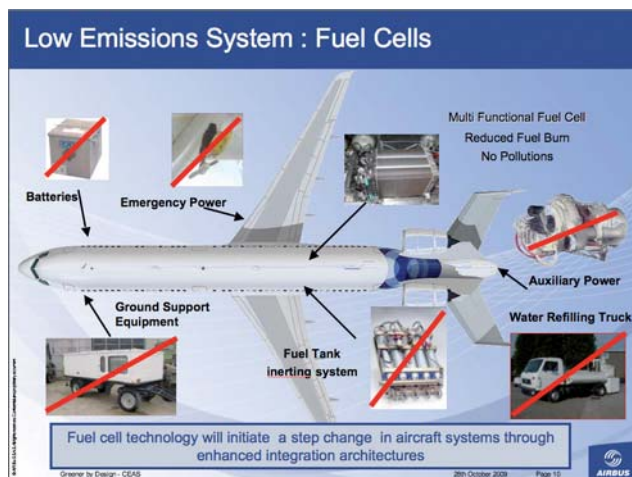
Material and manufacturing technologies are significantly contributing to the aircraft competitiveness: advanced light and hard alloys, new joining processes, new composite material and manufacturing processes, advanced design by structural optimization,

smart structures, nanotechnologies, etc.

FLIGHT PHYSICS

Flow control technology and application provide significant opportunity to reach environmental targets: aerodynamic drag minimization, weight saving through load management, flow control, load control.

LOW EMISSIONS SYSTEM: FUEL CELLS

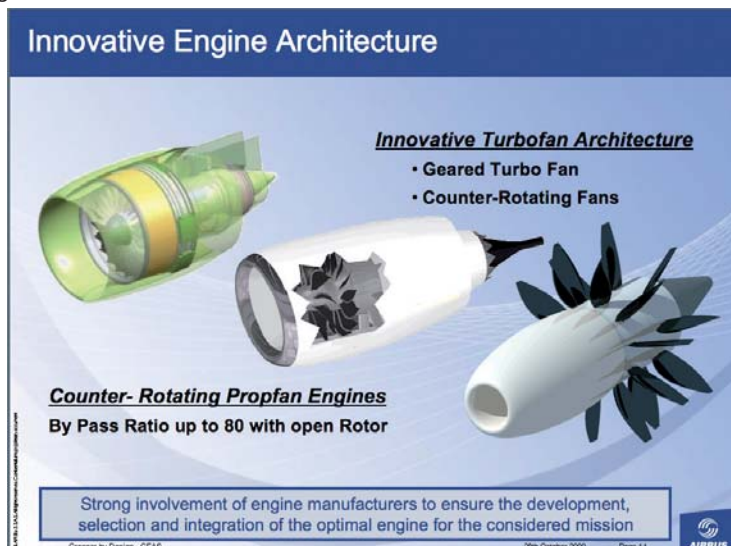


Multi Functional Fuel Cell technology thanks to their two major advantages – reduced fuel burn, no pollutions - will initiate a step change in aircraft systems through enhanced integration architectures.

INNOVATIVE ENGINE ARCHITECTURE

Two main advances: (i) innovative turbofan architecture (geared turbo fan and counter-rotating fans); (ii) counter-rotating propfan engines by pass ratio up to 80 with open rotor.

COMMERCIAL AVIATION ALTERNATIVE FUELS OPTIONS AIR TRANSPORT IS IMPORTANT FOR ALL OF US



Commercial Aviation Alternative Fuels Options

		"Drop-In" Fuels					Non "Drop-In"
		Conventional Jet Fuel ("Kerosene")	Alcohols	Bio Esters	Syn. Fuels	Hydrogenated bio-mass	Cryogenic Fuels
CATEGORY	Non-Renewable (Fossil)	Jet Fuel ✓			CTL GTL Exists Tomorrow ✓		Liquefied Natural Gas ✗
	Renewable		Ethanol 35% lower energy content ✗	FAME 10% lower energy content Freezes at -5°C ✗	BTL Future ✓	Hydrogenated Vegetable Oils Future ✓	Liquid Hydrogen Low energy content per unit volume, Availability, Infrastructure. ✗

Promising alternatives to Kerosene on the mid/long term horizon

Greener by Design - CEAS | 28th October 2009 | Page 12 | AIRBUS

THE CHALLENGE: MEETING BOTH GROWING DEMAND AND ENVIRONMENTAL CONCERNS

Two significant figures: 32 million jobs; US\$3.5 trillion in economic activity today. It is clear that Society wants aviation (share time with friends and family, discover new horizons and cultures, increase opportunities and business, resolve global issues), Economy needs aviation, Technology brings solutions.



