The Quarterly Bulletin of the CEAS

COUNCIL OF EUROPEAN AEROSPACE SOCIETIES

3AF AIAE AIDAA AAAR CzAeS DGLR FTF HAES NVvL PSAA RAeS SVFW TsAGI

Issue 1 - 2017
1st Quarter

Multi-dome base being constructed

INTERVIEW WITH PROF. BERNARD FOING, SENIOR SCIENTIST AND MOONMARS EXPLORER AT ESA/ESTEC

- MOON VILLAGE – HUMANS AND ROBOTS TOGETHER ON THE MOON
- IS A MOON VILLAGE THE NEXT STEP FOR SPACE EXPLORATION?

WHAT IS 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 thirteen Full Member Societies: 3AF (France), AIAE (Spain), AIDAA (Italy), AAAR (Romania), CzAeS (Czech Republic), DGLR (Germany), FTF (Sweden), HAES (Greece), NVvL (Netherlands), PSAA (Poland), RAeS (United Kingdom), SVFW (Switzerland), TsAGI (Russia); and six Corporate Members: ESA, EASA, EUROCONTROL, LAETA, VKI and EUROAVIA..
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:
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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

Relationships at a European Level:

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

European Professional Recognition:

- Directory of European Professionals

Honours and Awards:

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

Young Professional Aerospace Forum

Sponsoring

THE CEAS MANAGEMENT BOARD

It is structured as follows:

- General Functions: President, Director General, Finance, External Relations & Publications, Awards and Membership.

- Two Technical Branches:
  – Aeronautics Branch
  – Space Branch

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

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EDITORIAL

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

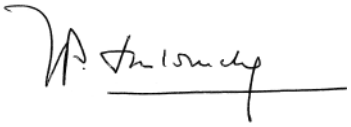
"Dear readers,

This issue 1-2017 of our Quarterly Bulletin is rather dense, having tried to cover in a balanced manner all topics: Life of CEAS – with notably the 2016 CEAS Annual Report - Aeronautical Sciences, Civil Aviation, Defence, and Space.

The Aeronautical Sciences are dealt with in three papers: a long interview with Dietrich Knörzer, former Senior Scientific Officer in the Aviation Unit of the Directorate of Transport Research within the Directorate General for Research & Innovation at the EC, a summary report on the 6th EASN (European Aeronautics Science Network) International Conference on Innovation in Aeronautics Research – October 2016 – by Prof. Spiros Pantekalis , Chairman of EASN, and a summary of EREA (association of European research Establishments in Aeronautics) position on Horizon 2020 Interim Evaluation as well as on European Innovation Council (EIC), by Dr Uwe Möller, EREA Secretary.

Two articles are relating to Civil Aviation: an interview with Philippe Merlo, Director of ATM at EUROCONTROL, and an abstract of the presentation delivered in 2016 on the occasion of a Conference by Michel Wachenheim, Special Advisor to Airbus CEO, whose title was: "The industry has to take major interest in international institutions".
The Air and Space Academy (AAE) had published in 2015 an Opinion Paper calling for a strong reinforcement of the role of the European Defence Agency (EDA) which suggests reviving cooperation in the area of new armament developments by taking as an example the successful "optional programmes" of the European Space Agency (ESA). Similar arrangements would give the EDA a new and decisive role in proposing and implementing such programmes. At a time when the construction of a strong and united European Defence is more than ever a strategic and urgent necessity, the presentation of a summary of this study by Gérard Brachet, Head of AAE's Defence Commission, is particularly opportune.
The interview with Prof. Bernard Foing, senior scientist and MOONMARS explorer at ESA/ESTEC, provides the reader with a precise view on 'Moon Village – Humans and robots together on the Moon ', a vision for an open architecture and an international community initiative, a next step for space exploration.
Paolo Burzigotti from ESA/ESTEC describes 'Iris', the satellite which will provide as early as 2018 the technology for the air-ground communications for future air traffic management (ATM), an important programme being developed within the framework of the recent Memorandum of Understanding between ESA and SESAR Joint Undertaking.

I wish you a good reading!"



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CEAS PRESIDENT'S MESSAGE

Christophe Hermans,
CEAS President 2017

Dear CEAS society members and other readers,

I'm honoured having been elected as CEAS Board of Trustees president 2017. Before introducing myself shortly, I would like to take the opportunity to thank the outgoing president Fred Abbink, who served CEAS for seven years, the last three of which as president. During his presidency, CEAS strengthened its ties with various European organisations and new members were welcomed.

Some ten years ago, I became a member of the CEAS Board of Trustees, representing NVvL and since six years I'm coordinating activities of the CEAS Aeronautics branch. As deputy director of the German Dutch Wind tunnels and Chief Technology Advisor of the Netherlands Aerospace Center, I'm dealing on a daily basis with the challenges of aeronautics, technology development and knowledge dissemination. CEAS and its member societies at a national scale all are instrumental for this.

European aerospace and aviation is at the foreground of technological innovation and efforts focus on meeting ambitious environmental targets. To defend and increase this position in an era of fast emerging innovative technologies beyond the traditional aerospace domain, Chinese ambition to develop a world class aerospace industry and changes in the geopolitical landscape (EU-skepticism, protectionism in US) calls for a continued and consolidated European investment in research and technology.

In this respect it is even more important that CEAS continues its efforts on harmonizing, strengthening, promoting and facilitating effective knowledge transfer and information exchange at a European level with engagement of students and young engineers.

Our Aerospace Europe community, its dissemination platform, our top-class journals, thematic events and of course our biennial conferences are cornerstones of activities from us and our valued partners. I think CEAS is well placed to continue making important contributions, the Aerospace Europe CEAS 2017 conference in Bucharest being one of them, in maintaining the strength of the European aeronautics and space communities.

Christophe Hermans

CEAS ANNUAL REPORT 2016

By Fred Abbink, CEAS President 2016

ANNIVERSARY OF CEAS MEMBER SOCIETIES

The year 2016 was a special year for three of our Member Societies:

- The Royal Aeronautical Society (RAeS) celebrated its 150th anniversary;
- The Netherlands Association of Aeronautical Engineers (NVvL) celebrated its 75th anniversary;
- The Aeronautics and Astronautics Association of Romania (AAAR) celebrated its 10th anniversary.

CEAS congratulates its Member Societies with these events.

CEAS ACTIVITIES IN 2016

In 2016 CEAS has worked on the following main subjects:

- Implementation of the CEAS Strategy 2015-2020;
- Membership and European Strategy;
- European Collaborative Dissemination of Aeronautical Research and Applications ECAero-2;
- Knowledge dissemination;
- CEAS Journals and Bulletin;
- Education and students/young professionals;
- CEAS Awards;
- Election of new President and Officers.

CEAS STRATEGY IMPLEMENTATION

The important points in the CEAS Strategy are:

- to increase the number of CEAS Members, Corporate Members and strengthen the links with for CEAS important European organisations through MoUs;
- to strengthen the relation with the European organisations, as JU Clean Sky, JU SESAR, EREA, EDA, EASA, etc.;
- to strengthen the links with the European aerospace universities and student/young professionals;
- And to promote the CEAS Journals as an important vehicle for the peer-reviewed publication of European aerospace articles.

MEMBERSHIP AND EUROPEAN STRATEGY

In March 2016 a Memorandum of Understanding between the European Aeronautical Science Network Association (EASN) and CEAS was signed by EASN Vice-President Zdobyslaw Goraj and me. The EASN-CEAS MoU strongly strengthens the link with the European Universities and opens the way to further joint organization of conferences and workshops.

This event increases the number of CEAS MoUs to 7 (ICAS, AIAA, AAE, CSA, KSAS, EREA and EASN).

In September 2016 Eurocontrol became a CEAS Corporate

Member. This increased the number of Corporate Members to 6 (ESA, EASA, Eurocontrol, Euroavia, Laeta and VKI).
In 2016 the links with the MoU partners were strengthened by active contacts. Dedicated meetings took place to inform the MoU partners about the CEAS activities and to investigate the possibilities for increased cooperation in the organization of conferences and the use of the CEAS Journals for knowledge dissemination with the Aerospace Academy, ICAS, AIAA, KSAS, EASN and EREA.
At the ICAS Conference in Daejeon also contacts were made with the Chinese Society of Aeronautics and Astronautics and with the Associacao Brasileira de Engnharia (Brasil).

EUROPEAN COLLABORATIVE DISSEMINATION OF AERONAUTICAL RESEARCH AND APPLICATIONS E-CAero 2

CEAS, together with the E-CAero 2 partners EUCASS, CIMNE, ERCOFTAC, EUROMECH and EUROTURBO have worked on the EU Project European Collaborative Dissemination of Aeronautical Research and Applications (E-CAero2).
The E-CAero2 project (2014-2017) funded within H2020 is the natural follow-up of the E-CAero project (2009-2013) developed within FP7: it involves the same partners (ECCOMAS, ERCOFTAC, CEAS, EUCASS, EUROMECH and EUROTURBO) and its main objectives can be summarized as:

- improved communication between associations;
- implementation of a common logistic platform that should provide a more visible European label;
- common policy regarding aeronautical events and publications;
- better synchronized conference events;
- scientific expertise better aggregated to conferences;
- events organised in cooperation between associations;
- and vision for common journal and publishing policy.

