The Quarterly Bulletin of the

CEAS

COUNCIL OF EUROPEAN AEROSPACE SOCIETIES

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

Issue 3 - 2015
July

THE 5th CEAS AIR & SPACE CONFERENCE:

- WILL BE HELD ON 7-11 SEPTEMBER 2015 IN THE PREMISES OF DELFT UNIVERSITY OF TECHNOLOGY
- IS ORGANISED WITH A VIEW TO MARKING A NEW STEP FORWARD IN THE RISE OF THE COUNCIL OF EUROPEAN AEROSPACE SOCIETIES

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 twelve Full Member Societies: 3AF (France), AIAE (Spain), AIDAA (Italy), DGLR (Germany), FTF (Sweden), HAES (Greece), NVvL (Netherlands), PSAA (Poland), AAAR (Romania), RAeS (United Kingdom), SVFW (Switzerland), TsAGI (Russia); one Associate Member: CzAeS (Czech republic); and four Corporate Members: ESA, EUROAVIA, LAETA (Portugal) and VKI (Belgium).
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 Aeronautical Journal
- CEAS Space Journal
- CEAS Quarterly Bulletin
- Aerospace Events Calendar – www.aerospace-events.eu

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

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- 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

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- 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

ABOUT CEAS2015

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

The 5th CEAS Air & Space Conference, hosted by the Netherlands Association of Aeronautics and Astronautics (NVvL), will take place in the premises of the prestigious Delft University of Technology from 7 to 11 September.

The final stage of its preparation is being run in a favourable context, after the 51st International Paris Air Show (15 to 21 June) which has been a remarkable success with record attendance by the public, a record number of exhibitors, many impressive in-flight demonstrations and in total more than 130 billion dollars' worth of orders concluded.

Besides on 19 June, Airbus Defence & Space announced it was about to recommence deliveries of A400M military aircraft, producing a real relief in the profession after the worrying questions to which the tragic accident of 9 May in Seville had given rise to.

CEAS2015: an expected successful event, why?

A broad and rich programme: the programme includes the intervening of sixteen high ranking keynote speakers at the beginning of the plenary sessions, the presentation of technical papers by aerospace scientists and engineers coming from twenty-five nations during the different technical sessions as well as an important conference panel on the theme of 'Future Air Combat System for Europe'.

In addition, the 12th European Workshop on Aircraft Design Education (EWADE) which aims to enhance the collaboration between European lecturers on aircraft design will be conducted in parallel, giving the event a strong student oriented dimension.

Furthermore the EU-funded project Active Flow, Loads & Noise control on next generation wing *AFLoNext 2nd generation active wing*, the increasing young women's participation in Science Studies and in the Aeronautic Industry IN2SAI project and the EU-project PulCheR (Pulsed Chemical Rocket with Green High Performance Propellants) will organise workshops as a partner in the CEAS 2015 Conference.

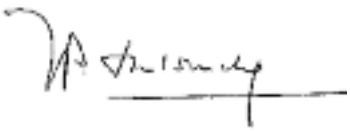
Delft University of Technology: the choice of this prestigious university, with its famous Faculty of Aerospace Engineering, will naturally contribute to the success of CEAS 2015.

The city of Delft: from tourism point of view, Delft, synonymous with ceramics ('Delft Blue' has been produced in this town for many centuries), with its lovely canals, ancient merchant houses, old churches and splendid city hall has also a lot to offer.

CEAS2015 and the E-CAero 2 project

The Delft Conference comes in the nick of time to impulse the E-CAero 2 project, conducted by the European Commission and whose objective is to harmonise and coordinate the activities of various European Aerospace Associations - EUCASS, ECCOMAS, CIMNE, EUROMECH, EUROTURBO and ERCOFTAC - which so far act independently from each other.

An indisputable success of the Delft Conference will be a decisive signal given to the convergence process which has recently started and which should be achieved at mid-term time horizon by an Overall Memorandum of Understanding governing a cluster of the European aerospace community associations.



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CEAS PRESIDENT'S MESSAGE

Fred Abbink, CEAS President

About the A400M Flight Test accident

On May 9 an A400M aircraft crashed during flight tests near Seville in Spain, causing the death of 4 Spanish crew members. The flight data and voice recorders have been recovered and the first analysis results are provided. This is a software problem in the Engine Control Unit (ECU) that was the cause of the accident. As early as June 19, Airbus Defence & Space announced the authorization to resume the delivery process which had been interrupted since the accident. This decision intervened shortly after the Spain's Ministry of Defence announced the lifting of the last A400M flight restrictions.

Considering the paramount importance and urgency of this military transport aircraft's operational availability in the European Air Forces, this is with highest relief that those encouraging news are being known.

Already 174 A400M are ordered by 8 different customers and 12 aircraft are already operational in certain European Air Forces.

Celebration of 10 years A380

On April 27 it was 10 years ago that this large airliner made its first flight. In April 2015 Airbus had received 317 firm orders from 18 different customers from and has delivered 159 A380's. The 13 operators of the A380 transport 3 million passengers per month.

Celebration of the 65th successful Ariane 5 launch at a row

On May 28 an Ariane 5 launched the 100th telecommunication satellite (Direct TV 15) in a geostationary orbit. This was the 65th successful Ariane 5 launch in a row. With Ariane 5 Europe has a very reliable access to space. However foreign developments require new developments to remain competitive, which justifies Ariane 6 development programme.

New Horizons Spacecraft approaching Pluto

The *New Horizons* mission will help us understand worlds at the edge of our Solar System by making the first reconnaissance of the planet Pluto and by venturing deeper into the distant, mysterious Kuiper Belt. Using Hubble Space Telescope images, four previously unknown moons of Pluto were discovered: Nix, Hydra, Styx and Kerberos. New Horizons has made photos of the smallest of these moons Kerberos and Styx. Pluto's closest approach of New Horizons is scheduled for July 14, 2015.

Fully solar-powered flight around the world

Pilot Andre Borschberg landed the plane on the Hawaiian island of Oahu on Friday 3 July morning, **5 days** after he took off from Japan, ending the longest and most dangerous leg in his team's attempt to fly around the world without a drop of fuel.

"The leg – the 8th of a planned 13 – sets a record for the world's longest non-stop solo flight in terms of time. It also was the longest flight in time and distance – **8,200 km** – for a plane run only on solar power", organisers said.

AIAA Fellows Dinner and Awards Gala

On May 5 the AIAA held its Fellows dinner in Washington DC. 20 new Fellows and 4 new Honorary Fellows got their Scroll and pin. I had the honour of becoming one of the new AIAA Honorary Fellows. And on May 6 also in Washington DC the AIAA held its 2015 AIAA Aerospace Spotlight Awards Gala. The new Fellows and Honorary Fellows were presented. Furthermore 9 Awards were presented. ESA's Director General Jean-Jacques Dordain was presented with the AIAA Goddard Astronautical Award.

CEAS has with its 12 Member Societies about the same number of individuals as members as the AIAA. The AIAA is a great example for Europe on what is possible when we really unite.

The latest CEAS Board of Trustees meeting held in Warsaw

On June 5 the CEAS Board of Trustees held its 31st meeting. On the agenda were among other items the CEAS cooperation in the EU E-Caero project, the CEAS 2015 Air and Space Conference, the further definition of the growth and possible contributions of the CEAS Corporate Members as well as the selection of the 2016 CEAS Gold Awardee. Pia Becker succeeded Jacqueline Chindea as the President (and CEAS Board of Trustees member) of Euroavia. The Polish Society of Aeronautics and Astronautics and Euroavia gave presentations on the activities of their organisations.

The upcoming CEAS 2015 Air and Space Conference

The preparation of the CEAS 2015 Air and Space Conference is making good progress.

Over 200 papers from 25 different nations have been selected. 16 high ranking keynote speakers will enlighten the audience with their views on the European Challenges to industry, space, air transport, research and research infrastructure, aerospace defence, as well as education.

On Monday 7 all the CEAS Presidents are invited to the opening of the conference and to a CEAS Presidents lunch. This will be a good opportunity to the presidents to meet and to discuss the CEAS Strategy for the next 5-10 years.
On Wednesday night, during the CEAS 2015 Conference Dinner, the CEAS 2015 Gold Award will be presented to Joachim Szodruch for his life time contributions to European Aerospace.

Fred Abbink

THE 31ST BOARD OF TRUSTEES MEETING

The 31st Board of trustees meeting of the CEAS was held on the 5th of June at the Warsaw University, Faculty of Power & Aeronautical Engineering

CEAS2015 CONFERENCE

Christophe Hermans presented the latest status of preparation of Delft Conference: see page

A PERMANENT PROGRAMME COMMITTEE FOR THE NEXT BIENNIAL CEAS AIR & SPACE CONFERENCES

Pdt Fred Abbink proposed for the future CEAS Conferences: to set up a **permanent** Programme Committee in the same manner as ICAS, on the one hand, and on the other hand, a **local** Organisation Committee set up and managed by the host society.

This proposal was accepted and the decision was taken undertake the creation of this Permanent Programme Committee in view of CEAS2017.

MEMBERSHIP

The CEAS-EREA Memorandum of Understanding will be signed on the occasion of the Delft Conference in September.
The Moscow Aviation Institute (MAI) wants to be associated to the CEAS. Necessary action will be conducted to allow it to become Corporate Member.
Contacts are being taken with EASA and EUROCONTROL.

EUROAVIA

Pia Becker (Germany) replaces Jacqueline Chindea at the presidency of EUROAVIA.

PUBLICATIONS STATUS

CEAS Aeronautical Journal: appearance of Vol. 6 Issue 1 of March 2015 – Issue 2 in process of completion
CEAS Space Journal: appearance of Vol. 7 Issue 1 of March 2015 – Issue 2 in process of completion (a special issue dedicated to GNC)
Issues 1-2015, 2-2015 and 3-2015 (the present one) have appeared respectively in March, May and July. The Issue 4-2015 (October) will be especially dedicated to the Delft Conference.

AWARDS

Gordon Mc Connell has been selected to receive the CEAS Gold Award 2016.

Statement of Justification

Dr McConnell, who has recently retired from the position of Senior Vice-President, Chief Engineer A350 XWB for Airbus, deserves the highest possible recognition by CEAS for an outstanding contribution to European aerospace and in particular for his exceptional technical, engineering development and programme leadership and his personal overall contribution to the success of Airbus – a truly European collaboration.
Described in 2014 in 'Debrett's 500' (which lists the UK's 500 most influential people), as having '*made countless noteworthy and influential contributions to the world of aeronautical engineering*', Dr McConnell is exceptionally widely known and respected, particularly across the European aerospace engineering and technical community, for his leadership, inspiration and achievements as Chief Engineer A350XWB, in relation to the engineering development of the A350XWB programme and the A340-500 and A340-600 aircraft and as Technical Director BAe Regional Aircraft.
His contribution has been key among those critical to the success of the Airbus enterprise and thus fully merits the award of the CEAS Gold Medal.