ABOUT THE AUTHOR

Jenny Body joined Airbus in 1971. In 2005, she became Government Relations manager. Her main achievement during this time was the preparation and establishment of the Next Generation composite Programme which is targeted at technologies for the next generation single aisle aircraft. Since January

2008 she has been the UK Senior Representative for R&T and head of UK Business Development tasked with maximizing support for UK based Airbus R&T. She has been recently elected a Fellow of the RAeS.

E-mail: jenny.body@airbus.com

ABOUT GALILEO

HISTORICAL BACKGROUND

The EGNOS (European Geostationary Navigation Overlay Service) and Galileo programmes were initiated in the mid 1990s with the aim of establishing a European Global Navigation System (GNSS). EGNOS is a regional system for Europe that monitors and corrects the signals emitted by existing satellite navigation systems – GPS and GLO-NASS – by improving their accuracy and assessing their reliability. Galileo is currently under development as Europe’s Global Satellite Navigation System: it is the European counterpart of GPS (Global Positioning System, developed and operated by the United States Department of Defense) and a Joint Initiative of the European Commission and the European Space Agency.

In order to manage the development and validation phase Galileo, the European Commission (EC) and the European Space Agency (ESA) set up a dedicated structure, the Galileo Joint Undertaking, which operated from September 2003 until the end of 2006. In 2007, the activities of this GJU were transferred to the *GNSS Supervisory Authority*, a Community Agency.

The Galileo programme was the first of its kind in several aspects: it was the first close collaboration between the ESA and the European Commission on such a large space programme, the first industrial programme to be managed at European level and the first time the Commission was to participate in a Public-Private Partnership (PPP).

Negotiations with the private sector on a concession agreement stalled in early 2007. The Parliament and the Council decided to redirect the programme in autumn 2007. Technological development has been set back five years. As at the end of 2008, no operational satellites had been launched and cost estimates for the development and validation phases had almost doubled from 1.1 to 2.1 billion euro, the European Court of Auditors was requested to look at which factors accounted for the failures. The conclusions of this audit are published in its Special Report No 7/2009. The latter concluded that management of the development and management phase was inadequate. If the mid-2007 redirection of EGNOS and Galileo is to succeed, the Commission must considerably strengthen its management of the programmes. The Report includes a number of recommendations aimed at supporting the Commission in this task.

SOME PRELIMINARY RECALLS ABOUT THE GALILEO SYSTEM

The main components of the GALILEO system are shown in figures 1, 2 and 3.

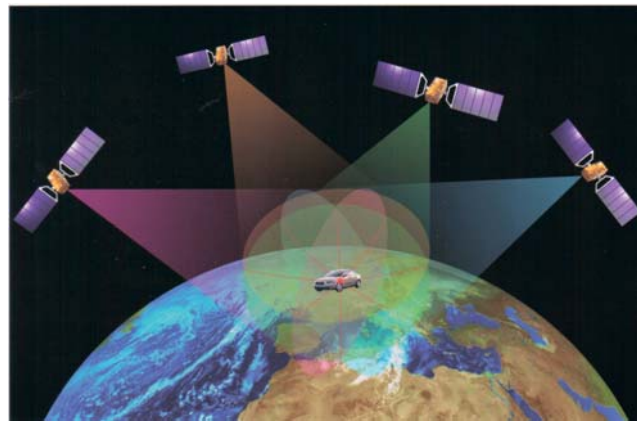


Figure 1. Navigation by satellite allows to accurately determine a position by measuring the distances between the satellites and a receiver. The latter registers the time signals coming from several satellites and calculates its position with regard to them. It performs this calculation by measuring the time of the transmission satellite-receiver. To know its position, the receiver needs the signals from 4 navigation satellites. The accuracy of the position calculated depends upon the accuracy of the time measurement: only the atomic clocks have the accuracy required, the order of the nanosecond. Special attention must be brought to the number of the satellites of the constellation and to their orbits.