Many of the objectives of E-CAero2 have been realised.
In order to define a name, image and structure for the newly to be created Europe- wide coordination mechanism for the dissemination of knowledge in aerospace through conferences, events and publications, CEAS has defined its mission. Based on the outcome of an assessment of the major activities of the involved societies, CEAS drafted a proposal for the brand name, image and structure of the new community, that has been approved by all project partners and is called '**Aerospace Europe**'. In parallel CEAS has actively supported ECAero2 partners in making available numerous papers, presented at our conferences for open access publication on the Aerospace Europe platform (http://aerospace-europe.eu/).
CEAS had intensive discussions with EUCASS about the possibility of the E-CAero 2 intended joint Aerospace Europe conference in 2017. But in spring 2016 EUCASS decided to hold its EUCASS Conference in July 2017 in Milano. Since January 2016 the CEAS Member Society AAAR is preparing for the Aerospace Europe/CEAS 2017 conference to be held in October 2017 in Bucharest, Romania.
On December 1 and 2 an ECaero2 meeting was held in Amsterdam. To this meeting also EASN was invited to see if and how EASN could contribute to the ECAero2 objectives. EASN had announced that it would organise an aeronautical congress in September 2017, increasing the number of European Aerospace Congresses to3. After the E-CAero 2 meeting it was decided that CEAS would organize a meeting with its MoU partner EASN as well as a meeting with is Member Society AAAR to see how to improve the situation for 2017 and the years after.

On December 19, 2016 CEAS and EASN held a strategic meeting in Munich. The result was that EASN and CEAS decided to upgrade their existing CEAS-EASN MoU into a CEAS-EASN Cooperation Agreement towards the joint organization of Aerospace Europe Congresses as well as specialist Congresses and to form a joint CEAS-EASN Scientific/Technical Committee for these congresses, starting in 2018.
With respect to the coordination of the EASN and CEAS congresses in 2017 the discussion is still on-going.

KNOWLEDGE DISSEMINATION

CEAS actively participated in the following general international and European Aeronautical Conferences:

- 2nd Polish Brazilian Conference in Warsaw on September 7. CEAS delivered a keynote lecture and a lecture on wind tunnel testing;
- 30th Congress of the International Council of the Aeronautical Science ICAS in Daejeon Korea, from 25-30 September. Over 40% of the overall 500 presented papers were submitted by the CEAS Member Societies. CEAS participated actively in the ICAS Programme Committee;
- 2nd Greener Aviation Conference in Brussels from 11-13 October. CEAS delivered a keynote lecture. CEAS participated actively in the Greener Aviation Programme Committee.

CEAS Specialist Conferences on Aeronautical subjects were:

- The AIAA-CEAS-3AF Aeroacoustics Conference in Lyon from 30 May till 1 June;
- 42th European Rotorcraft Forum ERF 2016 in Lille from 5 to 8 September.

CEAS Specialist Conferences on Space subjects were:

- European Space Components Conference ESCCON in Noordwijk from 1 to 3 March.
- 6th International Conference on Astrodynamic Tools and Techniques ICATT in Darmstadt from 14 to17 March.

CEAS JOURNALS AND BULLETIN

The CEAS Aeronautical and Space Journals play an important role in allowing authors in the nations of the CEAS Member Societies to publish their papers in a peer-reviewed journal. In 2016 the CEAS Aeronautical Journal published 4 issues with 45 peer-reviewed papers and the CEAS Space Journal 4 issues with in total peer-reviewed 27 papers. This was made possible by the great support and leadership of Christophe Hermans (CEAS Branch Chief Aeronautics) and

Constantinos Stavrinides (CEAS Branch Chief Space) and their Technical Committee chairs and supporting staff of DLR (amongst others Cornelia Hillenherms) and ESA (Willi Kordula). The CEAS Journals have now applied for indexing in SCOPUS (Elsevier) which has the largest database of peer-reviewed literature.

In the EREA Board meeting in December 2016 CEAS gave a presentation of all the activities in the context of the CEAS-EREA MoU. CEAS and the Association of European Research Establishments in Aeronautical EREA discussed how the CEAS Journals should be used to publish the peer-reviewed papers of the 14 EREA Research Establishments.
In a special meeting with EASN in December the possibilities of using the CEAS Journals as a means of publishing their peer-reviewed papers of the many workshops and conferences was also discussed.

Four quarterly Issues of the CEAS Bulletin were published. Jean-Pierre Sanfourche (Editor-in-Chiefof) plays an essential role in the realization of this important "Face of CEAS". The CEAS Bulletin amongst others contains interesting articles on actual aerospace subjects and a listing of all important upcoming aerospace events and conferences. The CEAS Bulletins and Aeronautical and Space Journals are excellent ways to increase the visibility of CEAS.

EDUCATION AND STUDENTS/YOUNG PROFESSIONALS

One of the strategic objectives of CEAS is the involvement of students and young professionals.
Since a long time Euroavia is one of the CEAS Corporate Members. CEAS was also involved in links with the Universities through EASN and the PERSEUS project. Through its conferences and international network and its CEAS Journals, CEAS provides students and young professionals the possibility to present on conferences, to publish in peer-reviewed journals and to meet European and international colleagues and experts. The EASN-CEAS Cooperation Agreement will further strengthen the link with CEAS and the academic world, including the students and young professionals.

CEAS AWARDS

- On November 28 in London, during the Royal Aeronautical Society Awards Ceremony, CEAS presented the CEAS Gold Award 2016 to Dr Gordon McConnell.
- The CEAS Technical Award 2016 was presented to the BlueCopter team.
- The CEAS Distinguished Service Award was presented to Dr Constantinos Stavrinidis for his great support to CEAS, his contributions to the CEAS Biennial conferences and his chairmanship of the CEAS Space Branch and chief editorship of the CEAS Space Journal.
- Under the leadership of Kaj Lundahl, CEAS Vice-President Awards and Membership, the selection of the recipient of the CEAS Gold Medal 2017 was prepared and executed. It will be presented in 2017 to Eric Dautriat, former Executive Director of the Clean Sky Joint Undertaking.

GENERAL ASSEMBLY AND BOARD OF TRUSTEES MEETINGS

In 2016 one General Assembly meeting (London Nov 28) and four Board of Trustees (BoT) meetings (Barcelona, March 14-15, St Petersburg, June 9 - Feb. 28, Warsaw, September 6 and London, Nov 28) were held.
During the General Assembly meeting unanimously Christophe Hermans was elected as the CEAS President for 2017. Ad interim he will also hold the post of CEAS Aeronautical Branch Chairman.
As new CEAS Space Branch, Mr. Torben K. Henriksen was elected. Mr. Henriksen is Head of Mechanical Department of the Directorate of Technology, Engineering and Quality of ESA.
Mr. Torben K. Henriksen succeeds Dr. Constantinos Stavrinidis. Dr. Stavrinidis has very actively contributed to CEAS and the CEAS Board of Trustees for 15 years. Since 2011 he was also the Chief Editor of the CEAS Space Journal. The function of Chief Editor of the CEAS Space Journal will be taken over by Prof. Hansjörg Dittus (DLR Executive Board Member for Space Research and Technology).

BOOK ON 25 YEARS OF CEAS

In 1992 the Confederation of European Aerospace Societies (CEAS) was constituted. At that time CEAS consisted of the Member Societies of the UK, France, Germany, Italy, Spain, The Netherlands, Sweden and Switzerland. In 2006 it was decided to transform CEAS from a Confederation into a Council of European Aerospace Societies. To celebrate 25 years of CEAS in 2017, it was decided to ask Prof. Keith Hayward from the Royal Aeronautical Society to write a book on 25 years of CEAS. At the BoT meeting in London on November 28, Prof. Hayward gave a short presentation on the progress of his activities with respect to the writing of the book.

A WORD OF THANKS

I want to sincerely thank all the CEAS Trustees for their great support in 2016 (and the years before). It was an honour and a pleasure to work in the CEAS Board of Trustees for 7 years, of which the last 3 years as CEAS President. We have made quite some progress in the last three years. MoUs were made with EREA and EASN, new Corporate Members were welcomed (EASA and Eurocontrol) and contacts with the MoU partners were strengthened. Through the E-CAero2 project the links with the EU were strengthened. CEAS provided keynote presentations at the EU Aerodays, the Greener Aviation Conferences in Brussels and at a large number of other conferences. In 2015 we held the successful 5th CEAS Aerospace Conference in Delft. The CEAS journals are increasing in content and impact. This work was only possible because of the great support of the CEAS Officers, the Director and all the other Board Members. Aspecial thanks goes to Mercedes Oliver-Herrero (and her employer Airbus) for her outstanding work as CEAS General Director and for her great support given to me.
It was great to be CEAS President and to work in the CEAS

BoTs but it is good that a younger person now takes over the function of CEAS President.
I know Christophe Hermans, the elected CEAS President, for over 30 years. He has been active in the CEAS Board of Trustees for 10 years, and is CEAS Branch Chief Aeronautics since 2010. He has great experience in the leading of Programme Committees and organiSing conferences. He has a broad aerospace knowledge and an extensive network. I am sure that with the help of the officers, director and board members he is the right person to lead CEAS in 2017. I wish the new CEAS President, its Board of Trustees members and all the other members of the CEAS family a very successful 2017.