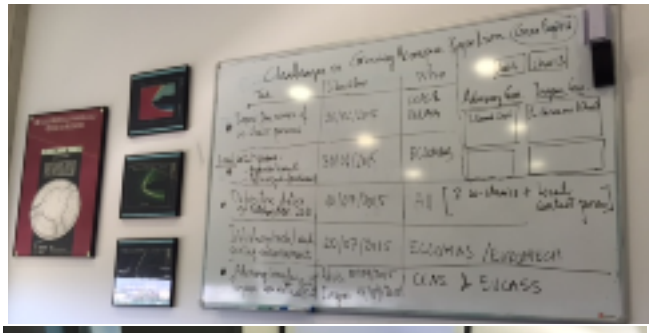
Citation

Gordon McConnell, through his exceptional leadership in technical and engineering development and personal contribution to the success of Airbus, has made an outstanding contribution to European aerospace.

E-CAero 2: A NEW STEP FORWARD

In the previous issue of the CEAS Quarterly Bulletin we had reported on the kick-off of the EU project "European Collaboration Dissemination of Aeronautical research and applications 2" (E-CAero 2). The ultimate ambition of this project coordinated by CIMNE (International Centre for Numerical Methods in Engineering) is to harmonise and rationalise the activities of seven European Scientific Aerospace Associations:

- **CEAS:** Council of European Aerospace Societies
- **EUCASS:** European Conference of Aeronautics and Space Science
- **ECCOMAS:** European Community of Computed Methods in Applied Sciences



Participated in this working session: Mercedes Oliver-Herrero, Pierre Bescond and Christophe Hermans (CEAS), Pedro Diez (CIMNE), Max Calabro (EUCASS), Jacques Périaux (ECCOMAS), Jordi Pons (CIMNE), Stella Sauvan (Euroturbo).

- **EUROMECH:** European Mechanical Society
- **EUROTURBO:** European Turbo Machinery Conference
- **ERCOFTAC:** European Research Community on Flow Turbulence and Combustion

A Project Team has been set up and the different Work Packages have been distributed according to a Work Breakdown Structure (WBS) exactly reflecting the objectives to be reached at mid-term time horizon: enhanced communication, event coordination, definition of a joint publication policy in Europe, establishment of a unified logistics network and of a specific secretariat for events, setting of a good harmonised information stream to scientists and technologists, and to highlight the existence of this confederation, the creation of a visible European Symbol.

An important coordination meeting took place in Barcelona (Spain) on 17 and 18 June

The objective of the meeting was to plan the Joint 2016 CEAS-EUCASS conferences called for in the ECAero 2 contract. It can be said that generally speaking, a real will to advance clearly appears.

The proposed theme of the conference was agreed upon and will be proposed to the other partners : Challenges in Greening Aerospace Propulsion The organisation will be conducted by CIMNE.

This Joint CEAS-EUCASS Conference, which will be partly financed by the E-CAero 2 Project is important because it will provide a unique occasion to seal the rapprochement between these two associations which since 2007 were working separately. It will be officially announced during the CEAS 2015 Conference of Delft in September.

Towards a convergence process

Beyond this 2016 conference it can be reasonably envisaged that the convergence process which is starting now will be achieved through an Overall Memorandum of Understanding which will govern the relationships between the six associations, in a certain manner the Constitution of a cluster of the European aerospace community associations, which proposed name is AEROSPACE EUROPE.

Next E-Caero 2 meeting

The next E-CAero 2 project meeting with all 6 partners will take place just after the summer of 2015 to review the progress on the 7 work packages. CEAS, in charge of Work Package N° 2 which calls for consolidating identity and structure of the community, including Mission, Objectives and Image, came up with the proposed name Aerospace Europe and the corresponding ae logo.

NEXT 2015 CEAS MEETINGS

- 8 September in Delft, 32nd BoT meeting
- 15 December in Brussels, General Assembly and 33rd BoT meeting.

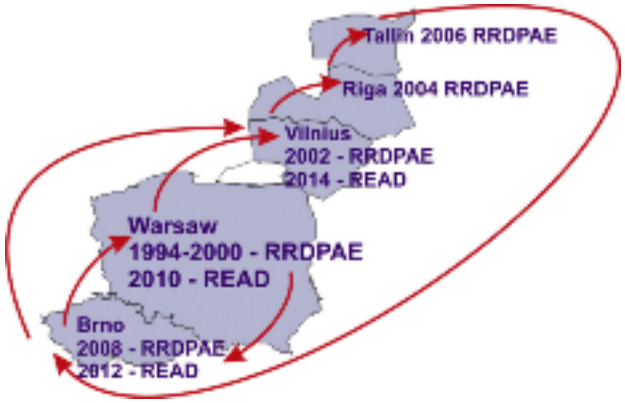
PSAA

Presentation of PSAA by Prof. Z.Goraj during the 31th Trustees Board Meeting of the CEAS, Warsaw, 5 June 2015

At the end of the meeting, Prof. Zdobyslaw Goraj presented the Polish Society of Aeronautics and Astronautics (PSAA).

A brief history

Polish Society of Aeronautics and Astronautics (PSAA) was officially established on 19.02.2010 and registered on 1.06.2010. Before 2010 the activity related to promotion of aeronautical engineering was organised within the Polish Federation of Engineering Associations (Polish acronym – NOT). Polish Federation of Engineering Associations, a public organization with almost 180 years history is the first Polish Engineering Association, initially named Polish Polytechnical Society, was founded in 1835 in Paris. It affi-



This scheme presents the history of a regional conference focused on aircraft design and related aerodynamic research, created in 1994 as RRDPDAE and renamed in 2010 into READ. The next conference will be held in Warsaw, 2016.

liates 37 branch Engineering Associations representing all fields of technology (ca. 230,000 individual members altogether) and has at its disposal 51 Houses of Technology all over the country, providing their members with modern technology equipment ready for rendering different services. It is a member of 46 international non-governmental organisations, including: FEANI - European Federation of National Engineering Associations; WFEO - World Federation of Engineering Organizations and many others. However, Polish Federation of Engineering Associations (NOT) is not seriously focused on promotion of Aeronautics, modern research, technologies and collaboration with international and foreign associations in the area of aerospace. It was one of the main reasons that Polish aeronautical community decided to create a new association widely oriented on promotion of aeronautical and space research activity. The association is called the 'Polish Society of Aeronautics and Astronautics' and operates under the Act of 7 April 1989 Polish Law on Associations. The Association aims to promote development of aeronautics and astronautics and popularise achievements and research in all areas of aerospace, especially obtained by Polish scientists and scientific institutions.

PSAA's OBJECTIVES

Association pursues its objectives by: (1) organising or co-organising all kinds of scientific meetings at national and international levels; (2) initiating discussion on topics related to aerospace; (3) presenting opinions on issues relevant to aerospace, including in particular the problems of the scientific community; (4) inspiring and organising scientific competitions; (5) cooperating with national and international associations, as well as inspiring scientific cooperation between Polish and foreign research centres and (6) maintaining its own website. Strategy of PSAA consists in close cooperation with CEAS, ICAS, EASN and PEGASUS. Important role in our activity takes place organising the international conference – known as Research and Education for Aircraft Design (READ) – travelling through the region including Poland, Czech Republic, Lithuania, Latvia and Estonia. The number of our members is not very impressive – we have 110 regular members, 30 students and 4 corporate members. At the end we must to mention about our future goals and ambition – we will try to attract to PSAA more industrial engineers, both from big industry and SMEs. However, it will not be easy, mainly due to the fact that most of biggest aeronautical companies in Poland belong to foreign owners. It is difficult to attract their employees to PSAA. Aerospace oriented SMEs are not numerous, not very strong and also not very interested in potential benefits PSAA can offer to them.

DGLR – THE GERMAN SOCIETY FOR AERONAUTICS AND ASTRONAUTICS

By Alisa Wilken, Head of Communication, DGLR

The German Society for Aeronautics and Astronautics – Lilienthal-Oberth e.V. (*Deutsche Gesellschaft für Luft- und Raumfahrt – Lilienthal-Oberth e.V; DGLR*) – is the second oldest technical and scientific society in the field of aerospace in the world. It has about 3000 members – both private and corporate – in Germany. DGLR is a member of the International Astronautical Federation (IAF) and the International Council of the Aeronautical Sciences (ICAS). It is one of the four founding members of the CEAS.

DGLR supports progress in all fields of aeronautics and astronautics and welcomes anyone with a professional or private interest in one of these fields. It is the largest and, at the same time, the only association in Germany represented in all fields of technology and working areas of the aerospace sector – from industry to the ministries, and from teaching to research. DGLR acts as a link and communicator between the individual disciplines and promotes national and international exchange.

Its main strategic goals are providing information to its members about important developments in aerospace, building up a network of experts and specialists for any particular aerospace research to enhance the exchange of information for further developments, and supporting young academics.

Information, network, support

To achieve these goals, DGLR is structured in various categories. One is the division into technical committees (*Fachbereiche*). The three main sectors are aeronautics, astronautics and cross-sectional matters. In 15 disciplines and approximately 50 specialist sub-committees, the DGLR members can, depending on personal interest and

DLRK 2012 in Berlin: a view of the conference room during a speech;
From left to right: Prof. Dr Robert Luckner – Prof. Rolf Henke (president) – Heiko Lütjens (2nd vice president) – Philip Nickenig (secretary general) – Prof. Dr Mirko Hornung – Dr Cornelia Hillenherms – Prof. Dr Manfred Hajek – Dr Bernhard Eisfeld – Dr Carten Wiedemann – Dr Christian Glitzner – Prof. DR Uwe Apel – Prof. Dr Dieter Schmitt – Claudia Kesseler (vice president) – Dr Jürgens Klenner – Prof. Dr Wolfgang Nitsche – Prof. Dr Joachim Szodruch.

across the full range of aerospace applications, consolidate their work and knowledge in a selected specialist field and within a team of like-minded people – from system analysis to airport engineering, from outer space simulation to monitoring of the environment. This allows members to build a network concerning their own special interests.
Furthermore, there is also the possibility to become acquainted with people who are interested in aerospace regionally. DGLR consists of 14 regional groups (*Bezirksgruppen*) that organise events and meetings for all the members within their region. The groups are aeronautics and astronautics meeting points for members and the interested public. Excursions, seminars and lectures offer the opportunity for members and guests to connect with experts and known specialists in aerospace research.

The current members of the DGLR senate including the members of our executive committee.

Students are especially supported by groups for young academics (Nachwuchsgruppen). These groups are usually formed at universities to start their own research projects, such as building small gas turbines or developing an autonomous unmanned aerial vehicle. For all those interested in a career in aerospace, looking for universities or a place to work, DGLR offers Skyfuture, a special online platform.
In addition to these categories, DGLR provides its members with information about the aerospace sector in print and online. Luft- und Raumfahrt – a magazine featuring new developments in aerospace as well as the society's news and events – is published six times per year. DGLR also has a strong online presence – a website that features news from members and gives an overview on current developments, a weekly newsletter, as well as social media channels representing the society itself and the youth portal Skyfuture.