★ Galileo System Architecture

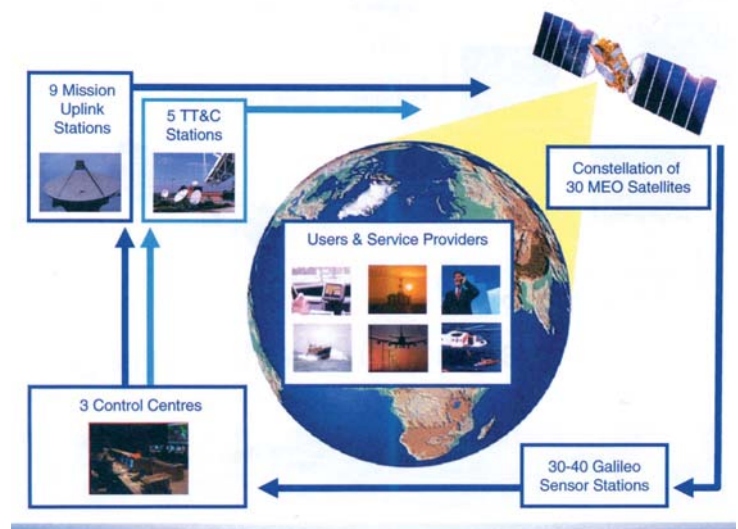


Figure2. Galileo System Architecture

THE SITUATION TODAY

THE GALILEO FULL OPERATIONAL CAPABILITY (FOC) PHASE PROGRAMME STATUS

The contracts for System Support, Satellites and Launchers

They occurred in early January 2010:

- **System Support:** the framework contract and first work order have been awarded to Thales-Alenia-Space Italy

★ Galileo Services





Open Service	Free to air; Mass market; Simple positioning	
Commercial Service	Encrypted; High accuracy; Guaranteed service	
Safety of Life Service	Open Service + Integrity and Authentication of signal	
Public Regulated Service	Encrypted; Integrity; Continuous availability	
Search and Rescue Service	Near real-time; Precise; Return link feasible	

Figure 3. Galileo Services

SpA. Contract signature took place at ESTEC on 26th January 2010. The scope of the contract consists of the provision of System Engineering Technical Assistance (SETA) activities in support to ESA in its role of overall System Prime Responsible. The Framework Contract covers the period 2010-2014.

- **Space Segment:** two framework contracts have been awarded to each of Astrium Satellites GmbH and OHB System AG. Their scope consists of the definition of the framework conditions for the potential supply of up to 32 satellites for a maximum duration of 7 years including the launch campaign and support to in-orbit commissioning. These contracts were signed on 30th December 2009.

Furthermore, a first Work Order has been awarded to OHB System AG (with Surrey Satellites Technology Ltd as payload prime contractor) for the procurement of 14 satellites to be delivered over the period November 2012-May 2014. Contract signature took place at ESTEC on 30th December 2009.

- **Launch Services:** a contract has been awarded to Arianespace for the provision of a baseline of 5 Soyuz Launch services planned between October 2012 and December 2013, including upgrade of Soyuz Fregat as well as launch pad and associated facilities upgrades. Contract signature took place at ESTEC on 26th January 2010.

The contracts for Ground Mission Segment, Ground Control Segment and Operation

- **Ground Mission Segment:** contract award with Thales-Alenia-Space France (TAS-F) expected in the 3rd quarter 2010.
- **Ground Control Segment:** the refined proposal of Astrium Ltd has been submitted on 29 January 2010. The conclusion is expected in the 3rd quarter 2010.
- **Operations:** contract kick-off with SpaceOpal, a legal consortium put in place by DLR and Telespazio, is expected in the 2nd quarter 2010.

SAR Validation Test Bench

Search and Rescue (SAR) Validation Test Bench activities are being initiated with a view to supporting SAR system verification and service validation using IOV (In-Orbit Validation) and later FOC architecture. Negotiations with CNES are running and the kick-off is planned in the coming weeks.

SITE DEVELOPMENT

- 3rd Galileo Control Centre: a Memorandum of Understanding between ESA and the Spanish Government is being prepared concerning its implementation.
- Regarding the hosting of the Galileo Security Monitoring Centres, proposals from UK and France (combined proposal), from the Netherlands and from Belgium are being evaluated by ESA.
- The list of sites selected for hosting remote stations (for Telemetry, Tracking & Command in S-band - Uplinks in C-band -Satellite Sensors in L-band) has been established (figure 4) and proper formal agreements are being prepared with the hosting countries.
- In order to provide the search and rescue service functions, it is required to deploy specialized stations in European territories (EU27 + Norway): a consultation of the Member States is in course of preparation in order to select the hosting sites in 2010.