AEROSPACE EUROPE CEAS CONFERENCE 2017

By Leonard Trifu, INCDT – COMOTI, Bucharest

Here below is summarized the status report of the upcoming Aerospace Europe CEAS Conference 2017:

- **Date:** 16 to 20 October 2017
- **Venue and Accommodation:** palace of the Parliament, 2-4 Izvor St., Sector 5, 050563, Bucharest, Romania
- **Organisation Committee - Point of Contact:** Dr Ionut Porumbel, phone +40.720.090.772, or +40.214.340.240 – Email: ionut.porumbel@comoti.ro
- **Programme:**

– Plenary Sessions – At least 12 Keynote speakers
– Special Technical Sessions for:
  > each CEAS Partner Society (EUCASS, ECCOMAS, EUROMECH, EUROTURBO, ERCOFTAC)
  > Clean Sky and SESAR
  > ACARE
  > Defence
  > Space
– Several Workshops, among which “Constant volume and distributed combustion” organised by COMOTI and “Latest results obtained in FP7 project TIDE”.
– 175 presentations grouped in 8 Plenary Sessions and 25 Parallel Technical Sessions.

Exhibition:

– Exhibition space (300 m^2) is available during the Conference for interested participants and it is located in the Palace of the Parliament building, in the main lobby, next to the registration

- **Key Dates:**

– **Closure of Extended Abstract Submission:** 31 March 2017
– **Review Decision and invitation for Full Paper Submission:** 30 April 2017
– **Early bird registration deadline:** 15 July 2017-02-07
– **Full Paper submission deadline:** 1st September 2017-02-07
– **Registration closed:** 10 September 2017
– **Final Conference programme:** 15 September 2017
– **Conference:** 16 to 20 October 2017

- **Publication Policy:** Book of Abstracts published and provided to registered participants in both hard copies and in electronic format – Aerospace Europe CEAS 2017 Conference Proceedings including the full papers will be published as a special edition of an indexed journal.

- **Social Events:** Welcome cocktail – Conference Dinner – Classical music concert

- **Technical visits:** 5 technical visits are scheduled for the last conference day, aiming to introduce the participants to the most important research and industrial organisations active in aviation and space in Romania.

- **Website:** www.CEAS2017.org

SCIENTIFIC PUBLICATIONS BY CEAS

By Cornelia Hillenherms

The **CEAS Aeronautical Journal** and the **CEAS Space Journal** were created under the umbrella of CEAS to provide an appropriate platform for excellent scientific publications. The German Aerospace Center (DLR) and the European Space Agency (ESA) support the Journals.

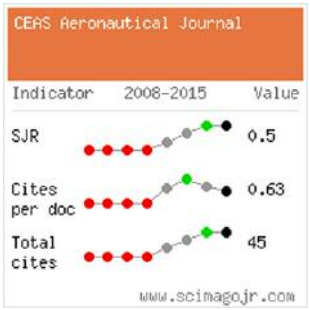
Both journals are devoted to publishing high-quality research papers on new developments and outstanding results in all areas of aeronautics-related / space-related science and technology, including important spin-off capabilities and applications.

As such the journals disseminate knowledge, promote aerospace research particularly in Europe, e.g. from current EU framework programmes, and foster the transfer of knowledge into practice.

The journals are published regularly with four issues per year. In 2016, authors from 14 / 13 different (also non-European) countries have submitted 117 / 41 manuscripts to the CEAS Aeronautical / Space Journal.

All articles are peer-reviewed by at least two independent qualified reviewers selected by highly competent field editors. Open access publication is optional (Springer Open Choice).

The journal subscription rate for members of CEAS member societies is 60 €/year (excl. VAT) – please contact your CEAS representative.

	CEAS Aeronautical Journal	CEAS Space Journal
Editor-in-Chief	Rolf Henke, DLR	Hansjörg Dittus, DLR
Managing Editor(s)	Cornelia Hillenherms, DLR	Wilhelm Kordulla (ESA), Torben Henriksen (ESA), Olga Trivailo (DLR)
Editorial Board	Peter Bearman, RAeS, London Hansjörg Dittus, DLR, Cologne Paolo Gaudenzi, AIDAA, Rome Christophe Hermans, NVvL, Amsterdam Johan Steelant, ESA, Noordwijk Triantafillos Tsitinidis, HAES, Athens	Peter Bearman, RAeS, London Paolo Gaudenzi, AIDAA, Rome Rolf Henke, DLR, Cologne Christophe Hermans, NVvL, Amsterdam Johan Steelant, ESA, Noordwijk Triantafillos Tsitinidis, HAES, Athens
Coverage	Aeroacoustics, aeroelasticity and structural mechanics, air transport systems, aircraft design, flight guidance and air traffic management, flight mechanics and flight control, flight physics and aerodynamics, propulsion, structures and materials	Structures, Thermal, ECLS, Mechanisms, Robotics, Propulsion, Aerothermodynamics, GNC, Power, Mission design and space systems, Satellite communication, Physical fluid dynamics, Materials, Optics, Optoelectronics and Photonics
Volumes	7 (2011 – 2016)	8 (2011 – 2016)
Issues[1]	20	18
Published Articles[1]	225	129
Full-text Article Downloads[2]	43336	31725
SCImago Journal Rank (SJR)[3]		
Source Normalized Impact per Paper	1,433	1,006
H-Index	6	5
WWW	http://www.springer.com/13272	http://www.springer.com/12567
Paper Submission	https://www.editorialmanager.com/canj	https://www.editorialmanager.com/ceas
ISSN	18695582 (print), 18695590 (online)	18682502 (print), 18682510 (online)
Abstracting / Indexing	SCOPUS, Google Scholar, EI-Compendex, SCImago, OCLC, Summon by ProQuest, etc.	
Publisher	Springer Science + Business Media	
Senior Editor	Silvia Schilgerius, Springer Nature, Vienna	

1. 2011-2016 2. 2012-2016 3. SCImago Journal Rank (SJR) is a measure of scientific influence of scholarly journals that accounts for both the number of citations received by a journal and the importance or prestige of the journals where such citations come from (source: http://www.journalmetrics.com)

INTERVIEW WITH DIETRICH KNOERZER

By Jean-Pierre Sanfourche, Chief Editor of the CEAS Quarterly Bulletin.

Dietrich Knoerzer, former Senior Scientific Officer in the Aviation Unit of the Directorate of Transport Research within the Directorate General for Research & Innovation, retired in December 2016.

Question 1 – *After having spent 28 years always working hard to push the aeronautical research & technology development programmes within the European Commission, could you briefly recall the main events that stood out as landmarks since the beginnings of the process in 1989?*

In 1989/1990 the first very important step was the experience of joint cooperative projects of research institutions and aeronautics companies of Europe, which were often competitors on the market. For the first time they all got public funding from the EU and they learnt sharing know-how for achieving the technological progress jointly faster than individually. Researchers and engineers from different culture and languages learnt to work together and to generate together new knowledge. Soon European projects as ELFIN for drag reduction or LOWNOX for NOx reduction of aero-engines brought Europe's companies in the lead for the critical technologies. Later with TANGO the break-through for composites wing and fuselage technologies was achieved, applied in the Airbus A380 and A350.

The most significant landmark was probably the announcement of the Vision 2020 at the Aerodays 2001 in Hamburg. This European Vision 2020 for Aeronautics was established by a high-level group of personalities under the Research Commissioner Philippe Busquin and announced challenging goals for aviation in Europe that got people in the USA by surprise and made them quite nervous. Vision 2020 initialised the Advisory Council for Aeronautics Research in Europe (ACARE) that created the Strategic Research Agenda (SRA), which gave guidance not only to the work programmes of aeronautics research within the EU Framework Programme but also for national research initiatives. The third major milestone was the launch of the Joint Technology Initiative Clean Sky within the 7th Research Framework Programme of the EU. The idea behind it was to bridge the gap between research and product development by large integrated technology demonstrators towards a high technology readiness level (TRL 7). Today Clean Sky addresses even a broader range of TRL in many aeronautics areas.

Question 2 – *What is your judgement about the implementation of "Horizon 2020" today? Do you think that new initiatives and efforts would have to be taken in order to reach all the goals?*

In "Horizon 2020" aviation research is performed in different activities: the joint technology initiative Clean Sky, the SESAR Joint Undertaking for air traffic management research, collaborative research within the Transport Programme managed by the Commission agency INEA and specific technologies in the different Thematic Programmes of "Horizon 2020". In "Horizon 2020" the budget of Clean Sky and SESAR was significantly increased on the expense of the collaborative research, which has less than half of the budget of FP7, although these collaborative projects were the back-bones of aeronautics research within the Framework Programmes.

The challenge remains to coordinate all these activities in line with the European initiatives such as the 'European Strategy for Low-Emission Mobility' published in July 2016 or the updated ACARE 'Strategic Research and Innovation Agenda' that will be published this year.

For the follow-on Framework Programme (FP9) in my view a balanced budget will be needed between upstream and break-through research, the 'classical' collaborative research including integrated projects and the large technology demonstration through Clean Sky.

Question 3 – *What is your view about Brexit's consequences on the EC functioning and more particularly on Research Framework Programme management and its aeronautics activities?*

First, the Brexit's consequences will be seen only, when the British Government submitted its official letter and both sides completed the following negotiations. The Research Framework Programme of the EU has already several associated countries that are not Member States of the EU (e. g. Norway, Israel, Turkey). They contribute financially to the Framework Programme allowing their research institutions and industry the participation similar to those from the EU. I believe that both sides will be wise enough to find here a solution, as cooperation in areas as aeronautics is very much interconnected between British organisations and those within the EU.