Events and awards

Once a year, DGLR provides members with a special occasion for catching up on recent developments in aerospace and networking. The German Aerospace Congress (*DLRK – Deutscher Luft- und Raumfahrtkongress*) in September is one of the largest networking events for the aerospace sector in Germany and offers current and future experts in the field the opportunity to exchange their knowledge.
DGLR is also organising this year's European Rotorcraft Forum in Munich, one of the most important events in the rotorcraft community, the Space Conference (*Raumfahrtkonferenz*) in Germany, short courses for further education and numerous smaller events throughout the year.
To honour the work of scientists conducting research into aeronautics and astronautics in Germany, DGLR offers several internationally recognised awards or an honorary membership. Among the scientific awards are the Ludwig-Prandtl-Ring – the highest award DGLR has to offer – as well as some youth awards.
Future in aerospace
Aerospace is becoming increasingly important. More people are needed to advance this field of research throughout

This picture shows the start of DGLR in 1911. It was the first meeting in Göttingen where it was decided to build a society with a place to meet and connect.

the world. DGLR provides the necessary support, while being an independent driving force for the strategic and political decisions made with regard to innovations and progress in the aerospace industry.
In future, DGLR wants to continue supporting, connecting experts and building up a growing network to enhance all research – not only in Germany, but at the European level as well.

Annex: a few words of History
DGLR was founded on 3 April 1912 in Berlin, under the name of Wissenschaftliche Gesellschaft für Flugtechnik (WGF), as a forum for all those involved in aeronautics wanting to become a member. The world-renowned aerodynamics specialist, Ludwig Prandtl, was one of the founding members. He implemented the first committees, which still have a place within the society's structure today.
In 1914, the name of the society changed to Wissenschaftliche Gesellschaft für Luftfahrt (WGL), and in 1935 to Lilienthalgesellschaft für Luftfahrtforschung. After the Second World War, any work in the field of aeronautics was forbidden by the allies. In 1952, the society was founded once again, and from 1962 onwards it also encompassed the new challenges faced by astronautics.
The astronautical movement in Germany began to evolve in 1923. The Verein für Raumschifffahrt e.V. was establishedin 1932; it became the Deutsche Gesellschaft für Raketentechnik und Raumfahrt (DGRR) in 1948.
In 1967, it was decided that all aeronautical and astronautical matters should be represented in one society. Thus, the German Society for Aeronautics and Astronautics (DGLR) was born. In 1993, it merged with three other societies for aeronautics and astronautics and became the *Deutsche Gesellschaft für Luft- und Raumfahrt – Lilienthal-Oberth e.V.*

THE EuroGNC2015 CONFERENCE

The two first CEAS Specialist Conferences on Guidance, Navigation and Control were held in Munich (Germany) in 2011 and in Delft (NL) in 2013.
ONERA, (Office National dEtudes et de Recherches Aérospatiales – the French Aerospace Lab), ISAE (Institut Supérieur de l'Aéronautique et de l'Espace – Higher Institute of Aeronautics and Astronautics, France) and ENAC (Ecole Nationale de l'Aviation Civile – National Civil Aviation School, France) accepted the challenge of jointly organising the third edition:

EuroGNC2015

This conference was supported by the AIAA (American Institute of Aeronautics and Astronautics). Chaired by Daniel Alazard, Professor at ISAE-SUPAERO, and Felix Mora Camino, Professor at ENAC, it took place at ISAE-SUPAERO, Toulouse (France) on 13-15 April 2015.
The Organising Committee, led by Christelle Cumer, research engineer at ONERA (Office National d'Études et de Recherches) and Nadine Barriety, in charge of communication at ONERA, and the International Programme Committee composed of about 50 eminent scientists and engineers (1) strongly contributed to the success of the event:

- **140 participants, including 35 students**
- **100 papers presented**
- **3 keynotes:**
  - **Maturation of GNC Algorithms with SPHERES aboard the International Space Station (Dr Alvar Saenz Otero, MIT/SSL)**
  - **Design and Validation of the A350 Flexible Structure Control Law (Mr Stephane Delannoy, AIRBUS)**
  - **Rosetta Mission: Flight Dynamics Aspects of the 'Philae' Delivery (Mr eric Jurado, CNES)**

THE TOPICS WHICH WERE DEALT WITH

Control Theory, Analysis and Design – Novel Navigation, Estimation and Tracking Methods – Aircraft guidance, Navigation and Control – Spacecraft Guidance, Navigation and Control – Missile Guidance, Navigation and Control – Mini/Micro Air Vehicle Guidance, Navigation and Control – Flight Testing and Experimental Results – Human and Autonomous/Unmanned System – Intelligent Control in Aerospace Applications – Aerospace Robotics and Unmanned/Autonomous Systems – Sensor Systems for Guidance, Navigation and Control – Guidance, Navigation and Control Concepts in Air Traffic Control Systems.

AMONG THE SUBJECTS WHICH WERE DISCUSSED

ADAPTIVE CONTROL AND ROBUST CONTROL

It is well known that the challenges are often more demanding in aerospace than in other fields. As a matter of fact, the control of aerospace vehicles remains a difficult task because of ever larger flight domains, more complex and coupled dynamics, and wider variety of flying vehicles.
Among the most promising control techniques, **adaptive control** has gained significant interest due to recent developments ensuring fast adaptation to environmental changes while preserving robust stability.
A renewed interest in **robust control** is also observed. Recent advances in non-smooth optimisation and developments of efficient software have contributed to bridge the gap between theory and practice, allowing these techniques to be used in many industrial applications.

VISUAL SERVOING

Visual servoing, also known as **vision-based control**, has emerged more recently with the development of small, accurate and affordable cameras. This technique uses feedback information extracted from vision sensors to control the motion of a vehicle or a robot. The ever-growing computer power makes it now possible to process the rich information provided by these sensors, which is an essential step towards the control and the guidance of vehicles with fast dynamics. Many theoretical and practical results have already been presented, but solid mathematical analyses and proofs, real-time issues and efficient hardware implementations of image processing algorithms still deserve to be further investigated.

TO PROVE THAT THE FLIGHT CONTROL SYSTEM IS SAFE AND RELIABLE

Before flight testing, each aerospace vehicle has to go through a rigorous certification and qualification process to prove to the authorities that the flight control system is safe and reliable. Currently significant time and money is spent by the aeronautical industry on this task. *Monte-Carlo simulations* are used in most cases, but it is often difficult to isolate worst cases scenarios or to confidently assert that no such scenario exists. Fortunately, many stability, performance, loads and comfort criteria can be reformulated as robustness analysis problems. Promising techniques such as **multi-objective optimisation** under uncertainty using for example evolutionary algorithms can thus be applied to determine parameters/inputs/flight conditions for which the criteria are violated or poorly satisfied. A considerable effort is currently underway to enhance

these techniques, motivated by the increase in computer power and the advent of multi-core processors, which allow to perform parallel computing at a reasonable cost.

THE CLASS OF UAVs INTRODUCES NEW CHALLENGES IN TERMS OF GNC

The above topics are all the more important that they are significant for both traditional aerospace vehicles as well as to emerging ones such as small Unmanned Aerial Vehicles (UAVs). Originating as a military tool, UAVs have evolved from expensive and complicated military tools into expensive, relatively easy to use machines that are accessible to most people. Revenues generated by the activity have seen a tremendous growth as underlined by the initial public offering (IPO) of the DJI company.

Relaxed validation and certification regulations, why?
The UAVs, compared to classical flying vehicles, perform a wider variety of missions, many of which including tightly space-constrained evolutions requiring high dynamics trajectories. Another particularity of those vehicles is that they are often operated closer to one another as well as to obstacles, requiring accurate and reactive navigation. As many of the applications intended for UAVs are motivated by their low acquisition cost, the expensive validation and certification techniques traditionally used in aerospace cannot be directly transposed. Their small mass and velocity imply limited consequences in case of crash and could justify relaxed regulations.

The possible use of the latest generation of microprocessors
An additional advantage of this relaxed certification is the possibility of using the latest generation of microprocessors. As a matter of fact, the vast processing power availability allows to experiment with a new class of algorithms that were previously inapplicable on other vehicles. The cost constraint limits the quality if sensors used on those vehicles and motivates new challenges for navigation algorithms, as does the use of innovative sensors like vision.
Last but not least about unmanned systems, integration with Air traffic management (ATM) has become a big issue that needs to be urgently tackled.

THE CUBESATs

More recently the same trend can be seen with CubeSats, these small low cost satellites which promise to offer a whole new range of applications once the technical and regulatory issues differentiating them from their full sized counterparts are be solved.

The 41 best papers, selected by the members of the Programme Committee are published in the book edited by SPRINGER, entitled:
"ADVANCES IN AEROSPACE GUIDANCE, NAVIGATION ANF CONTROL
Selected Papers of the Third CEAS Specialist Conference on Guidance, Navigation and Control held in Toulouse, April 2015 "

(1) The members of the international Committee came from: Brazil (ITA, IAE, UNIFEI) – Canada (EPM, Bombardier) – China (Civil Aviation University) – ESA - France (Airbus, Astrium, CNES, ENAC, IMS, ISAE, LAAS/CNRS, ONERA) – Germany (DLR, TU Berlin, TU Munich, University of Stuttgart, TU Hamburg) – India (Indian Institute of Science) – Israel (Ben Gurion university) – Italy (Bologna University, Politecnico di Milano, University of Pisa) – Poland (University of Rzeszow, University Warsaw) – Portugal (IST) – Russia (Moscow Aviation Institute, IIAAT) – South Korea (Seoul National University) – Sweden (Defence Research Agency) - The Netherlands (TU Delft) – UK (RAeS, University of Bristol, University of Leicester) – USA (University of Buffalo, Georgia Institute of Technology).

This summary report has been written by J.-P. Sanfourche (CEAS) in collaboration with Nadine Barriety (ONERA)

THE 11TH EUROPEAN TURBOMACHINERY CONFERENCE

By Prof. Tony Arts, VKI, Belgium – EUROTURBO Secretary

At the initiative of the German, English, French and Belgian Engineering Associations a European Turbomachinery Committee was founded in July 1993 with the mission to organise at European level a biennial international conference on fluid and thermodynamics aspects of turbomachines as a replacement for the hitherto national conferences on this subject. This conference was to be different in scope, size and organisation from the annual ASME (American Society of Mechanical Engineers) Gas Turbine Conferences that take place every other year in Europe.

EUROTURBO

The initial Turbomachinery Committee has now evolved into EUROTURBO, a legal established organisation under the chairmanship of Prof. Francesco Martelli (University of Florence).
This event was also seen as an integrating element between the Western and Eastern European countries and as an additional mean to foster collaboration in turbomachinery research at a European level. Finally this conference was an ideal forum to present and publicize the results of research projects funded by the European Commission

and benefited therefore also from the support by the Commission.