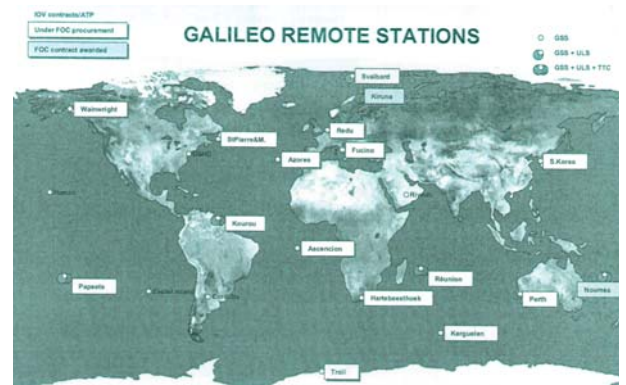


Figure 4. The map of Galileo Remote Stations

THE GALILEO PROGRAMME STATUS

The IOC schedule

Following the contracts awards for Satellites first work order and launchers baseline lunches, it has been possible to establish an Initial Operational Capability (IOC), which is firmed up with industrial commitments: see figure 5.

The FOC schedule

Concerning the achievement of the Final Operational capability (FOC), additional funds will be required: (i) for procu-

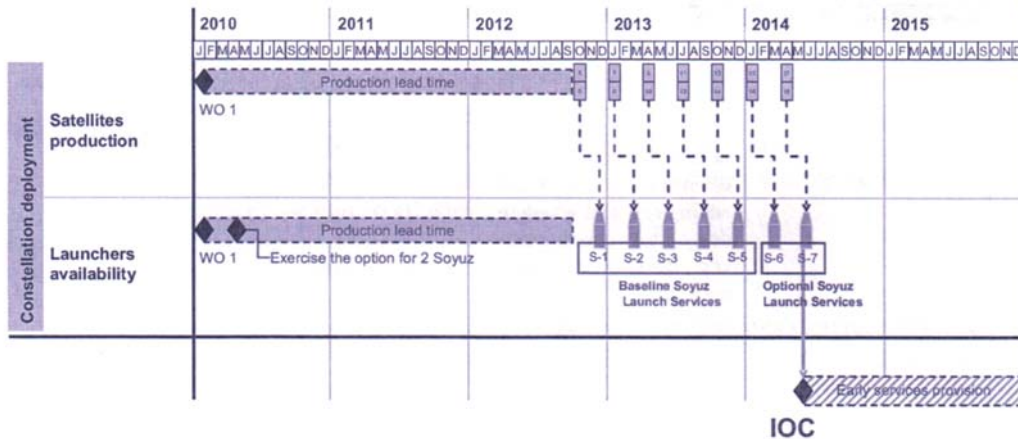


Figure 5. Galileo Initial Operational Capability (IOC) schedule

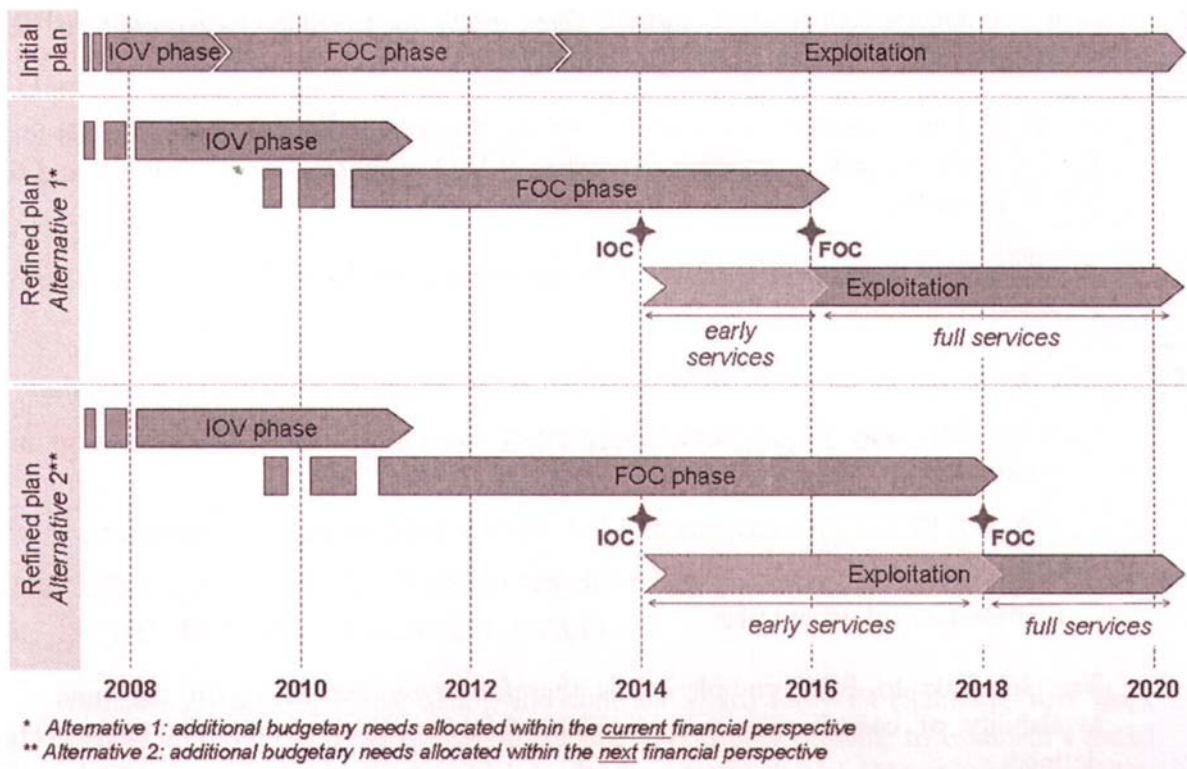


Figure 6. Galileo Final Operational Capability (FOC) schedule

ring and deploying the FOC Space Segment; (ii) for ensuring EGNOS continuity of operations.

The schedule to FOC completion is therefore now depending on the time of availability of complementary funds (figure 6):

- Alternative 1: completion of Galileo FOC assured with additional budget in the current financial time;
- Alternative 2: delayed completion of Galileo FOC with only additional budget in the next financial perspective.

TWO RECENT EVENTS

- INAUGURATION OF A GROUND STATION FOR GALILEO INSIDE THE GUIANA SPACE CENTER

This inauguration took place on 19 November 2009 in the presence of René Oosterlinck, Director of the Galileo Programme and navigation-related activities at ESA, and of Joël Barre, Director of CNES/CSG. The site, made available by CNES, will play an essential role: the Kourou station

will consist of a Telemetry, Tracking & Command (TTC) Station to monitor and control the Galileo constellation satellites, a Sensor Station (GSS) for acquisition of the satellites navigation signals, and two Uplinks Stations (ULS) for transmission of navigation and integrity messages to the satellites.