Question 4 – *Flightpath 2050 goals are even more ambitious than those of 'Vision 2020': what are the measures to be taken at short- and mid-term time horizon in order to realise them?*

Indeed, the goals of Flightpath 2050 are really ambitious. In my view, two of them should have priority by additional short and medium term measures: the CO_2 reduction per passenger kilometre and the competitiveness of Europe's aviation industry. Not only since COP21 in December 2015 in Paris the limitation of global warming is a world-wide issue, to which a high-tech sector as aviation has also to contribute. Additional measures for enhanced greening technologies are needed such as significant drag reduction, advanced light-weight structures, enhanced fuel and energy efficiency, bio-fuel for aviation, hybrid-propulsion and probably new break-through technologies. Efforts are done already, e. g. by Clean Sky, but more is needed for sure.

The second challenging goal is Europe's industrial compe-

titiveness under an increasing competitive thread especially from up-rising economies. The digitalisation of the production and the handling of big data are only two examples. The remaining calls for proposals of "Horizon 2020" should give priority to this.

Question 5 – *Many people believe a closer and closer cooperation between the European Commission and European Defence Agency (EDA) of the European Council is absolutely necessary for conducting future R&TD programmes for both civil and military aeronautics in an efficient synergy approach: is such a process being initiated today?*
There are considerations for conducting future R&TD programmes for both civil and military issues, not only in aeronautics. Especially EDA is pressing for it. Indeed there are many dual use technologies (e.g. materials, IT, production technologies, etc.), and more cooperation in defence research is needed within the EU. Today the Framework Programme permits already the development of technologies with a dual use character. The European Commission speaks in its communication of December 2016, the 'European Defence Action Plan' about a "research window" to fund collaborative defence research projects at the EU level as part of the new multiannual financial framework (after 2020). I personally believe that any specific defence research should take place within a dedicated programme that includes also aeronautics activities, similar to the programme on security research within Horizon 2020. Integrating dedicated defence related research with the civil research bears the risk of a strong competition from the defence industry suffering under limited national defence budgets with the others that have to earn their money on the highly competitive civil market.

Question 6 - *You are the instigator of the E-CAero project aiming at rationalising the coordination between all scientific aeronautical associations in Europe: what is your judgement about the present situation, on the one hand, and on the other hand about the efforts that remain to be accomplished?*
In the Aeronautics Research Unit of the European Commission we saw the need of better coordination of public activities of Europe's aerospace related associations, in particular in the view of the quite fragmented aerospace conference scene of Europe. For years we observed that many EU-funded projects preferred to present their results at the large international AIAA conferences in the USA rather than at medium size aerospace events in Europe that hardly exceed 500 participants. Therefore the support action E-CAero was stimulated. The cooperation on technical issues works already well, but the main goal, the merging of the larger conferences failed until now. In 2017 there will be three competing events: the EUCASS-conference in July in Milan, the EASN-conference in September in Warsaw and the CEAS-conference 'Aerospace Europe' supported also by E-CAero in October in Bucharest. In future there should be only one large European aerospace conference, to which the involved associations contribute with their experiences. My hope to achieve this already for 2017 failed. The reasons are mainly financial issues and fears to lose its own identity.

Question 7 – *In my view a fantastic progress would be achieved if CEAS and EUCASS could merge: CEAS more particularly oriented towards policy, strategy and programmatic aspects, whilst advanced science and technology would be the responsibility of EUCASS. Do you share my opinion? If yes what would be your recommendations to rapidly reach this objective?*
I see the role of CEAS and EUCASS complementary: CEAS is the council of the European national associations such as AAAF (France), DGLR (Germany) or RAeS (United Kingdom), which often have a long tradition and many activities on national level. EUCASS is a quite young European scientific network with the main objective to organise its bi-annual conference. Indeed, while CEAS addresses aerospace policy and programmatic aspects together with its national member associations, EUCASS could contribute its experience for a future bi-annual joint aerospace conference by joining the council CEAS as an international conference association. For such a European conference, in my view, CEAS and its member associations should enhance in order to ensure its success and even a world-wide recognition.

Question 8 – *Personally the image I have in my mind is a CEAS being the counterpart of AIAA for Europe, and the present CEAS Quarterly Bulletin becoming the equivalent of Aerospace America (title of our magazine: "Aerospace Europe". How do you react to my vision?*
This is an ambitious vision and I wish it will become reality one day. Of course, it is more difficult in Europe, where the CEAS member associations have often a long tradition on national level. Closer trans-national cooperation would be needed and probably a direct CEAS membership e. g. for individuals that have no national aerospace association of their country. With an increasing importance of CEAS, its European journal – then probably called 'Aerospace Europe' – could become attractive for aerospace enthusiasts from all over Europe and beyond. I believe, Europe is in the position to provide many interesting news and events of aerospace, and an 'Aerospace Europe' conference could reach a similar importance as the AIAA events.

Question 9 – *Knowing you for many years, I imagine that you will remain extremely active in European aerospace business: am I right? So could you reveal your projects?*
For sure I will keep my interest and curiosity in aeronautics and its technologies. For many years I had a very interesting job with aeronautics in the European Commission, but my interest in aeronautics started long-time before.
My idea is now some work with universities e. g. in the form of seminars, by this with the young generation. I also plan to make my knowledge used e. g. by acting as an aeronautics expert. Then I intend to continue my activities as a glider pilot with the academic flying club FVA of the RWTH Aachen University.

6TH EASN ASSOCIATION INTERNATIONAL CONFERENCE ON INNOVATION IN EUROPEAN AERONAUTICS RESEARCH

Between the 18th and 21st of October 2016 the **European Aeronautics Science Network** carried out successfully its 6th annual international gathering which took place at the Crowne Plaza Porto Hotel in Portugal, co-organised with the **Institute of Science and Innovation in Mechanical and Industrial Engineering** (INEGI) of the University of Porto (FEUP).

The annually organised EASN International conferences, aim to share high quality, current achievements and new upstream ideas for future research and in the same time to offer their participants a forum to meet and present to the European aeronautics community their latest achievements and capabilities. In this frame, the 2016 gathering proved to be a unique opportunity for the participants to obtain an overview of the recent advancements. The 6th EASN International Conference, the largest of its kind, included **11 Thematic Workshops and 28 Technical Sessions** where more than **250 participants** from **30 countries** had the chance to attend the presentations given by more than **210 speakers** in a variety of topics stretching from Materials, Structures and NDT to Multidisciplinary Design Optimisation, Power Generation and Storage.

More than 170 abstracts were submitted while more than 70 full papers were published in the Conference's proceedings and a number of selected papers will be published in international journals following peer review. The international journals in which full papers of the 6th EASN International Conference will be published are: "The Journal of Aerospace Engineering" (JAERO), the "International Journal of Structural Integrity" (IJSI), the "Aircraft Engineering and Aerospace Technology" (AEAT) and the "Fatigue & Fracture of Engineering Materials & Structures" (FFEMS).

During the four days gathering, distinguished Key-Note guests updated the delegates about the future Industrial trends and the European priorities with respect to the medium and long-term goals. Among others, European Commission's Dr. **Dietrich Knoerzer** spoke about "*Global Challenges to Aviation – A Need for Advanced Technologies*" and the Project Officer of CSJU, Dr. **Jean-Francois Brouckaert** presented the "*Clean Sky Academy Initiative: How to better involve students in Europe's largest Research Program for Aeronautics*". Prof. **Ray Whitford** from Cranfield Shrivenham spoke about "**Aerodynamic Crutches**" while Dr. **Markus Fischer** from Airbus made a presentation on "*Research on High Technologies for the Large Passenger Aircraft of Tomorrow- CleanSky2, Large Passenger Aircraft*". Mrs. **Valerie Guenon** V.P. of Safran, shared her viewpoint on "*The past 15 years and the next 15 years of European Aviation Research, an industry perspective*" and Clean Sky's Dr. **Giuseppe Pagnano** focused on "*Sustainable development in Aeronautics – Role & Perspectives of the Clean Sky Initiative*". Finally Dr. **Jose Rui Marcelino**, PEMAS President, set the scene of the "*Portuguese aerospace industry*".

From left to right, Prof. Spiros Pantelakis, Chairman of the EASN and Dr. Dietrich Knoerzer former senior Scientific Officer in the Aviation Unit of the Directorate of Transport Research within the Directorate General for Research & Innovation.

Finally and responding to the increasing interest from the

From left to right, Clean Sky's Dr. Giuseppe Pagnano, Mrs. Valerie Guenon V.P. of Safran and Dr. Markus Fischer from Airbus.

European Aeronautics Community for a scientific event which offers a forum for discussion and exchange of information about state-of-the-art research and development activities in Aeronautics and Air Transport, EASN has announced its **7th annual International Conference on Innovation in European Aeronautics Research** to be held on **September 26 – 29, 2017** at the **Conference Centre of the Polish Institute of Aviation** co-organised with the **Aircraft Design Department of the Warsaw University of Technology**. The 7th EASN International Conference aims to build on the success of the series of EASN events by becoming an even broader and even more comprehensive gathering. The conference will include **Plenary Talks** by renowned guests and **Roundtable Discussions** with key-figures from the academia, industry, research community and policy makers. It will also include **Thematic Sessions** on a series of domains and disciplines of A&AT along with Technical Workshops where evolving ideas, technologies, products, services and processes will be discussed. As always, the 7 EASN Conference is designed to foster the cooperation and interaction between participants on a multidisciplinary basis serving as a platform for sharing your research activities and exchanging novel ideas for future research with a relative pan-European and global audience. The event is structured in a way that enhances the interaction and presents an excellent opportunity for networking and creating new synergies for future collaborations on a bilateral basis or in the frame of multilateral projects.