The 11th European Turbomachinery Conference, Madrid, 23-26 March 2015

Following the successful first ten conferences on turbomachinery held in Erlangen (DE) 1995, in Antwerpen (BE) 1997, in London (GB) 1999, in Florence (IT) 2001, in Prague (CZ) 2003, in Lille (FR) 2005, in Athens (GR) 2007, in Graz (AU) 2009, in Istanbul (TR) 2011 and in Lappeenranta (FI) 2013, the eleventh European Conference on Turbomachinery - Fluid Dynamics and Thermodynamics has taken place on 23-27 March 2015 in Madrid (ES), in the premises of the Technical University (UPM).

A view of the conference room during the 11th European Turbomachinery Conference, 23-26 March 2015 in Madrid

ORGANISATION

The local organisation was ensured by the team led by Dr Raul Vazquez Diaz (Rolls-Royce Ltd) and Prof. Roque Corral Garcia (Polytechnic University of Madrid – ITP).

It is to be mentioned that the 4-day technical programme was supplemented with a series of social events over the week, fostering international friendship, discussions and collaborative ventures.

SCOPE

The scope of this conference covered the scientific and engineering outcomes concerning the fluid dynamic, thermodynamic, performance and stability aspects in the design, development and operation of axial, mixed flow and radial turbomachines. This event, of primary interest to researchers, design engineers and users of turbomachinery, was in addition intended to be a primary event for technology transfer across Europe in this field through the presentation of the latest developments.

A high number of presentations

From the 270 abstracts initially collected from 26 countries, 170 full papers were submitted. To ensure a high scientific quality of the conference a very thorough paper review process, under the leadership of Prof. Claus Sieverding (von Karman Institute) with at least 3 reviewers per paper was employed. 130 papers were finally accepted for presentation. Out of those, twelve best papers have been proposed for publication in an internationally renowned technical journal. It is worth to mention that 36 % of all papers had at least one author from industry. To enhance further the quality of the conference, high level experts delivered invited lectures on leading edge turbomachinery technologies. The contributions of this year were received from Rolls-Royce Deutschland, the Polytechnic University of Madrid, GE Global Research, The University of Texas at Austin and Rolls-Royce Ltd. The detailed conference programme (invited lectures and technical papers) can be consulted on www.etc11.eu

▶ The technical papers will appear within six months on the web. This decision perfectly fits with the guidelines of the European Commission and the aims of the E-Caero 2 European project.

A good attendance

More than 290 attendees registered to the conference, coming from 28 nations in and outside Europe (USA, Canada, Japan, Egypt, Australia, Korea, Algeria …). This was the highest number since the first European Turbomachinery Conference.

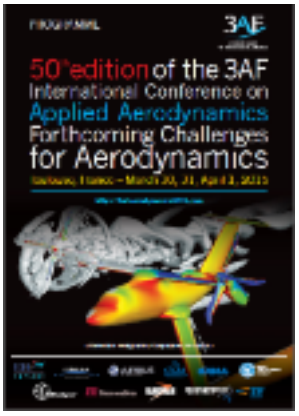
The next Conference

The next event will be organized in March 2017 in Stockholm (Sweden). The Call for Abstracts will be released in January 2016 on the EUROTURBO website (www.euroturbo.eu), and closed early April 2016. After acceptance of the abstract, the full papers will be due by early September 2016 for the review process. Full details will appear by the end of this year on the EUROTURBO website.

THE 50TH INTERNATIONAL CONFERENCE ON APPLIED AERODYNAMICS ('AERO2015')

By Jean Délery, Chairman of the Aerodynamics Committee of 3AF, and Jean-Pierre Sanfourche (CEAS)

THE TITLE OF THIS CONFERENCE WAS: 'FORTHCOMING CHALLENGES FOR AERODYNAMICS'



This conference, organised by the French Aeronautics and Astronautics Society (3AF), took place in Toulouse (France), in the premises of ISAE-SUPAERO, from 30th of March to 1st of April 2015.

Its programme had been established by an international Scientific Committee composed of:

- Prof. Holger Babinsky, University of Cambridge UK),
- Prof. Piotr Doerffer, Institute of Fluid Flow Machinery (IMP-PAM), Society of Science, Gdansk (Poland),
- Prof. Amable Linan Martinez, Polytechnic University of Madrid (Spain),
- The members of the Aerodynamics Technical Commission of 3AF.

It was co-sponsored by the AIAA (USA), the RAeS (UK) and the CEAS.

Besides it was supported by Airbus, ONERA, EUROSAE (Education & Training partner), a number of industrial societies (CD-adapco, Math Works, ITI TranscenData, Measurement Specialities), and naturally ISAE-SUPAERO which hosted the event.

About 160 people participated, coming from 11 nations (Australia, Canada, France, Germany, Italy, Poland, Russia, Serbia, UAE, UK and USA). Most of the delegates were researchers belonging to universities or research institutes.

A VERY BROAD PROGRAMME

The campus of the prestigious Aeronautics and Space Institute 'ISAE-SUPAERO' in Toulouse (France)
Some key figures: 1600 students in course of education in aerospace; 145 researchers-teachers, of which 65 are entitled to conduct research programmes; 28% of foreign students coming from 55 nations and the 5 continents.

The conference aimed at dealing with the numerous forthcoming challenges for aerodynamics because of the more and more constraining demands in aviation: environment

A view of the delegates of the 50th International Conference on Applied Aerodynamics, in front of the building 'Enseignement' of ISAE-SUPAERO in Toulouse (France)

('greener and greener', noise), wake vortex, atmospheric dirty marks (trails), safety, security, range performances, and also stealth technologies for military air vehicles. In addition to the aviation sector itself, other topics were reviewed, notably the wind turbines' efficiency and reliability as well as the buildings air conditioning systems' energy consumption.

FIVE SESSIONS

The communications made by the different presenters cover the fields where aerodynamics necessitates new R&D actions.

The conference was organised around five sessions:

- **Session 1:** Challenges in flow modelling and numerical simulation. This session was conducted by **Philippe Spalart**, engineer at Boeing and one of the most worldwide recognised experts in the area of turbulence simulation. The title of his presentation was:

TURBULENCE PREDICTION IN AERONAUTICS AND NEIGHBOURING FIELDS

" We consider turbulence prediction for the coming few decades, in real life at high Reynolds number, using High-Performance Computing. The relevant fields include ground transportation, wind energy, internal and external building flows, and possibly weather studies.

It is shown, again, that Large Eddy Simulation will not displace Reynolds-Averaged Navier-Stokes modeling, because of its excessive computing cost in the large areas of very thin boundary layer. It is also argued, unfortunately with confidence, that RANS modeling will not reach the required accuracy over complex or separated regions. Therefore, the field belongs to combinations of RANS and LES, such as Detached-Eddy Simulation. These approaches are delicate and far from perfect, and much evolution remains, but they have the potential to reach Industrial Accuracy, in the right hands. This means better user education is very needed.

A new theme is that LES will not displace RANS over the whole domain. In particular, unlike in Natural DES, LES will be initiated inside the attached boundary layer, once it has transitioned and thickened sufficiently but before it encounters strong pressure gradients or other challenges to its health and to RANS accuracy. In addition to Wall Modeling within the LES, this implies a high-performance and automated device to create unsteady "LES Content" in the boundary layer.
Examples of the limitations of current methods and initial successes of the extended DES approach are given."

• **Session 2:** Experimental challenges. The pilot presentation of this session was addressed by **Patrick Wagner**, head of large technical facilities at ONERA, the French Aerospace Lab. The subject dealt with was:

METROLOGY FOR FUTURE WIND TUNNELS TESTING NEEDS

"The wind tunnel division of Onera has invested in development of new testing techniques, new test set-up, including in-house validation. New developments of our large-scale wind tunnels are aiming at:
– Improved accuracy and added value for customers.
– Preparing the future, and being ready to provide adequate answers, when requests come from customers.

Most recent developments are focusing on:
– Sting interferences calculated with CFD for high-speed flow conditions. WT data are getting closer to flight data.
– Model deformation measurements (MDM) provide real model shape under test loads.
– Optical measurements are now commercially available to provide global and local quantitative information (PIV, PSP, IR).
– Productivity is improved with large-scale models providing more automation possibilities, to reduce tunnel occupancy. Better Mach number control has also a major impact on wind tunnel productivity.
– Acoustic measurements in an aerodynamic test section with no liners.
– Open-fan testing and data acquisition capabilities.
– Improved balances to measure model loads.
We have short term and long term perspectives for preparing the future:
– Testing of a very large scale laminar profile.
– Engine integration test set-up.
– Wireless technology.
– MEMS technology applied to transition tripping with actuated dots.
– Future strategy for merging wind tunnel experiments and CFD."

• **Session 3:** New technologies. **Helen L. Reed**, professor at Texas A&M University, in her quality of pilot lecturer, delivered a presentation dealing with:

INTERACTIONS OF STEM-EXCRESCENCES AND CROSS FLOW ON SWEPT-WINGS

"The implementation of laminar flow control on an aircraft has the potential for significant decreases in the vehicle's drag budget due to the reduction of skin-friction drag. However, experience has dictated that even judiciously designed LFC wings can fail to be laminar in an operational environment. This discrepancy in performance has been attributed to surface imperfections present on operational airfoils due to many causes including manufacturing tolerances, control-surface interfaces (such as for high-lift and anti-icing devices), panel seams, bug strikes, rivet heads, and paint weathering. It is therefore often not sufficient to simply understand control methods in a laboratory environment; in order to move towards practical laminar flow, a need exists to quantify acceptable surface excrescence levels on a laminar-flow airfoil. Tighter tolerances also translate directly to increased manufacturing costs, complexity, and fabrication time.
Significant progress has been made by The Northrop Grumman Corporation in quantifying the effects of two-dimensional (2-D) excrescences on an unswept surface subject to favorable pressure gradients. Note that streamwise instabilities are subcritical to favorable pressure gradients and there is no crossflow instability because there is no sweep.

This talk describes recent efforts to extend this work to a three-dimensional (3-D) basic flowfield dominated by an inherent crossflow instability. On many swept laminar-flow airfoils, Tollmien-Schlichting instabilities are stabilized via an extensive region of favorable streamwise pressure gradient, leaving the crossflow instability to be the basic cause of transition and breakdown to turbulence. What is not known, however, is how crossflow vortices will interact with a shear layer such as that coming off of a step. Because 2-D steps modulate the shape of the boundary-layer velocity profile very differently from 3-D imperfections, a better understanding of their effects on transition, including pressure gradients and leading-edge sweep, could be very beneficial in loosening manufacturing tolerances and allowing more practically producible and maintainable laminar flow wings.