- GALILEO SCIENCE COLLOQUIUM

On 14-16 October 2009 at the University of Padua, more than 150 scientists from 21 countries attended a colloquium on the fundamental aspects and scientific applications of Galileo.

Jean-Pierre Sanfourche.

Article written on the basis of ESA and EC/EGPC documents.

EUROPEAN SPACE AGENCY : TWO RECENT ACHIEVEMENTS

FIRST IMAGES FROM ESA'S WATER MISSION 'SMOS'

23 February 2010: in less than four months since launch, on 2nd November 2009, the first calibrated images are being delivered by ESA's SMOS (Soil Moisture and Ocean Salinity) mission. These images of 'brightness temperature' translate into clear information on global variations of soil moisture and ocean salinity. By consistently mapping these two variables, SMOS will not only advance the understanding of the exchange processes between Earth's surface

and atmosphere, but will also help to improve weather and climate models. In addition, the data from SMOS will have several other applications in areas such as agriculture and water resources management.

Brightness temperature: it is a measurement of the radiation emitted from the Earth's surface. Since the launch, engineers and scientists from various institutes in Europe have been busy commissioning the SMOS satellite and instrument: ESA is now in a position to show the first results, which are very encouraging. The commissioning phase will continue until the end of April.

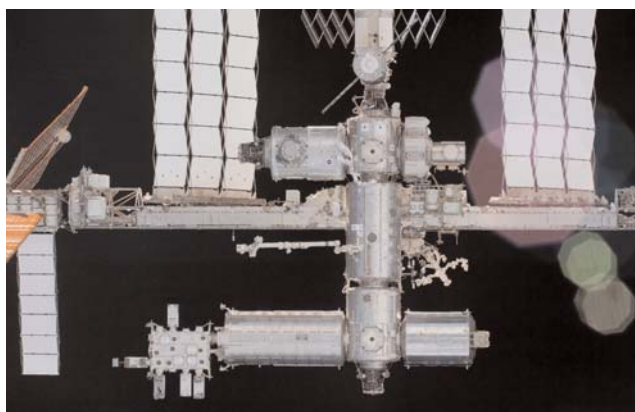


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THE LATEST ISS MISSION

22 February 2010, Space Shuttle Endeavour landed in the morning at the Kennedy Space Center after a flight delivering more living space, equipment and a bay window to the International Space Station. It was the Shuttle mission STS-130.