Updated information will be posted on a regular basis on the conference's minisite.

Visit the minisite of the 7th EASN International Conference on www.easnconference.eu

EREA POSITION ON HORIZON 2020 INTERIM EVALUATION

Executive Summary and Key Messages

Achieving the EU´s blueprint of smart, sustainable and inclusive growths and jobs, there is an essential need to invest in research and innovation while covering the entire research and innovation chain from TRL levels 1 to 8-9. This starts from novel ideas that emanate from basic research and continue via technology development, technology validation, and system demonstration up to the final development of an innovative product, which can be sold successfully on the market. This approach is crucial to address the grand societal challenges like sustainable energy supply, climate change and sustainable, safe and secure transport.

EREA continues to see Europe and the investment in research and innovation as one of the key global drivers to tackle the grand societal challenges and better equip European citizens, industry and society as a whole for the future. Subsequently, we envisage a stronger commitment of all stakeholders towards a bright future of European research and innovation. This includes a stronger commitment of member states and the European Commission to a more extensive and large Framework Programme to succeed Horizon 2020. Regarding the implementation of Horizon 2020 and subsequent Framework Programmes EREA continues to be supporter of further simplification for users and calls for an early agreement on the rules of participation of all research granting programmes allowing a more balanced approach between trust and controls.

In detail EREA recommends:

- *To support the entire research and innovation chain with appropriate instruments such as ERC, collaborative research, and PPPs/JTIs. Instruments to support Innovation like EIC using financial instruments (loans) should be set-up only in addition to the current support schemes;*
- *To continue the approach of more precisely outlined WP topics as done in WP2016-2017. A restricted success in the first step is needed to ensure a dedicated success rate of 30 to 40% in the second step;*
- *To better align programming and funding rules of the different EU-funds to allow for better coherence and synergies.*

EREA Registered in the EU Transparency-Register under No. 010397411668-54

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AIT (AT) – CSEM (CH) - CEiiA (PT) –CIRA (IT) – DLR (DE) – FOI (SE) – ILOT (PL) – INCAS (RO) – INTA (ES) – ITWL (PL) – NLR (NL) – ONERA (FR) – TsAGI (RU) – VKI (BE) – VZLU (CZ)

EREA AND PEGASUS JOINT POSITION PAPER ON H2020 INTERIM EVALUATION

Executive Summary and Key Messages

In order to keep the innovation thrust in aerospace alive, we must invest in education and long term research. But to be able to achieve the EU´s blueprint of smart, sustainable transportation while maintaining inclusive growth and jobs, there is an essential need to invest in research and innovation covering the entire research and innovation chain from TRL levels 1 to 8-9. This approach is crucial to address the grand societal challenges like sustainable energy supply, climate change, and sustainable, safe and secure transport. Scientific research is an important key in enabling the sector to reach the goals it put forward in the ambitious ACARE Flightpath 2050. Currently, however, regarding Transport, the European funding opportunities focus on higher TRL level research and ready-to-market technology.

We continue to see Europe and the investment in research and innovation as one of the key global drivers to tackle the grand societal challenges and better equip European citizens, industry and society as a whole for the future. Subsequently, we envisage a stronger commitment of all stakeholders towards a bright future of European research and innovation. This includes a stronger commitment of member states and the European Commission to a more extensive and large Framework Programme to succeed Horizon 2020.

Regarding the implementation of Horizon 2020 and subsequent Framework Programmes we fully support further

simplification for users and call for an early agreement on the rules of participation of all research granting programmes allowing a more balanced approach between trust and control.

Our recommendations:

- *To set the right example by dedicating a considerable part of the budget and efforts to the European Research and Innovation Framework Programmes encouraging excellence and close collaboration between actors;*
- *To support the entire research and innovation chain with appropriate instruments such as ERC, collaborative research, and PPPs/JTIs. Instruments to support Innovation like EIC using financial instruments (loans) should be set up only in addition to the current support schemes;*
- To ensure the continuance of bottom-up low-TRL research in the future;
- *To earmark a larger portion of the funding for collaborative research on TRL levels 1 to 4, which will keep the invaluable innovation and human capital source for one of Europe's most strategic sectors vibrant and bring in new ideas for the technological base of the European Industry;*
- *To continue the approach of more precisely outlined WP topics as done in WP2016-2017. A restricted success in the first step is needed to ensure a dedicated success rate of 30 to 40% in the second step;*
- *To better align programming and funding rules of different EU-funds to allow for better coherence and synergies.*

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PARTNERSHIP OF A EUROPEAN GROUP OF AERONAUTICS AND SPACE UNIVERSITIES

The Partnership of a European Group of Aeronautics and Space UniversitieS (PEGASUS) is a network of aeronautical universities in Europe created in order to facilitate student exchanges and collaborative research between universities. It has been originally created by the groupement des écoles aéronautiques françaises (group of French aeronautical grandes écoles) (ENAC, ENSMA and ISAE) in 1998. The European manufacturers like Airbus have close contact with PEGASUS network.

Member universities

The network consists of 25 universities in 10 countries:

Czech Republic:
– Czech Technical University in Prague

France:
– École de l'air
– École nationale de l'aviation civile (ENAC)
– École nationale supérieure de mécanique et d'aérotechnique (ISAE - ENSMA)
– ISAE - SUPAERO

Germany:
– RWTH Aachen University
– Berlin Institute of Technology
– Braunschweig University of Technology
– Dresden University of Technology
– University of Stuttgart

Italy:
– Polytechnic University of Milan
– Polytechnic University of Turin
– University of Naples Federico II
– Sapienza University of Rome
– University of Pisa

Netherlands:
– Delft University of Technology

Poland:
– Warsaw University of Technology

Portugal:
– Instituto Superior Técnico

Spain:
– Technical University of Madrid
– Technical University of Valencia
– University of Seville

Sweden:
– Royal Institute of Technology

United Kingdom:
– Cranfield University
– University of Bristol
– University of Glasgow

EREA POSITION ON EUROPEAN INNOVATION COUNCIL

Need to invest in research and innovation while covering the entire research and innovation chain.

Because of lacking natural resources the only way for Europe to maintain its worldwide leading position in the global competition is to ensure a continuous flow of new innovative ideas and products. These will also help to address the societal challenges like sustainable energy, sustainable transport and climate change.

Except in the ICT Sector most sectors in particular aviation, transport and energy have experienced long lasting research and development chains as well as long product cycles. To ensure innovation in these sectors the entire research and innovation line needs to be well covered. This starts from bright new ideas that emanate from basic research and continue via technology development, technology validation, system demonstration up to the final development of an innovative product, which can be sold successfully on the market and covering the entire TRL line from 1 to 9.

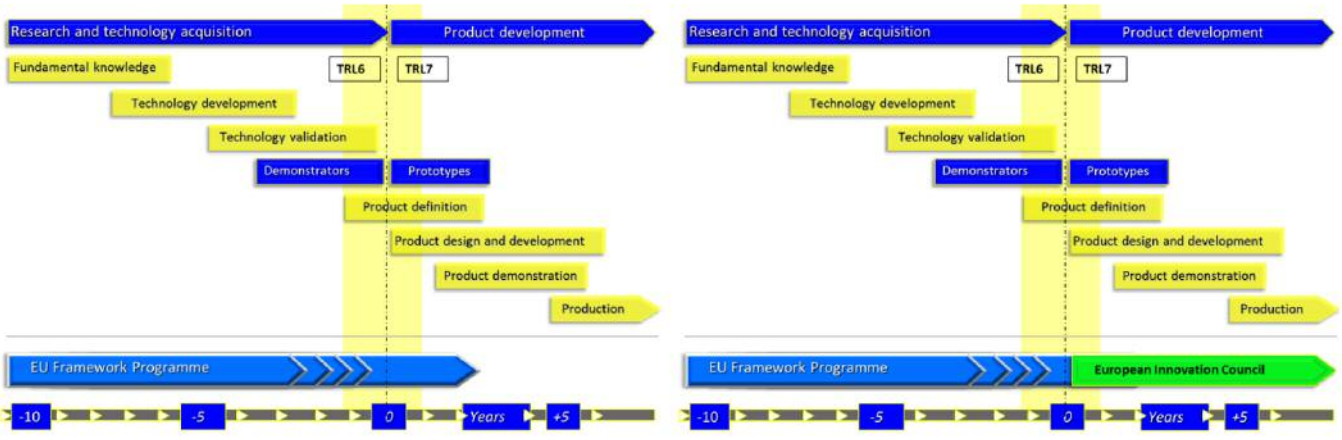
On European scale the steps from basic research (TRL1) up to system demonstration (TRL6) are covered appropriately by ERC, RT&D collaborative research and the system demonstration in Joint Technology Initiatives like Clean Sky, SESAR and FCH-JTI. However, similar as on national level on European scale there are only few instruments to cover the so called valley of death, in which companies will have to deploy the demonstrated technologies into the final successful product. A European Innovation Council could be the right instrument to support industry and enterprises on higher TRLs from 7 to 9.