To this end researchers at Texas A&M University are conducting tightly integrated computational and experimental efforts to quantify these effects. Forward- and aft-facing 2-D step excrescences near 1% and 15% chord are modeled in order to examine the effects of operating conditions, pressure gradient, sweep, and curvature. Experiments and computations on the same 30° swept-wing model are performed in the flight environment attached below the port wing of a Cessna O-2A Skymaster, in the Klebanoff-Saric Wind Tunnel, and within the Computational Stability and Transition Lab. In both experimental environments, IR thermography is used to detect the global laminar-turbulent transition location. In the wind tunnel, a hotwire traverse is also utilized to map out the boundary layer and further measure the influence of these excrescences.

Specifically this talk will discuss the computational approach for and results from modeling the aircraft/wind-tunnel/test-model flowfield via Navier-Stokes analysis, and the excrescences embedded in the flowfield modeled via a coupled direct-numerical-simulation/parabolized-stability-equation approach. Validation with the experimental results in which forward- and aft-facing 2-D steps are created in a controlled way at 15% x/c will be discussed. ”

• **Session 4**: New configurations. **Serge Bonnet**, engineer at Airbus, in his quality of pilot lecturer, gave a presentation on:

AERODYNAMICS IN AIRBUS DURING EARLY PROGRAMME PHASE – PROGRESS OF ‘TARGET SETTING’

“ The decision to launch a **new program** at the right time depends on several parameters, such as the **market expectations**, the benefits the airline may perceive in terms of performance and Life Cycle Cost, the ability to propose adequate differentiating “values” through the introduction of new technologies in particular, not forgetting **resource and financial** status of the company. On top of that, this decision also depends on the overall Product Policy and competitive context.
Top “**objectives” and “requirements**” are to be identified very early in the aircraft development process, in order to satisfy expectations and to minimize late and expensive adaptations.

Global **optimization** under these “requirement constraints” is a complex process; one key function to be optimized is operational cost, in particular **fuel** consumption, but at an affordable acquisition cost for the Airlines, and affordable development and production cost for the Aircraft Manufacturer.
A reduction of fuel consumption can be obtained by propulsion improvement (reduction of specific fuel consumption), weight reduction and **aerodynamic** improvement, namely optimization of **lift over drag** ratio.
At an early stage, the “best aircraft configuration” has to be identified; this requires to manage all disciplines together such as to find the right **balance between weight and drag**.
On a pure aerodynamic point of view, the **key configuration parameters** have to be understood and challenged (for instance, investigate span extension opportunities) as well as the **technologies** which should be “taken on board” (laminar flow areas, specific devices like “riblets”…).
Initial choices, compromises, decisions need interactions between **experts in “Overall Aircraft Design” and in Aerodynamics**; they are also based on methods fast enough to be run in multidisciplinary environment. Results must be accurate enough to allow later relevant aerodynamic detailed design (profile design in particular) and to get robust prediction of aircraft performance guarantees.
The purpose of this conference is to present the **process of “aerodynamic target setting**” at an early stage of the development of an aircraft.
These targets should be **challenging enough but “realistic**” as well. Among these targets there is one figure to decide: which lift over drag ratio at cruise Mach conditions should we target?
Future evolutions of preliminary design methods and tools will be presented; in particular, extension from “**Semi-empirical” approach to more “light CFDs**” should allow on one hand to get **more accuracy** on conventional configurations and on the other hand to better address “**unconventional configurations**. ”

• **Session 5**: Multiphysics and optimisation. **George Barakos**, professor at the University of Liverpool, in his role of pilot lecturer made a presentation on:

ROTARY WING AERODYNAMICS – RECENT PROGRESSES AND FUTURE CHALLENGES

“ This paper presents a summary of the progress made in the modelling of helicopter flows with Computational Fluid Dynamics (CFD) methods. Once the current state-of-the-art is summarised, the paper presents future research directions currently emerging from Universities and research centres.
It is the case that helicopters always presented a challenge for Computational Fluid Dynamics methods due to the strong coupling between the aerodynamics, aeroelasticity, and flight mechanics that govern the flight of this class of vehicles. Additional difficulties are due to the complex vertical rotating flow that includes high Mach number flow regions (near the tips of the rotor blades) as well as low-speed flows around bluff bodies (flow around the fuselage). In addition, the rotation of the helicopter blades imposes a level of unsteadiness that makes the analysis of helicopter flows nearly impossible within the framework of the Reynolds-Averaged Navier-Stokes (RANS) equations. Consequently CFD methods have to at least employ the Unsteady RANS approach regardless of its limitations. It is this unsteady nature of helicopter flows that has been at the core of the slow progress with CFD for this particular type of vehicles. A further complication come from the fact that the rotor and fuselage of a helicopter are in relative motion to each other and this makes it possible for computations to be undertaken with a CFD mesh that is fixed in space.
As computer technology and numerical algorithms developed, some of the problems of tackling helicopter flows with CFD were alleviated. It is now possible to compute (albeit with some numerical effort and with the use of parallel computers) the flow around an isolated helicopter in trimmed flight including the effects of rotor blade aeroelasticity (Figure 1). Interestingly, it is the very complex nature of helicopter flows that attracted several researchers in the area and recently time-marching as well as frequency-domain solutions were presented at least for helicopter rotor flows. Furthermore, some of the most advanced algorithms in numerical mesh generation, adaptation, mesh overlapping, and local mesh refinement have been developed and demonstrated for helicopter flows.
Several European Union and international research programmes [1,2] have also resulted in reliable databases of experimental data. Validation of CFD methods against

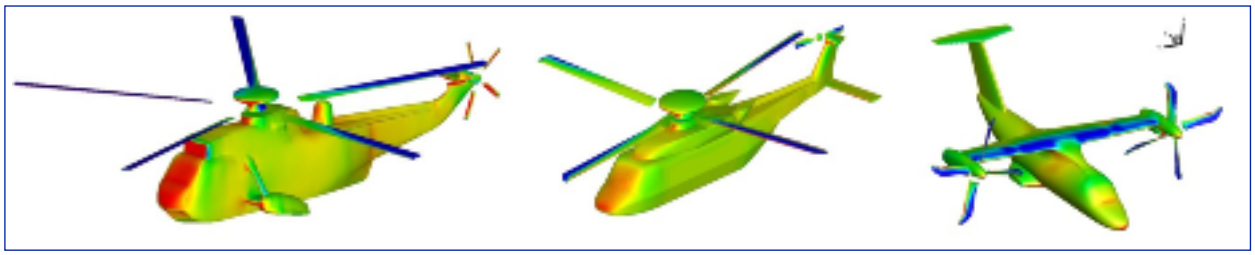


Figure 1: Examples of CFD computations around rotorcraft configurations at trimmed flight.

these databases showed good agreement at least for the pressure part of the flow on the rotor blades and the fuselage. This recent success boosted confidence on CFD that is currently used to assess the effect of flow control devices on rotors as well as for performing design studies and comparisons of rotorcraft configurations. Indicative examples that are discussed in this paper are related to the use of active flaps of different types on the rotor blades, optimisation of the blades across the flight envelope [3] of the helicopter, re-shaping of the fuselage for drag reduction, or prop-rotor optimisation for use with tilt-rotor aircraft.

In parallel, several active areas of research are expected to contribute to helicopter simulations in the near future. For example (Figure 2), new CFD methods are now aiming for higher order of spatial accuracy to tackle issues related to the acoustics and vibration of helicopters. Studies of the flow around the blades aim to include boundary layer control on the rotor to allow for shock alleviation (should that occurs near the blade tip) or delay of the flow separation and dynamics stall (on the retreating blade side). The problem of fluids/structure interaction on rotor blades is also an active area of research where the mechanics of the rotor head is included in the simulation of the dynamic blade response. Finally, the use of complete aeromechanics models with CFD is currently emerging as a technique for analysing the flight of helicopters during manoeuvers and for providing to helicopter designers estimates of the transient loads encountered during flight. These methods will allow CFD to address problems like the landing of helicopters on ships, and its safe operation near the ground, and buildings. ”

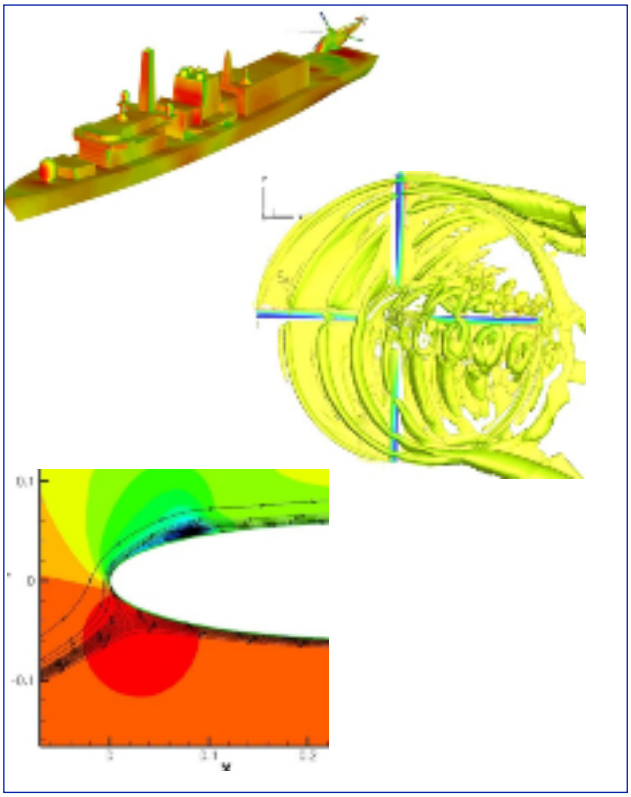


Figure 2: Some examples of emerging CFD computations From right to left: helicopter landing on a ship, rotor in blade-vortex-interaction state, transitional flow near the leading edge of a rotor blade.

References

[1] R. Steijl and G. Barakos (2012) CFD analysis of complete helicopter configurations - the GOAHEAD project. Aerospace Science and Technology, 19 (1). pp. 58-71.

[2] B.G. van der Wall, (2003) 2nd HHC Aeroacoustic Rotor Test (HART-II) – Part 1: Test Documentation”, German Aerospace Center Institute Report IB 111-2003/31.

[3] A. Brocklehurst and G. Barakos, (2013) A review of helicopter rotor blade tip shapes. Progress in Aerospace Sciences, 56. pp. 35-74.

Among the main outcomes of AERO2015

Among the strong points which emerged from the conference, there is precisely the fact that it is necessary to actively pursue the research programmes aiming at predicting and controlling separation and at reducing the aerodynamic drag by maintaining laminarity (in particular by developing actuators using plasma or synthetic jets).

The studies being currently conducted belong on the one hand to theory - they are based upon stability theories applied to control actions – and on the other hand, to numerical simulation aiming at settling accurate and efficient solvers well adapted to complex configurations.

A big effort is devoted to experimentation with a view to understanding the behaviour of phenomena such as laminar-turbulent transition, noise generation, large scale unsteady situations, or also boundary-layer separation.

In addition the new configurations are being studied by means of numerous tests performed in wind tunnels where measurements’ and results’ processing methods are being constantly improved (example: computer-aided wind tunnel).