Two European-built elements, Node-3 and Cupola, were successfully delivered and installed : they are working well. The astronauts appreciate very much the additional space and the view from the largest window in space.



The ISS photographed by STS-130 crew. Credit NASA



Endeavour home after completing a special delivery to the ISS. Credit NASA

The Aerospace & Defence Knowledge Transfer Network

About the A&D KTN

The UK Aerospace & Defence Knowledge Transfer Network helps promote collaborative R&D across UK industry, Government and academia, improving industrial performance and implementing the UK National Aerospace Technology Strategy (NATS).

Priorities include:

- To deliver improved industrial performance through innovation and the NATS.
- To make the UK more attractive for investment in aerospace and defence
- To facilitate innovation and collaboration across the civil and defence sectors
- To improve coherency in science, technology and innovation towards Government, supported by rigorous analysis and technology roadmapping.

Funding is provided by the UK Technology Strategy Board. More information is available at: www.aeroktn.co.uk

Meet the Aerospace & Defence KTN Team



Ruth Mallors, Director
Ruth is responsible for delivering the A&D KTN against the delivery objectives of the Technology Strategy Board.



Daniel Jones, Coordinator
Daniel manages the A&D KTN's events portfolio and marketing. He also handles finance and requisition responsibilities



Pete Murray, Researcher
Pete harvests data relevant to the sector, and provides bespoke reports in areas of technical, social or environmental relevance.



Bettina Rigg, Infrastructure Manager
Bettina manages the A&D KTN website and CRM systems, as well as coordinating the KTN's Communications strategies.



Sameer Savani, Operations Manager
Sameer assists the work underpinning the National Aerospace Technology Strategy and facilitates the committees that drive this.



Melinda Witherow, Space SIG Coordinator
Melinda coordinates events and correspondence with the Space SIG, a cross KTN initiative that tackles themes within the space sector.

Book Now for The Aerospace & Defence 2010 Annual Conference!

The Aerospace & Defence KTN invites you to its 1st conference on the 27th and 28th April 2010, at the Lancaster London Hotel. The conference will focus on Technology Identification, Technology Investment Mechanisms, and Broadening Engagement.

You will hear from: Sir John O' Reilly, Vice Chancellor Cranfield University; Jordon Giddings, Deputy Chief Scientific Advisor to the DfT; all 12 of the National Technical Committees facilitated by the A&D KTN, as well as many other stakeholders from across the technology base and the investor community.

To find out more and to book your delegate places please visit our event webpage at

www.aeroktn.co.uk/ktnconference2010

Download your booking forms now!



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Korean Society for Aeronautical and Space Sciences (KSAS)

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AMONG UPCOMING EUROPEAN AEROSPACE EVENTS 2010

13-16 April • **ESA/ESTEC** – 24th European Frequency and Time Forum – **Noordwijk, NL** www.eftf2010.org/

21-22 April • **RAeS** – Aerospace 2010: Celebrating Synergy – RAeS Annual Conference

London, UK www.aerosociety.com/conference

The 2010 Conference should adopt a ‘far horizon’ position, looking forward to science and technology developments that may be expected to reach utility in the next few decades. By this means, we should aim to counter the ever-growing pressure to curtail civil aeronautics, instead showing how it may be made more acceptable. Equally, dramatic changes in military aeronautics should be foreshadowed.

27-28 April • **Aerospace&Defence 2010 Annual Conference**

London, Lancaster London Hotel www.aeroktn.co.uk/ktnconference2010

28-30 April • **ISROS** - 2nd International Symposium on Reliability of Optoelectronics for Space

Cagliari, Italy www.isros.org/en/

3-6 May • **ESA and 3AF** – 6th International Spacecraft Propulsion Conference and 3rd International Symposium on Propulsion for Space Transportation –

San Sebastian, Spain lisa.gabaldi@aaaf.asso.fr www.propulsion2010.com

17-20 May • **IEEE** – 15th International Symposium on Electromagnetic Launch Technology

Brussels, Belgium www.emlsymposium.org

18-20 May • **ESA** – 4th International Conference on Astrodynamics Tools and Techniques