European Innovation Council

As start-ups, spin-offs and so called unicorns need to make fast progress, processes for a faster and simplified financing of innovations can be made available via the EIC. It could offer grants and loans for seed investments and spin-offs, keeping in mind that it targets close-to-market research where a high probability of a return on investment within 2 to 5 years is given. Companies, especially start-ups and SME, face difficulties to learn about and understand the funding mechanisms. To address this, the EIC should act as focal point, providing all relevant information and be recognized as the main organization dealing with innovation in this segment of the innovation chain. In case of coexistence with other bodies, as European Institute of Innovation and Technology (EIT), respective roles should be clearly identified: overlapping and confusion should be avoided. Furthermore simple and lean processes for application, eligibility conditions, technical and cost reporting should be established. Efforts should be focused on technical progress rather than burdensome administrative procedures. The EIC should set a specific, effective and clear governance structure, incorporating all stakeholders in its decision process and giving the possibility to ensure that the EIC orientation meets the private stakeholders' expectations. Existing instruments, which are currently fragmented into several funding mechanisms, e.g. SME instrument, COSME, Fast-Track-to-Innovation, should be merged into a single instance that is clearly separated from the RT&D collaborative research. Synergies with the structural funds or European Fund for Strategic Investments could be highlighted with a precise procedure and guidelines on ways to take advantage of those synergies effectively. To prevent establishing silos for industry, research organizations and universities, the EIC should also provide funding for collaborative research carried out by industry and academia.

The European Innovation Council does not diminish the need for funding collaborative research carried out by Industries, SMEs, research organisations and universities.

As the whole research and innovation chain must be funded in the years to come, the European Research Council (ERC), the European Innovation Council and the European Investment Bank (EIB) cannot be the only pillars for funding



EIC as complementary instrument on European scale

and financing in Horizon 2020 or future framework programmes. In order to avoid silos between the various research and innovation stakeholders the ERC should neither be the only instrument for fundamental research nor should the EIC be an exclusive club for industry and technology transfer organisations. There is a strong need for funding research in TRL 1-6 to generate knowledge and innovations.

In a similar way a set of appropriate instruments (small and medium sized collaborative research projects to develop new technologies and large collaborative projects/programmes for system demonstration) are needed to push forward excellent ideas and generate research results in order to build the sound technology basis for a competitive European industry. This means that funding for fundamental research should not be relegated only to the European Research Council, but should be actively supported throughout other program areas of Horizon 2020 as well as future framework programmes, in order to guarantee the continuity of collaborative research in all thematic areas and throughout the entire innovation chain.

Conclusion

Consequently, the EC's idea is supported to complement the existing European funding instruments ERC, collaborative research, JTIs/PPPs with an European Innovation Council as a one-stop shop for innovators starting with a Technology Readiness Level of 7 or higher. It is crucial that this additional instrument flanks existing instruments and does not weaken them by reducing their resources. The entire research and innovation chain must be covered by European support to ensure in the long run a continuous development of new innovative products and processes, hence creating growth and jobs in Europe.

EREA Registered in the EU Transparency-Register under No. 010397411668-54

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INTERVIEW WITH EUROCONTROL

Jean-Pierre Sanfourche, Chief Editor of the CEAS Quarterly Bulletin has interviewed Philippe Merlo, EUROCONTROL Representative at CEAS

Philippe Merlo joined EUROCONTROL as Director ATM in February 2014. He is responsible for the areas of ATM, Research & Development, including the respective relations to international bodies such as ICAO.

He has spent all his career in ATM, having worked for the Directorate General for Civil Aviation (DGAC, France) since graduating from Ecole Nationale de l'Aviation Civile (ENAC, France), holding a number of successive senior posts.

He has a degree in engineering from Ecole Polytechnique and a degree in civil aviation from Ecole Nationale de l'Aviation Civile (ENAC).

Question 1

Could you sum up in some words the present status of EUROCONTROL functioning reviewing briefly among others: (i) the relationships with National Authorities, Air Navigation Service Providers, Civil airspace users, Military airspace users and Airports; (ii) the relationships with ICAO, FAA and NATO?

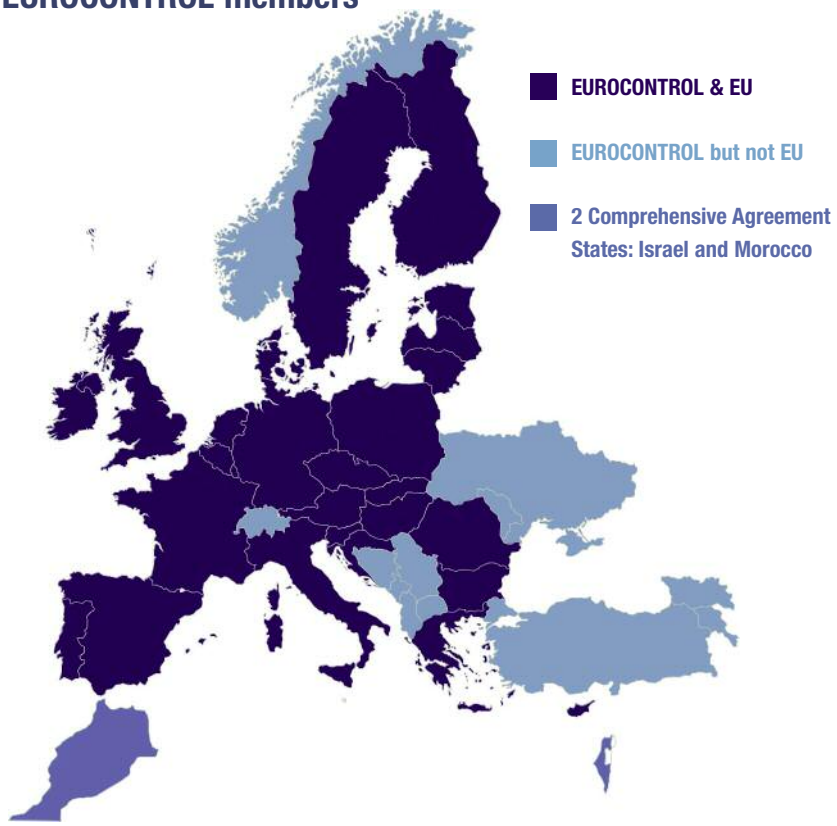
EUROCONTROL is a civil-military intergovernmental organisation, created 50 years ago, to enhance the integration of Air Traffic Management in Europe. The Aviation National Authorities are our stakeholders. Due to our key role in ATM R&D and in Network Management, EUROCONTROL has strong relationship with all European Air Navigation Service Providers (ANSP). EUROCONTROL is itself also an ANSP managing the ATC centre of Maastricht, right in the middle of the European air traffic core area and covering the upper airspace in four countries. Our key stakeholders also include the airlines, the airports associations, and the representatives of national military users. Civil-military coordination is always a challenge and EUROCONTROL play a key role in bridging the gap. As a centre of ATM expertise in Europe, EUROCONTROL is instrumental in international ATM cooperation with FAA, ICAO and NATO. Many of our Member States rely on EUROCONTROL to represent them in these bodies.

Question 2

EUROCONTROL counts today 41 Member States: are other nations coming in the future?

On 29 April and 2 June 2016 EUROCONTROL signed Comprehensive Agreements with Morocco and Israel giving them the status of quasi-members (all rights of a full member except for voting). This comprehensive agreement model could possibly be extended, in the future, to other Mediterranean States.

EUROCONTROL members



Question 3

How BREXIT's consequences are being approached?

The impact of the BREXIT is still difficult to evaluate as the exact terms of the UK leaving the European Union are not known yet. The BREXIT decision does not directly impact UK membership in EUROCONTROL which is an intergovernmental organisation not directly linked to EU.

In this context UK as a member of EUROCONTROL will continue to contribute to EUROCONTROL's commitment to building the Single European Sky.

The impact of Brexit on UK's participation in the SESAR programme still needs to be analysed.

Question 4

As regards the very important SES Programme:

– What are exactly the parts of its regulations the EU has delegated to EUROCONTROL?

The European Commission is fully in charge of the regulations steering the Single European Sky Policy, and its technical pillar, the SESAR programme. No delegation has been given to EUROCONTROL in that field. However, within the SES framework defined by the EC, EUROCONTROL has been entrusted with the following key roles:

– The Network Manager function in charge of coordinating Air Traffic Flow and Capacity Management and the allocation of scarce resources; it is also joint chair of the European Aviation Crisis Coordination Cell

– Founding member of the SESAR Joint Undertaking together with the European Commission; as a principal European centre of expertise in the ATM field, EUROCONTROL is also the largest contributor to the SESAR programme. One of our key roles is the maintenance of the SESAR Masterplan and architecture, providing the capability to define and propose mature and coherent batches of SESAR deployment.

– The support to the Performance Review Body through the Performance Review Unit; EUROCONTROL has been instrumental in developing a specific expertise in ATM performance assessment.

The European Commission is presently a permanent observer in EUROCONTROL's governance and a process is underway to enhance this role. EUROCONTROL has established a strong partnership with all the other European ATM bodies: European Aviation Safety Agency (EASA), SESAR Joint Undertaking (SJU), SESAR Development Manager (SDM), European Defence Agency (EDA), and Performance Review Board (PRB).

How responsibilities are being shared and managed between EUROCONTROL and EASA?

EASA is today fully in charge of the ATM regulation in the European Union. Consequently, EUROCONTROL's activities in the regulatory field have been significantly downsized. Today, we only keep a small team able to provide regulatory advice and support to our non EU Member States. Our cooperation with EASA is based on the principle of separation between the provider and the regulator. EUROCONTROL is now clearly on the provider's side with our Network Manager role and, in this capacity, it provides its ATM expertise to many EASA rule making taskforces.