The subjects dealt with during the conference also concerned terrestrial vehicles and wind turbine generators, to which a full session was dedicated.

MUNICH AND BAVARIA – AVIATION ELECTRONICS EUROPE

GENERAL BACKGROUND

Bavaria is one of two centres of the German aerospace industry, with 1/3 of German aerospace industry based there, whether in terms of employees (36,000), companies (450 separate companies) or turnover (€6.9 Billion).

Strategically Munich is an excellent location for the event '**Aviation Electronics Europe**' which provides great opportunity for the event to grow, in the heart of Europe, where there is a large cluster of aerospace industry.

The Bavarian state government has commissioned bavAIRia with the cluster management of the aerospace cluster as well as the satellite navigation cluster. What is the goal of bavAIRia cluster management organisation? It is to bring together the various stakeholders from industry, science and politics on a neutral ground in order to facilitate cooperation projects for strengthening global competitiveness of Bavaria's aerospace and satellite navigation. For this purpose, bavAIRia offers services regarding state funded research projects, and various activities with regard to human resources, marketing, supply chain integration and internationalisation.

THE RECENT 2015 CONFERENCE 'AVIATION ELECTRONIC EUROPE': MUNICH, 25-26 MARCH

Venue: the MOC of Munich

The purpose of the Aviation Electronics Europe event was for the international avionics and aviation electronics industry to learn, network and source new information about the latest industry challenges and issues in relation to SESAR and NextGen and the current and future policies, standards and technologies of aviation electronics.

Opening keynotes

– SES/EASA Regulation update, DG MOVE, European Commission
– Managing transition between SES and EASA, SESAR coordinator
– Turkish Airlines

Avionics in SESAR

– CNS and Avionics
– Changes coming in the communication area?

EUROCONTROL

– 4D Navigation (Airbus)

Standardisation & Certification

Connectivity and eEnabling from noas to tail and beyond

Situational Awareness – Latest and future challenges

– ADS-B In and Out Implications
– Low Air Speed Data
– Automatic emergency descent function
– An integrated approach for enhances Flight Vision Operation

Open Architecture and COTS technology

– Real Time Components Execution Platform for embedded software
– Multicore MILS: evolution of the Multiple Independent Levels of Security software architecture to enable multi-level secure multicore systems
– System Integration and Certification Considerations for IMA (Integrated Modular Avionics) Systems
– Robust embedded Computing for Advanced Integrated Architectures

Future Avionic innovations and Advanced Concepts

– Integrated Modular Avionics and what next?
– The future of Combined Vision Systems (HUD/Synthetic Vision/Enhanced Vision) and the potential effects on avionics and cockpit

The2015 Conference Proceedings can be found on http://www.ae-expo.eu/proceedings/

NEXT AVIATION ELECTRONICS EUROPE CONFERENCE

The next edition of Aviation Electronics Europe will take place in Munich on 20-21 April 2016.

ABOUT EUROPE'S MIDCAS UAV DEMONSTRATOR PROJECT

As the potential of UAVs appears more and more important and promising, the ablity for them to fly in controlled civil airspace requires appropriate technical means and operational procedures. Defence air forces becoming the dominant users of large RPAS (Remotely Piloted Air Systems), the EDA (European Defence Agency) is working closely with SESAR and the EASA with a view to defining a reliable concept of operations for RPAS, including quite a robust Detect & Avoid (A&D) system.

Tim Robinson, Editor in Chief of AEROSPACE Magazine, has written an article on that subject on 26 May 2015. A feature of the July issue of this magazine has been published by the Royal Aeronautical Society (RAeS). Thanks to the kind authorization of the latter, we have pleasure in reproducing here below this Tim Robinson paper.

UNLOCKING EUROPEAN SKIES FOR UAVs

26 May 2015

Tim Robinson reports as Europe's MIDCAS UAV demonstrator project wraps up a successful 'detect and avoid' flight-test campaign.

The flight trials used a modified Alenia Sky-Y UAV fitted with five different sensors. (EDA)

While in recent months much attention has been given to the future potential of small package UAVs operating in civil aerospace, the larger the UAV, the more important that it has a robust sense and avoid (or detect and avoid (D&A)) system in place. Currently, military UAVs are deconflicted carefully, either flying in empty ranges, conflict zones or under close supervision to operate under or thread between ATC-controlled civil air routes.

Yet as the potential of UAVs becomes more and more pent-up — so too are the rules becoming more restrictive. The ability to fly in controlled civil airspace would not only allow larger UAVs to fly cargo, patrol, communications relay, or search and rescue missions (to name but four) — but for military users would allow ferry flights, training missions and give a huge boost in operational flexibility. Notes the European Defence Agency (EDA): "There is an interest from the civil side, but the military have pressing need now, as the dominant user of large RPAS. We work closely with SESAR, and EASA recently issued their concept of operations for RPAS. A D&A system will almost certainly be a requirement for certain classes of RPAS."

However, to fully unlock the skies the thorny and complex challenge of D&A must be addressed. Unlike the smaller, lighter quadcopters found under 500ft and operated within line of sight, a mid-air collision between a tactical or MALE-sized drone or larger (the Reaper UAV for example has a wingspan of 20m and a MTOW of 10,494lb) and a manned aircraft represents a whole different level of threat.

Enter MIDCAS

Inside the GCS (Ground Control Station) for the MIDCAS UAV demonstrator. (EDA)

To that end there are now several projects investigating and de-risking D&A for unmanned air vehicles to allow them to use controlled civil airspace on a regular basis. In the UK, this has been led by the ASTRAEA consortium - which has conducted aerial tests using a Jetstream as a 'surrogate' UAV. Meanwhile in the US, General Atomics and NASA conducted a trial in November using an Ikhana (NASA MQ-9) equipped with three sensors — ADS-B, TCAS and an air-to-air radar, with a view for further trials this summer.

But Europe has not been sitting still either. At the end of April, the EDA announced that, together with the MIDCAS (Mid Air Collision Avoidance System) consortium, a UAV demonstrator had concluded a successful flight test and simulation campaign to trial D&A technologies.

Formed in 2009, the €50m MIDCAS is the European D&A project, and has as its members Airbus D&S, Sagem, Thales,

Diehl BGT Defence, DLR, ESG, Indra, Alenia Aermacchi, Selex ES, CIRA with Saab as the overall team leader.

Sky-Y UAV

The trial flights saw a highly modified and upgraded Alenia Sky-Y RPAS system fly since December 2014, racking up ten test flights over the course of the flight test campaign. Flying from Grazzanise Air Base in Italy, the Sky-Y performed fully automatic avoidance manouevres using both cooperative and non-cooperative sensors. Non-cooperative sensors are especially important as although most commercial airliners will now be equipped with ADS-B, it is GA and light aircraft that may not be squawking or in communication with ATC that present the biggest risk.

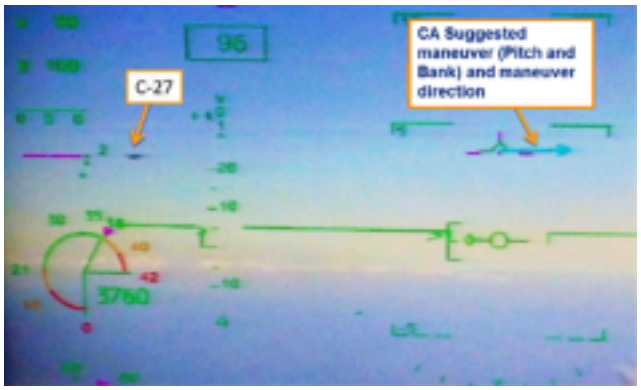
To 'detect' both co-operative and non-cooperative targets the Sky-Y RPAS was equipped with ADS-B and an IFF interrogator as cooperative sensors and Radar, EO and IR as non-cooperative sensors. Data from these is then fused to give a picture of potential conflicts. Field of View (FoV) for the non-cooperative sensors, says EDA, is a little below the +/-110 deg in azimuth and +/-15 deg in elevation.

TESTING, TESTING

As noted earlier, the test flights saw MIDCAS fly the Sky-Y demonstrator from Grazzanise air base, just north of Naples in a segregated test area. There the team first worked up to the unmanned flights by de-risking them using a CASA C212 as a 'surrogate' UAV with the D&A system fitted and a Falcon 20 as an intruder target.

For the real unmanned tests, the Sky-Y was flown with a C-27J tactical transport as a target. The speed of the UAV was typically around 95kt, with the intruder flying around 140kt. Closing speeds, say EDA, depended on the scenarios, with the highest being recorded in head-on conflicts of around 240kt. All tests were flown in daylight, under varying conditions.

LEVELS OF AUTONOMY



HUD from the operators point of view showing suggested evasive manouevre. (EDA)

Detecting an incoming threat, though, is only half the battle. The next stage of the process is 'avoid' and the MIDCAS trials saw the Sky-Y perform a dynamically calculated manoeuvre to maintain separation and avoid conflict. According to EDA, the avoiding action also included warnings to human operators on the ground, before the autonomous system took evasive action from the intruder. The autonomous decision making was spilt into three stages:

1) inform the RPAS pilot of surrounding traffic and any potential conflict

2) alert the RPAS pilot for the need for traffic avoidance, in which case the pilot can choose to activate an automatic traffic avoidance manoeuvre

3) alert the RPAS pilot of a pending collision risk in which case the pilot can choose to make an early activation of an automatic collision avoidance manoeuvre. If not activated by the pilot the system will automatically activate the collision avoidance manoeuvre when necessary.

The autonomous avoidance manoeuvres came in two flavours - a relatively 'benign' traffic avoidance consisting of a left/right or climb/descent — along with a more aggressive anti-collision manoeuvre that combined a turn with an up/down at the maximum performance of the UAV.

CONCLUSION

Derisking D&A is critical for the flexibility of operating larger, more complex UAVs/UCAVs. (Dassault)

With the flying tests and ground simulation activities complete — the MIDCAS team is currently involved in analysing the data and also making it exploitable for partners and interested parties. Says EDA: "One of the aims is to share some IPR (intellectual property rights) between partners and to drive the standardisation process, which is needed for exploitation of any technical results. That said, there is clearly a common interest in the area of standardisation and certification, and there is friendly dialogue facilitated by EDA, but this is bounded by the respective contractual arrangements and related IPR".

These trials then have been an important milestone in proving that larger UAVs can safely share the skies with manned aircraft - even one that all not equipped with IFF or ADS-B and that ATC may be essentially blind to.

Notes the EDA: “The MIDCAS concept of operations is informing the debate at EASA and ICAO, as there is no substitute for actually trying to build and fly things. We currently need to keep technology, standardisation and regulation all moving along together.”

THE EUROPEAN DEFENCE AGENCY (EDA) AND THE EUROPEAN SPACE AGENCY (ESA) LAUNCH 'DESIRE II' DEMONSTRATION PROJECT

On 9 April, EDA and ESA agreed to kick-off a new project in accordance with their demonstration roadmap to support the development of governmental, institutional and commercial services provided by Remotely Piloted Aircraft Systems (RPAS) flying in non-segregated airspace.