Norway – www.congrex.nl/10a08/

19-21 May • **ONERA/AAE** – 5th International Congress and Exhibition, Embedded Real Time Software and Systems –

Toulouse, France www.erts2010.org

24-26 May • **ESA** – Ultra-Luminous X-ray sources and Middle Weight Black Holes – Workshop

Madrid, Spain http://xmm.esac.esa.int/external/xmm_science/workshops/2010_science/

25-26 May • **RAeS** – Human Factors Conference – **London, UK** www.aerosociety.com/conference

31 May-4 June • **ESA** – The 4S Symposium, ‘Small Satellite Systems and Services’

Funchal, Madeira, Portugal www.congrex.nl/10a03/

7-8 June • **DGLR/EUCOMAS** – International Conference – **Berlin, Germany** petra.drews@dglr.de

www.vdi-wissensforum.de/index.php?id=766

8-13 June • **ILA 2010 Berlin Air Show** –

9-10 June • **RAeS** – Flight Simulation Technology, 40th Anniversary of the First RAeS International Conference

London, UK www.aerosociety.com/conference

9-11 June • 8th international ERCOFTAC Symposium on Engineering Turbulence Modelling and Measurements –

Marseille, France www.ERCOFTAC.org/ETMM8

14-18 June • 7th International Planetary Probe Forum Workshop – planet Protection Short Course

Barcelona, Spain www.planetaryprobe.eu

16-17 June • **RAeS**- Operating Helicopters Safely in a Degraded Visual Environment: How Can helicopters Operate More Safely in Day/Night and Adverse Atmospheric Conditions? – Rotorcraft Group Conference

London, UK www.aerosociety.com/conference

AMONG UPCOMING EUROPEAN AEROSPACE EVENTS 2010

28 June-2 July • **ESA** – ESA Living Planet Symposium – **Norway** www.congrex.nl/10a04/

19-25 July • Farnborough International Air Show 2010

20 July-4 August • **Germany** – International Air Cadet exchange (IACE) petra.drews@dglr.de

27-28 July • **RAeS** – Applied Aerodynamics Conference; Capabilities and Future requirements – Bristol, UK
www.aerosociety.com/conference

31 August-2 September • **DGLR** – 59th German Aeronautical and Astronautical Congress
Hamburg, Germany petra.drews@dglr.de

7-9 September • **ERF/3AF** - 36th European Rotorcraft Forum – **Paris, France** lisa.gabaldi@aaaf.asso.fr
www.erf2010.org

16 September • – **RAeS** - Reducing Maintenance Costs through Innovation – Airworthiness & Maintenance Conference, Cranfield, UK. www.aerosociety.com/conference

19-24 September • **ICAS**, hosted by 3AF – 27th Congress of the International Council of the Aeronautical Sciences (ICAS) **Nice, France** lisa.gabaldi@aaaf.asso.fr www.icas.org

21-23 September • **ESA** – Workshop on Tracking, Telemetry and Command Systems for Space Applications – **Noordwijk, NL** www.congrex.nl/10a07/

22-23 September • **RAeS** – The Global Market Place: Challenges for Flight Crew Training – Annual ‘FCT’ Conference.
www.aerosociety.com/conference

27-29 September • **RAeS** – 4th European Flight Test Safety Workshop – Flight Test Conference.
www.aerosociety.com/conference

4-8 October • **ICSO** – **ICSO 2010** – International Conference on Space Optics – **Rhodes Island, Greece**
www.congrex.nl/10A02/

15 October • **RAeS** – Women in Aviation & Aerospace – Conference. www.aerosociety.com/conference

18-19 October • **FTF** – 7th Swedish Aeronautical Congress ‘Flygteknik 2010’ – Aerospace Technology 2010 – Aerospace Industry 2020-2040: What we do today? Stockholm City Conference Centre – Norra Latin, Stockholm, Sweden. www.flygtekniskaforeningen.org

20 October • **RAeS** – Joint Greener Aviation by Design & Propulsion Conference
London, UK www.aerosociety.com/conference

26-28 October • **RAeS** – 2010 Aircraft Structural Design Conference. www.aerosociety.com/conference

10-11 November • **RAeS** – Unmanned Air Systems Conference – **London, UK** www.aerosociety.com/conference

17-18 November • **RAeS** – General Aviation Group Conference. www.aerosociety.com/conference