What are the main technical research tasks assigned to the Experimental Centre (Brétigny)?

Our Experimental Centre in Brétigny is our main facility for contributing to the SESAR R&D programme. It hosts around 150 ATM experts (70 more are based in Brussels) and a unique set of ATC simulation and validation platforms. These systems are versatile enough to replicate all the ATC systems existing in Europe, able to cover all the different phases of flight, from air traffic flow preparation to taxiing on airport, take-off and landing, climb and descent, and cruise. There is also a cockpit simulator to consider the pilot perspective. This gives the Brétigny Experimental Centre a leading role in many SESAR projects, in particular the following:

- Increased runway and airport throughput
- Enhanced safety nets for en-route traffic and TMA operations
- Optimised airspace user operations
- Advanced airspace management
- Advanced demand/capacity balancing – DCB
- Network collaborative management

EUROCONTROL supports SESAR Research and Innovation actions from exploratory research to large scale demonstration projects. However, industrial research projects form the bulk of its contribution and we focus on high potential research actions to improve the performance of the European network and aviation's global interoperability.

Question 5

EUROCONTROL, ESA and the EC signed an agreement formalising cooperation in the realm of satellite navigation systems and services: (i) what is the status of the current thoughts and perspectives; (ii) what are the perspectives presently foreseeable thanks to GALILEO?

Galileo and EGNOS are developed and managed by the EC, ESA and the GSA. Two years ago, EUROCONTROL signed a cooperation agreement with the GSA to provide them with some support in better understanding the aviation and ATC operational needs for satellite navigation. EUROCONTROL also represents the European position in several ICAO panels and working groups where the world wide standards are defined for the use of satellite navigation by aviation. In the coming years we will see the introduction of multi-constellation and multi-frequency receivers that will significantly enhance the precision, reliability and resilience of the satellite navigation signals. However, equipage of the airline fleet can only happen progressively and will take time.

Question 6

Would it be possible to highlight the present Innovative Technologies and Productivity Enhancements being pushed by EUROCONTROL, most notably in the ATM domain?

On the technical side, the main objective is to develop and implement a SWIM based architecture (System Wide Information Management) connecting all the European ATM key players and systems to the same ATM communication network. The development of all the SWIM standards is a major achievement of SESAR. Each individual ATM component should be able to contact all the others, with all the possibilities offered by the new internet technologies. This would greatly improve the potential efficiency of ATM, clearing the way for tighter collaboration decision making and easier sharing of ATM information. This would also enable the emergence of more modular and efficient infrastructure, allowing remote connection between terminals and central data servers (virtual centre, remote tower). The development of such an advanced architecture and infrastructure is necessary to enable the implementation of trajectory based operations (free flights, business trajectory, advanced PBN based TMA trajectories), the main operational benefit targeted by SESAR.

Question 7

What are the present most important initiatives being undertaken by EUROCONTROL concerning Security improvement?

EUROCONTROL is instrumental in supporting the civil-military European cooperation in the field of Aviation Security, making sure that a good coordination is also established with NATO. The following two objectives could be highlighted:

– Identifying the critical ATM assets that must be protected at all times, as part of a threat and risk assessment process;
– Developing a common Cyber-Security plan to protect these critical ATM assets from Cyber-attacks.

EUROCONTROL has in particular proposed to develop two centralised services closely connected to Cyber-Security; the first one to distribute private and public confidential keys in order to enable authentication of all ATM players connected to the ATM communication network; the second one to implement an ATM computer emergency response team (CERT) associated with a Security Operational Centre (SOC) able to detect Cyber-attacks and coordinate quickly the reaction plan.

Question 8

Same question regarding Safety?

Regarding Safety, EUROCONTROL, in its Network Manager role, closely follows safety performance indicators, federates the ATM safety perspective and cooperation among service providers, and develops safety analysis and safety cases before presenting them to the oversight and certification of EASA. The work done on reduction on wake vortex exemplifies the kind of efficient cooperation with EASA; the safety case was developed by EUROCONTROL but with an early involvement of EASA. Once mature, it was sent to EASA for approval and quickly signed.

Question 9

What are the main advances do you expect from the upcoming World ATM Congress 2017 (Madrid, 7-9 March)?

The next WAC in Madrid will focus on the progress of the SESAR program, integration of drones in the airspace, and the implementation of a Cyber-Security infrastructure to protect the ATM network.

Question 10

Would you agree to let us know your major objectives for the Year 2017?

Among the many challenges for EUROCONTROL in 2017, I would stress the following ones:

1. Successfully prepare for the re-nomination of EUROCONTROL as Network Manager;
2. Consolidate the cooperation between EASA and EUROCONTROL by the finalisation of a common ATM Safety Roadmap;
3. Successfully launch our S2020 projects;
4. Support the safe and rapid development of the drone sector.

CIVIL AVIATION: THE INDUSTRY HAS TO TAKE MAJOR INTEREST IN INTERNATIONAL INSTITUTIONS

On 12-16 april 2016, took place in Paris the Aegats '16 Conference: advanced aircraft efficiency in a global air transport system. This conference focused on proactive best possible ways to enhance aircraft efficiency in a global air transport system, whilst maintaining a high level of proficiency of all the players.
Among the messages delivered during this conference:
«EUROPEAN AERONAUTICAL INDUSTRY HAS TO TAKE MAJOR INTEREST IN INTERNATIONAL INSTITUTIONS: WHY?" by Michel Wachenheim

His presentation, which is here below briefly summarized highlighting the most important points.

The air transport's deregulation, settled in the USA as early as 1978 then in Europe in 1988, constitutes the basis of the international air transport policy. However markets' liberalization is still today faced with many barriers, which strike the airlines at first but also impact the other actors of the chain, particularly the airports and the aircraft manufacturers. The latter should therefore keep abreast of air transport evolutions much better than in the past and involve themselves in the debates relating with international civil aviation policy.

The European aeronautical industry has not completely understood yet how much it is important to be present at right level and active within relevant international institutions, in first rank of them the ICAO (International Civil Aviation Organisation), when the US industry dominates for a long time this organisation. Presently a high number of worldwide aeronautical stakes are dealt with at ICAO, the only forum that allows a debate involving all countries in the world.
Now in this worldwide debate the European States do not weigh as much as they should do, because of the absence of institutional recognition of the European Union (EU) and of the European Aviation Safety Agency (EASA) on the one hand, and on the other hand, of the progressive disappearing of national administrations' expertise, their competences being transferred at community level whilst at the same time national budgets are being reduced.
The European aeronautical industry must therefore involve itself in the debates.

INTERNATIONAL CIVIL AVIATION GOVERNANCE

Air transport is bound by firm requirements in matter of safety that enforce very high worldwide normalisation and interoperability rules. Since 1944 Chicago Conference those firm requirements have been extended to security as well as to environment's protection. Short Safety, security and Environment have become the main OACI strategic axes.
This worldwide coordination at States level goes together with an analogous coordination of the different aviation economic operators: IATA (international Air Transport Association), ACI (Airports Council International), CANSO (Civil Air Navigation Services Organisation), ICCAIA (International Coordinating of Aerospace Industries Association), IBAC (International Business Aviation Council), etc.
The main trades specific to aviation are also coordinated at world level: IFALPA (International Federation of Airlines Pilots Associations), IFATCA (International Federation of Air Traffic Safety Electronics Associations), etc.
After having enlightened the present by describing the historical evolution which has led to today governance and by exposing the basic principles of 1944 Chicago Conference, Michel Wachenheim explained in detail the ICAO's role and governance. After that he presented the international aviation geopolitics: power influence relations within ICAO and evolvement of worldwide power balances that reinforce its role.
He continued his presentation by reviewing the reasons of European weakening: the EU's paradoxes and complexities, the fact that Europeans are no longer interested in occupying posts at ICAO, and at last the negative effect of the EU-ETS (EU – Emission Trading System) regulation related to climate change, which has been unilaterally established outside ICAO and in non-conformity with Chicago Convention.
ICAO is of strategic importance for the European aeronautical industry, why? The rules adopted at ICAO are at the basis of all national regulations, consequently if we want to exercise an influence on their elaborations, the actors of industry must be present at ICAO. The stakes are quite high and concern all most basic aspects: air transport security and safety, Air Traffic Management (ATM), environment's protection, and other subjects linked with air transport politics.
Aeronautical industry is represented within ICCAIA (International Coordinating Council of Aerospace Industry Associations) at international level and at European level within ASD (AeroSpace and Defence Industries Associations of Europe) and EUROCAE.
In the end after having presented the EASA, Michel Wachenheim concluded as follows:
"*The European aeronautical industry has several reasons for trying to increase its influence in the EASA and to firmly support it:*

• *EASA was created to support the European aeronautical industry by establishing European navigability certificates based upon a European security/safety regulation: this objective must remain priority holder;*

• EASA, even if it cannot formally represent Europe at multilateral level (OACI), is in charge of making known European positions in the discussions related to international regulation: the States are on the track not to dispose longer of the expertise needed and to have therefore henceforth the possibility to rely on a strong, competent and reactive Agency."

Michel Wachenheim, former Civil Aviation General Director (DGAC – France) and former Director of the Cabinet of French Minister of Transport, was from 2009 to 2013 Ambassador, representing France on the Council of ICAO. Since 2014 he is Special Advisor to Airbus CEO.