WHAT IS DeSIRE II?

This is a demonstration project expected to run for 18 months with a total budget of €2.6 million. An industrial consortium led by Telespazio will act as prime contractor and system integrator. The main results and recommendations coming out of the project will be disseminated to support European standardisation and regulatory activities, especially for the definition of future satellite-based command & control data links.

DeSIRE II is a follow-on to the first DeSIRE I demonstration, an EDA-ESA project led by Spanish company Indra which ran from 2011 to 2013, culminating with a series of successful test flights demonstrating the ability of a RPAS using a satellite link to safely share the sky with other airspace users.

THE FLYING TEST BED

During DeSIRE II, a Piaggo Aero P.1HH HammerHead (see above picture) will be used as a flying test bed for the development, integration and testing of a set of capabilities designed to allow safe RPAS operation in civilian airspace in support of missions such as environment monitoring, maritime surveillance or crisis management.

THE CONSORTIUM

Out of the 2.6 million project budget, €1.2 million will be invested by ESA, €600.000 by the EDA on its operational budget and €800.000 by the industrial consortium composed of:

>Telespazio, e-GEOS, Selex ES, Piaggo Aero, ViaSat, Skyguide and AEdel Aerospace GmbH.

CHARACTERISING SATCOM COMMAND AND CONTROL DATA LINKS

The project will also aim at characterising Satcom command and control data links in different frequency bands through simulation, emulation and flight demonstration campaigns. It will also be supported by end users: Italian Coast Guard, Italian Civil Protection Department, Guardia di Finanza, European Fisheries Control Agency, Ceren and Armasuisse. Those end users will consolidate their operational and regulatory requirements to operate RPAS in non segregated airspace.

DeSIRE is designed to prove the effectiveness of the systems when flying beyond radio line-of-sight (BRLOS) using satellite communications in non segregated airspace for maritime surveillance. As a matter of fact, a major hurdle for remotely piloted aircrafts flying BRLOS is to ensure sufficient availability and continuity of the communication links between the pilot, the aircraft and the air traffic controller. It is to be noticed that until now, satellite data links for RPAS have been used only for military applications and, separately, civilian operations in segregated airspace. This led to a lack of data for regulatory bodies on flights combining radio line-of-sight (RLOS) and BRLOS (Beyond RLOS) conditions. So, DeSIRE II aims to demonstrate how space-based data link communication could be a key technology for future BRLOS operations in non segregated airspace, thanks to its ability to offer global, broadband and safe communications for both payload and safety communications.

Satellite navigation also plays an important role for RPAS: with satellite navigation, the remotely piloted vehicles can be directed without using ground-based navigation systems as reference.

J.-P. S. From information provided by EDA

SESAR MAKES PROGRESS ON CIVIL-MILITARY INTEROPERABILITY

A series of flight trials were conducted in September 2014, successfully validating a number of SESAR solutions for civil-military interoperability. The validation campaign demonstrated how a ground interface can enable the exchange of air-ground data messages between military aircraft and Air Traffic Management (ATM) ground systems for controller-pilot data link communications (CPDLC) and initial 4D trajectory management, and also how Automatic Dependent Surveillance – Broadcast (ADS-B) can be enabled onboard military aircraft using existing military transponders. The outcomes of this campaign provide unprecedented evidence that modern military aircraft can be interoperable within a SESAR environment in a cost-effective way.

SEAC SUCCESSFULLY VALIDATES 'FOLLOW-THE-GREENS'

In the end of April 2015, the SESAR European Airports Consortium (SEAC), together with its partners, has completed the validation of 'Follow-the-Greens' in Frankfurt.

What is 'Follow-on-the Greens'?

This is an innovative and performance enhancing guidance method for aircraft movements on airport taxiways. The objective is to speed up the taxiing procedure of aircraft to and from the runway system, making the process more efficient.

Directing the crew to the assigned taxi route: towards improvement

Currently the cockpit crew is directed by radio to the assigned taxi route by the apron controllers.

In the future, the taxiway lighting system will be used to direct the crew and therefore the aircraft. Each segment of taxiway needed is switched on. All areas not needed are switched off. This makes the guidance of aircraft safer, as errors are hereby minimized. The guidance system is computer controlled: this is a modification of the system already in place.

This new guidance system comprises an integrated controller working position and a surface management system covering other SESAR solutions related to routing & planning and guidance. The validation was executed on the basis of the layout and traffic characteristics of Munich airport. It focused on the situational awareness, workload, perceived safety, usability as well as radio communication for the ground controllers. Scenarios included runs in good weather as well as low visibility conditions, different traffic loads and remote ground control.

Seven controllers and five pilots from different European Airlines participated in the exercise and their initial feedback was very positive. During the validation runs up to 40 experts were involved, including members of the International Evaluation Team.

The exercise went smoothly and the systems performed reliably and stable.

J.-P. S. From information provided by SESAR JU

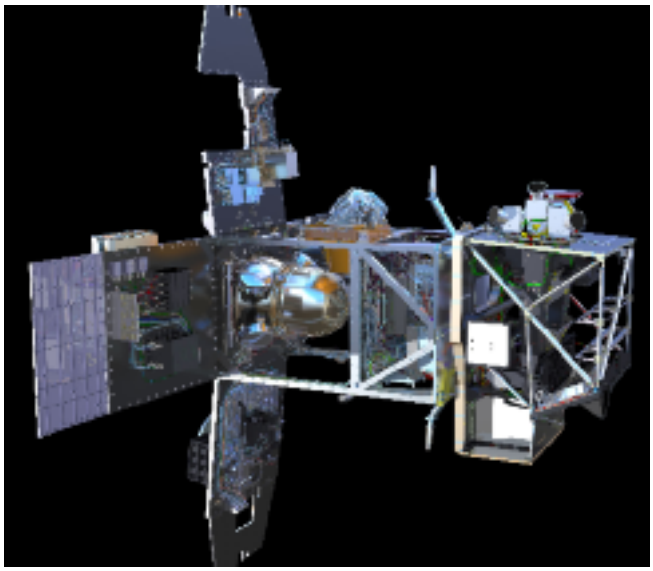
SECOND COPERNICUS ENVIRONMENTAL SATELLITE IN ORBIT

ON 23 JUNE 2015 SENTINEL-2A WAS LAUNCHED FROM KOUROU

Sentinel-2A was carried on a Vega rocket from Europe's Spacecraft in Kourou, French Guiana, at 01:52 GMT on 23 June 2015, adding a high-resolution optical imaging capability to the **European Union Copernicus Environmental Monitoring System** (previously named GMES).

Vega VV05, carrying Sentinel-2A, lifted off from Europe's Spaceport in Kourou, French Guiana, on 23 June 2015. Sentinel-2 carries an innovative wide-swath, high-resolution multispectral imager with 13 spectral bands for a new perspective of our land and vegetation. The second in the two-satellite mission – Sentinel-2B – is being prepared for launch in 2016. © ESA–M. Pedoussaut, 2015

The night of 26 June marked the end of Sentinel-2A's first three days in space, with the delivery into orbit and the start of the critical Launch and Early Orbit Phase (LEOP) which has seen ground teams at ESOC (Darmstadt) working around the clock to activate crucial onboard systems and ensure the spacecraft's health.
The LEOP phase has now formally ended, with the spacecraft and ground systems all operating as expected. Controllers are checking and calibrating the instruments to commission the satellite. The mission is expected to begin in three or four months.



Inside view of Sentinel-2. © ESA/ATG medialab

The 1.1 tonne satellite carries a high-resolution optical payload that will gather some of the best global imagery of our land and vegetation. This information will be mainly used for agricultural and forestry practices, as well as to manage food security, monitor pollution in lakes and coastal waters and contribute to mere and more rapid disaster mapping.
Sentinel-2A will complement the all-weather, day-and-night radar imagery provided by the first in the fleet, Sentinel-1A, launched on 3 April 2014.
Sentinel-2B, its twin satellite, is scheduled for launch in mid-2016.

Reminder: Six families of Sentinel Satellites will make up the core of EU's Copernicus environmental monitoring network. Copernicus will provide operational information on the world's land surfaces, oceans and atmosphere to support environmental and policymaking, and meet the needs of citizens and service providers.
Sentinel-2A is the second satellite of the complete Copernicus network, which will comprise 20 satellites in total.

ROSETTA: THE ADVENTURE CONTINUES

Rosetta, launched in 2004, arrived at the comet 67P/Churyumov-Gerasimenko in August 2014, where it has been studying the nucleus and its environment as the comet moves along its 6.5-year orbit closer to the Sun. After a detailed survey, Rosetta deployed the lander, 'Philae' to the surface on 12 November 2014.

Philae fell into hibernation after 57 hours of initial scientific operations, and recently awoke and made contact with the orbiter Rosetta again.

Rosetta's nominal mission was originally funded until the end of December 2015, but at a meeting held on 23 June, ESA's Science Programme Committee has given formal approval to continue the mission for an additional nine months.

Rosetta approaching comet

INTERNATIONAL SPACE STATION: ESA ASTRONAUT SAMANTHA CRISTOFORETTI BACK ON EARTH AFTER 6-MONTH STAY ONBOARD THE ISS

Samantha Cristoforetti

ESA ASTRONAUT Samantha Cristoforetti, NASA astronaut terry Virts and Russian commander Anton Skaplerov landed on 11 June 2015 in the Kasakh Steppe after a 3-hour ride in the Soyuz spacecraft. They had left the ISS at 10:20 GMT at the end of their 6-month stay in the ISS.

Samantha is the 7th ESA astronaut and the first woman astronaut to have completed a long-duration mission in space. She took over duties from ESA astronaut Alexander Gerst for cargo on ESA's Automated Transfer Vehicle (ATV) Georges Lemaître, the last ATV in a series of five.

Landing of the Soyuz TMA-15M spacecraft
The Soyuz TMA-15M spacecraft is seen as it lands with Expedition 43 commander Terry Virts of NASA, cosmonaut Anton Shkaplerov of the Russian Federal Space Agency (Roscosmos), and Italian astronaut Samantha Cristoforetti from European Space Agency (ESA) near the town of Zhezkazgan, Kazakhstan on Thursday, June 11, 2015. Terry Virtz, Anton Shkaplerov, and Samantha Cristoforetti are returning after more than six months onboard the International Space Station where they served as members of the Expedition 42 and 43 crews. © ESA–S. Corvaja, 2015

London, 20 – 23 October 2015

"A perfect place to see what European research and innovation efforts can accomplish and to stimulate cross-border working to find innovative ways for Europe to remain a global player"

Máire Geoghegan-Quinn, *EU Commissioner for Research and Innovation (Madrid, 2011)*

What is Aerodays?

Aerodays is the European flagship event in Aviation research and innovation taking place once during each EU Research Framework Programme.
Designed to present strategic perspectives for Aviation, including research and innovation. The goal is to share achievements of collaborative research and innovation in Aeronautics and Air Transport within Europe and in world-wide international co-operation.