23 November • **RAeS** – Autumn Flight Simulation Group Conference. www.aerosociety.com/conference

29 November-2 December • **ASD/CEAS Conference** – ‘AEROWEEK’ – Brussels, Belgium. See details page 20.
www.asd-europe.org

ABOUT 'AEROWEEK': 29 NOVEMBER - 2 DECEMBER 2010, BRUSSELS



The European aerospace industry has today become a world leader. The sector is an export-oriented, innovative industry which contributes very positively to the trade balance. In 2007, around three-quarters of Europe's production of civil aviation output was exported outside of the EU. The aerospace industry also invests heavily in R&D and provides highly-skilled, well-paying jobs. However, it suffers from a steadily worsening image among Brussels policy-makers.

The ASD¹ community intends therefore to organise an **"AeroWeek" (29th November – 2nd December 2010)** to start reshaping this deteriorated image and take benefit of a new European Parliament (EP) and a newly-nominated European Commission (EC) to engage into a closer dialogue with EU decision-makers. It also aims at addressing the European citizens concern about green air transport sustainable development and should contribute to the setting up of a Group of very high level personalities coming from the EP, the EC and aerospace industry to shape a new vision and the future agenda of aeronautics Research and Technology developments.

The AeroWeek will consist of an "exhibition", a high-level round table followed by a VIP dinner in the EP as well as a one and a half day political conference outside of the European Parliament jointly organised by ASD and the CEAS.

Through a large scope of visuals, video shows and models, the **"exhibition"** aims at highlighting on a most exciting way 3 key messages: aerospace industry is a rare high-tech success and a continuous fountain of innovation, aerospace industry heavily contributes to economic development and provides highly-skilled jobs and aerospace industry is an eco-efficient industry

which is central to make aviation growth sustainable.

The aerospace industry is not perceived as an active participant in EU policy debates, mainly interfacing with aerospace-friendly policy makers. The ASD community intends to be more pro-active and develop a stronger relationship with the complete range of stakeholders involved in the policymaking. In the framework of the AeroWeek, the idea is to organise an **open and contradictory high-level discussion** (including some NGO representatives) whose topic will be linked to the growing environmental concerns and climate change debate. On top of that, a **joint ASD/CEAS political conference** dealing with aeronautics and space will be organised on **30th November and 1st December**. The conference will be structured with plenary sessions and workshops and the idea is that few high profile policy-makers (MEPs, Commissioners, EC Director-Generals) and industry CEOs would participate as key note speakers. Skills may be one of the key dimensions of the conference, with the contribution of students' networks and high school pupils. The target audience is the aeronautics industry at large. The conference will give the opportunity to involve some aviation stakeholders (airlines, air navigation service providers, research establishments) and institutional partners (SESAR Joint Undertaking, Clean Sky Joint Undertaking, EASA, EUROCONTROL). The conference programme is being worked out and you will receive more information in due time.

1. ASD (AeroSpace & Defence Industries Association of Europe) represents the aeronautics, space, and defence industries in Europe. ASD has 28 member associations in 20 countries, representing over 2000 companies with a further 80 000 suppliers, many of which are SMEs. Total annual industry turnover is over €137 billion

GLOBAL LUNAR CONFERENCE 2010 IN BEIJING



2010 will certainly be a pivotal year for the future of space exploration and a stepping stone for the international cooperation towards the exploration of the Moon and beyond. In that perspective, and in relation with the latest developments from the space faring and emerging nations, Chinese Society of Astronautics (CSA) together with International Astronautical Federation (IAF) is very actively preparing the Global Lunar Conference that will be held in Beijing, China, from 31 May to 3 June 2010.

In order to make it a major event, the IAF and its partners are involving international experts as well as institutional and private key players to discuss the latest updates on lunar exploration.

The Conference will also welcome the 11th ILEWG Conference on Exploration and Utilisation of the Moon (ICEUM11).

You will find practical and technical information as well as the uploading procedure on the website: www.gluc2010.org

We are also pleased to inform you that the last day of the conference (3 June 2010) will be dedicated to technical visits in Beijing that will be included in the registration fee. The programme will be announced in the next weeks and should include the visit of the China Academy of Launch Vehicle Technology (CALT), the China Academy of Space Technology (CAST) and the China Astronaut Research and Training Centre.

The CSA, the IAF and the Conference Programme Committee Co-Chairmen, Dr Li Ming, Prof. Arvidson and Prof. Dr Foing hope that you will consider participating in this major event and look forward to welcoming you in Beijing next spring!