Who takes part?

The last Aerodays 2011 in Madrid welcomed over 1400 delegates including governmant officials, key decision makers from industry, researchers, engineers, academics, students and journalists.

Conference themes for 2015

Throughout the four day event, there will be 4 key themes addressed resulting from Europe's Vision for Aviation 'Flightpath 2050':

- ***Greening of aviation*** - If carbon emissions continue to rise, they could contribute up to 15% of global warming within 50 years. The industry needs to deliver technology solutions at an increasing rate to mitigate the impact
- ***Competitiveness of industry*** - innovation and technological leadership is the competitive differentiator for European industry. With emerging players vying for market share, technology that optimises energy use and maximises efficiency, quality and reliability will be the keys to success
- ***Efficient and seamless mobility*** - aviation is key to connectivity through transport, adding value through business and the general public. Aviation technologies will help ensure the sector is an integral, seamless node for the future
- ***Breakthrough innovations*** - the potential of zero-carbon flight has been demonstrated. Autonomy has potential for safety and efficiency. Smart materials are yet to be produced on an industrial scale. These and other exciting breakthroughs need to be discovered and adopted to enable future generations to fly.

Some good reasons why you should be at Aerodays 2015!

- It's a forum for senior policy-makers and researchers to debate and discuss
- It's a platform for the sharing outputs from world-leading technology programmes
- Get a comprehensive overview on technological developments in aviation
- Take part in networking and social forums to increase connections and interaction within the aviation sector
- Learn in a master class programme on partnering and collaborating in EC consortia
- It's a place to incentivise and motivate young scientists and engineers
- There's the opportunity for school children to engage with aviation technology and developments

For information and to register interest visit: www.aerodays2015.com

ADS

Department for Business Innovation & Skills

European Commission

CONSULT THE CPMIS : CEAS CONFERENCE PROGRAMMING MANAGEMENT INFORMATION SYSTEM

The aim of the CPMIS is to facilitate the search of the different aerospace events in the world that are programmed at short and mid-term time horizon, and so allowing to optimise the scheduling of future events by avoiding possible overlapping and redundancies, but on the contrary to encourage co-operations and synergies between the actors concerned.

The address is: http://www.aerospace-events.eu

A search engine selects the events according to specific topics and key words. A graphic display (day, week and months view) eases the access and the view.

- 4 TYPES: Conference, Workshop, Lecture, Air Show
- 6 MAIN CATEGORIES: Aeronautical sciences - Aerospace (for events including all aspects of aviation and space) – Civil Aviation – Air power – Space – Students and Young Professionals.
- 64 SUB – CATEGORIES: aeroacoustics – aeroelasticity – aerodynamics, etc.

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Point of Contact:

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– Jean-Pierre Sanfourche, CEAS, responsible for the Events Calendar permanent updating and validation: **sanfourche.jean-pierre@orange.fr**

YEAR 2015 – THIRD QUARTER

28 June-2 July • **TsAGI/CEAS/AIAA – IFASD 2015** – 16th International Forum on Aeroelasticity and Structural Dynamics – Saint Petersburg (Russia) – Solo Sokos Hotel Palace Bridge – www.ifasd2015.com/

29-30 June • **ERCOFTAC** – 11th Conference on Synthetic Turbulence Models – Lyon (France) – ECL Ecully www.ercoftac.org/

29 June-3 July • **EUCASS** – EUCASS 2015 – Krakow (Poland) – www.eucass2015.eu/

6-9 July • **AIAA** – 20th AIAA International Space Planes and Technologies – Glasgow (UK) – Strathclyde University, Technology and Innovation Centre – www.aiaa.org/hypersonics2015

6-10 July • **EUROMECH** – ESMC 2015 – Madrid (Spain) – Carlos III University Leganés – www.esmc2015.org/

12-16 July • **AIAA** – International Conference on Environmental Systems – Bellevue, WA (USA) – www.depts.ttu.edu/ceweb/ices

20-24 July • **ESA** – GHRSST XVI – Noordwijk (NL) – ESA/ESTEC – www.ghrsst.org

27-29 July • **AIAA** – AIAA Propulsion and Energy 2015 Forum and Exposition + 51st AIAA/SAE/ASEE Joint Propulsion Conference + 13th International Energy Conversion Engineering Conference - Orlando, FL (USA) – www.aiaa.org/

9-13 August • **AAS/AIAA** – 2015 Astrodynamics Specialist Conference – Vail, CO (USA) – www.spaceflight.org/docs/2015_astro.html

13-16 August • **TAWAIN** – Taipei Aerospace Defense Technology Exhibition – Taipei (Taiwan) – www.tadte.com.tw

20-23 August • **CHINA** – Shenyang International Air Show – Faku Caihu Airport – Faku Shenyang Liaoning (China) – www.aero-shenyang.com

31 August-02 September • **AIAA** – AIAA SPACE 2015 Forum and Exposition – Pasadena, CA (USA) – www.aiaa.org/

01-04 Sept. • **ERF 2015 – DGLR** – Munich (Germany) – www.erf2015.de - www.erf2015.dglr.de

02-04 Sept. • **5th EASN Workshop** – Manchester (UK) – University Manchester – www.workshop.easn-tis.com/

06-09 Sept. • **ESA** – ESA Antenna Workshop – Noordwijk (NL) – ESA/ESTEC – www.congrexprojects.com/2015

07-09 Sept. • **ECCOMAS** – 5th ECCOMAS Conference on Mechanical Response of Composites – Bristol (UK) www.bristol.ac.uk/composites/

07-10 Sept. • **AIAA** – 33rd AIAA International Communications Satellite Systems Conference and Exhibition – ICSSC-2015 – Gold Coast (Australia) – www.satcomspace.org

07-11 Sept. • **CEAS – CEAS 2015 Conference** – Delft (NL) – www.ceas2015.org

07-11 Sept. • **ESA/IFREMER** – Advanced Training on Ocean Remote Sensing – Brest – Ifremer/HQ – www.esa.int/Our_Activities/

08-10 Sept. • **ESA** – Exploring Hot and Energetic Universe – Madrid (Spain) –ESA/ESAC – www.sciops.esa/int/

15-16 Sept. • **ATCA** – Flight Safety Symposium 2015 – London (UK) – Heathrow Park Inn by Radison www.flightglobalevents.com/

15-17 Sept. • **ESA** – Space for Hydrology Workshop – Frascati (Italy) – ESA/ESRIN – www.esa.int/Our_Activities/

16 Sept. • **RAeS** – Conference Future Trends in Certification if Advanced Technology Structures – Bristol (UK) – National Composites Centre – Bristol & Bath Science Park – www.aerosociety.com/Events

16-18 Sept. • **ICAO** – E-GAP Seminar – Montréal (Canada) – ICAO/HQ – www.icao.int/Meetings/EGAP/

22-24 Sept. • **SAE International** – SAE 2015 Aero Tech Congress – Seattle (USA) – Washington State Convention – www.sae.org/events/atc/

22-25 Sept. • **3AF/AIAA** – ANERS 2015 – Aircraft Noise and Emissions Reduction Symposium – La Rochelle (France) www.3af.fr

23-24 Sept. • **IATA** – 11th Maintenance Conference – Miami (USA) – Tumberry Isle – www.iata.org/events/

23-24 Sept. • **SENER** – ESMATS 2015 – Bilbao (Spain) – E.J. Conference Centre – www.esmats.eu/bilbao/Index.php

23-25 Sept. • **RAeS** – Conference Flight Crew Instruction, Selection, Skills & Supply – London (UK) - RAeS/HQ www.aerosociety.com/Events

23-24 Sept. • **3AF/AIAA/CEAS** – X-Noise/CEAS Workshop - La Rochelle (France) – www.3af.fr

29-30 Sept. • **ATAG** – Global Sustainable Aviation Summit – Geneva (Switzerland) – Starling Hotel www.enviro.aero.summit

30 Sept.-02 Oct. • **SESAR JU** – ATTCCS 2015 – Toulouse (France) – Université Paul Sabatier www.sesarju.eu/newsroom/events/

07-08 October • **RAeS** – President's Conference 2015 – UAS + Detect & Avoid workshop – London (UK) - RAeS/HQ www.aerosociety.com/Events

12-15 October • **NATO/STO** – NATO Conference Future Rotorcraft Requirements – Prague (Czech Republic) www.cso.nato.int

CEAS – the Council of European Aerospace Societies – will host its 2015 Air & Space conference in Delft (NL).

CEAS 2015 will be a unique opportunity for aerospace industries, academia, organizations and associations to communicate, share and debate innovative concepts and technical solutions in the aerospace domain.

CEAS 2015 will promote the establishment of knowledge and technical networks with the aim of increasing European competitiveness in the field of aerospace.

The EU-funded project AFLoNext *2nd generation active wing* will organize a **workshop** as a partner in the CEAS 2015 conference on flow control technologies for novel aircraft configurations.
The 12th European **Workshop** on Aircraft Design Education (*EWADE*) will be held during the CEAS 2015 conference.
IN2SAI events aim at bringing science and industry closer to women in science and aerospace.

Conference programme

Inspiring and influential speakers have chosen the CEAS conference to share perspectives that are relevant to you and your organization during 7 plenary sessions:

Challenges for the European Aeronautical Industry

- Hans Buethker (Chairman & CEO Fokker Technologies)

Challenges for European Access to Space

- Franco Ongaro (Director TEC & head ESA-ESTEC)
- Arnaud de Jong (CEO Airbus Defense and Space Netherlands)

Challenges to the European Airlines

- Athar Husain Khan (CEO Association of European Airlines AEA)
- Peter Hartman (Vice-chairman Board of AirFrance/KLM)

Challenges in realizing a Single European Sky

- Florian Guillermet (Director SESAR JU)
- Paul Riemens (CEO LVNL)

Challenges to the European Aerospace Research and Research Infrastructure

- Eric Dautriat (Executive Director CleanSky)
- Rolf Henke (Member DLR Executive Board)
- Michel Peters (CEO NLR)

Challenges to European Aerospace Education

- Hester Bijl (Dean TU Delft, Faculty of Aerospace Engineering)
- Frithjof Weber (Head of Knowledge and Competence Management Airbus)
- Franco Bernelli (Politecnico di Milano, Aerospace Science and Technology)

Challenges to the European Air Power in Asymmetric Conflicts

- CDRE Peter Round (Director Capability EDA)
- Lt-Gen Sander Schnitger (Commander Royal Netherlands Air Force).

205 Technical papers have been selected for publication and presentation by aerospace scientists and engineers from 25 different nations around the world to disseminate the latest scientific knowledge and research.

Technical visits

Four alternative technical tours to places of interest like major R&D centers (ESA-ESTEC and NLR), the TU Delft and aerospace industry (Fokker Aerostructures) are offered.

esa NLR NVvL TU Delft

CHALLENGES IN EUROPEAN AEROSPACE

Register @ www.ceas2015.org