HOW COULD THE EUROPEAN DEFENCE AGENCY PLAY ITS ROLE TO THE FULLEST? [1]

By Gérard Brachet

Gérard BRACHET is consultant in space policy.
After having been President of the Air and Space Academy from 2009 to 2012, he is presently Chairman of the Defence Commission of this Institution. He is Member of the International Academy of Astronautics (IAA) and Honorary Secretary of the International Astronautical Federation (IAF).
Among most recent positions in his career:
- 1997 to 2002: Director General of CNES (French Space Agency).
- From 2003 onwards, consultant on space policy issues and space applications, advising industry and government institutions, in particular the European Commission and the European Space Agency. He is Research Associate at Fondation pour la Recherche Stratégique (FRS), Paris.
- June 2006 to June 2008, chairman of the United Nations Committee for the Peaceful Uses of Outer Space (UN COPUOS).
- 2012 - 2013, expert from France in the Group of Governmental Experts (GGE) set up by the Secretary General of the United Nations to develop "Transparency and Confidence Building Measures" in outer space.

Gérard Brachet is graduated from ISAE-SUPAERO (1967) and received in 1968 the Master of Sciences in Aeronautics and Astronautics from the University of Washington.
Gérard Brachet is Officier de l'Ordre National du Mérite and Officier de la Légion d'Honneur.

The Académie de l'air et de l'espace/Air and Space Academy regularly publishes "Dossiers",which reflect the outcome and recommendations from the conferences that it organizes, and "Opinions" which are elaborated by one of its commissions on issues of interest in the fields of Air and Space. Both Dossiers and Opinions are formally endorsed by the full membership of the Academy. The Defence Commission was particularly active over the last few years, elaborating three Opinion papers published by the Academy: Opinion No. 5, published in 2013, entitled "Recommendations to avoid a strategic downgrading of Europe in the field of Combat Aviation", Opinion No. 6, published in 2015, entitled "Enabling the European Defence Agency to play its role to the fullest", and Opinion No. 7, published in 2016, entitled "A robust management system for joint European defence programmes". This paper focuses on Opinion No. 6 of the Air and Space Academy, which calls for a strong reinforcement of the role of the European Defence Agency.
Gérard Brachet,
President, Defence Commission,
Air and Space Academy

Summary
Attempts to construct a true European defence and provide Europe and its Member States with the means for real military sovereignty have so far met with failure. Apart from the A400M (which eventually came about despite the difficulties inherent to any multinational programme) and some helicopter, frigate and missile programmes, joint developments have unfortunately been on the wane in the past decade and a strong new impulse would seem to be imperative if Europe is to dispose of effective defence systems. The Academy believes that such an impulse would require a redefinition and reinforcement of the role of the European Defence Agency (EDA). The EDA was created initially to play an important role in this area and its initial analysis of capabilities met with general approval, but its limited means and the very strict limitations imposed by certain Member States consigned it to an almost marginal role in proposing and managing new programmes.
The European Defence Agency should have complete freedom of initiative to suggest the development of new weapons systems to any Member States who may be interested. Its proposals could be based on the progress anticipa-

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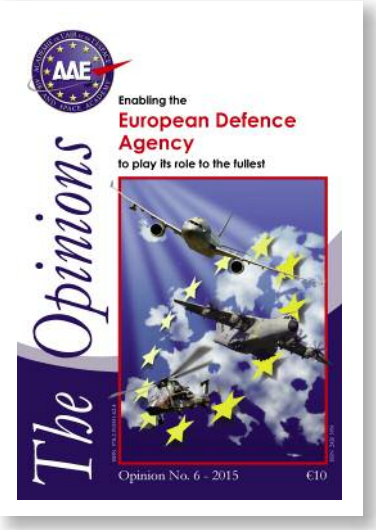
ted in terms of harmonising operational needs.
The main objective is here to facilitate the joint development of weapons systems in all fields. The example of ESA's organisation for optional programmes can be directly transposed here. Indeed, the role and methods of the European Space Agency (ESA), which have enabled Europe to acquire an enviable position in the space sector, could provide an interesting example.
After deciding on a new opt-in development programme with variable geometry, the management of the programme should logically be entrusted to a programme management team belonging to EDA. However, since EDA has limited programme management capabilities it could in certain cases fall back on OCCAR (Organisation Conjointe de Coopération en matière d'ARmement) with which it concluded a cooperation agreement in 2012. Indeed OCCAR, whose purpose is to manage and conduct new weapon systems programmes decided by its Member States and which has acquired a solid experience in this area could act on EDA's behalf as a programme manager by delegation. Such an arrangement would be similar to that practiced by the European Commission with ESA for management of the EU space programmes Galileo and Copernicus.
In its founding texts, the European Defence Agency has a broad power for initiative which until now has been difficult to implement. The Agency is however, in its very essence, a fundamental element for implementing European cooperation in the area of armaments, which is more than ever necessary.



Revived cooperation in the area of new developments would be likely to significantly enhance and strengthen European defence. The successful example of ESA's optional programmes may be a promising way forward; the proposal is thus to give the European Defence Agency a new, decisive role in proposing and implementing such programmes.

Full text

It must be acknowledged that attempts to construct a true European defence and provide Europe and its Member States with the means for real military sovereignty have so far met with failure. Despite considerable expenditure and over a million personnel in the armed services, the 28 armies of the 28 European states, acting separately, with insufficient and often incompatible means, do not provide any of the States in question, much less Europe, with a real defence on a level with the threats that are emerging today.
The absence of political will on the part of the governments of the Member States of the European Union to build a shared military sovereignty, the only effective substitute for the illusion of national sovereignties, is leading to a glaring political and economic waste over the whole of the European Union.
It is essential for Europe's long-term survival to turn this situation around and inconceivable to concede defeat. But one should perhaps be realistic, accept that the initial objective may have been too ambitious given the highly nationalistic vision which prevails currently in many Member States, and search for the means to improve Europe's defence capability stage by stage.
It would be less politically sensitive for instance to harmonise and develop future arms systems cooperatively between several States. This would nonetheless represent a considerable saving for all State budgets, on condition of setting up determined, disciplined management, particularly important in a period of economic crisis leading to cuts in defence budgets. Such an initiative would provide Europe with a greater number of effective weapons systems and constitute a sound basis for later development of reinforced joint operational actions. A dynamic policy in this area is alone capable of contributing decisively to stabilising the European defence industry.
Leaving aside the A400M (which eventually came about despite the difficulties inherent to any multinational programme) and some helicopter, frigate and missile programmes, joint developments have unfortunately been on the wane in the past decade and a strong new impulse would seem to be imperative if Europe is to dispose of effective defence systems.
Such an impulse would almost certainly require a redefinition and reinforcement of the role of the European Defence Agency (EDA). This agency was created initially to play an important role in this area. Its initial analysis of capabilities met with general approval, but its limited means and the very strict limitations imposed by certain Member States consigned it to an almost marginal role in proposing and managing new programmes.
EDA can only be what its Member States wish it to be. If it is to carry out its role to the fullest, Member States must recognise its mandate for proposing and coordinating initiatives, and allocate the corresponding budget. But this is clearly not the case. The "larger" States often do not wish to share their know-how with the "smaller" States, which anyway have other economic and social priorities (and frequently prefer the easy option of buying from the United States, with political and economic compensations).
Excessive dependence on the US for critical capabilities is very dangerous for Europe in the sense that American interests could differ from those of Europe in the future. The recent strategic shift on the part of the US towards Asia is a good illustration of this.
In order to change this state of events, the role and methods of the European Space Agency (ESA), which have enabled Europe to acquire an enviable position in the space sector, could provide an interesting example. They are sum-

marised below and followed by suggestions for how to transpose them to the functioning of the EDA. Such a transposition is all the more relevant since ESA, which was 3 at the outset explicitly a "peaceful" and not a military organisation, has now taken over certain questions linked to security such as in the Galileo programme (Public Regulated Service, PRS).

The European Space Agency

The European Space Agency (ESA) is an intergovernmental organisation set up in 1975 which aims to **reinforce European capabilities in the space sector**. Its aim is to promote European cooperation in this area, particularly in terms of space research and technologies as well as their applications.

To this end, ESA:

- implements **a long-term European space policy** and encourages its Member States to pursue joint goals in the space domain;
- implements **activities and programmes in the space sector**;
- **coordinates the European space programme and national programmes**;
- **defines the appropriate industrial policy** for ESA programmes, and encourages Member States to carry out a coherent industrial policy.

ESA comprises in 2017, 22 European Member States including Norway and Switzerland, countries not belonging to the European Union, and has signed a cooperation agreement with Canada. Its annual budget is of the order of 3.5 billion €. It is managed by a Council comprising representatives of Member States, which convenes four to five times a year at a level of the civil servants representing Member States, and every two years on a level of Ministers in charge of space in their respective countries. In the latter case it is known as the ESA Ministerial Council.

Two kinds of programme are carried out by ESA:

- a mandatory programme - the Science programme - funded by all Member States on a pro-rata scale based on their national GDP,
- optional programmes involving a limited number of Member States which are free to decide on their level of involvement and funding, the only rule being that the sum of contributions covers the total cost of the programme.

The Science programme is decided each year by the ESA Council on the basis of proposals from a "Science Programme Committee", themselves drawn from recommendations from a consultative committee made up of high-level scientists from the different Member States.

Optional programmes are proposed in different areas (launchers, space station, Earth observation, meteorology, telecommunications, navigation, etc.), more often than not by the ESA Executive. They can be put forward initially by certain Member States, in which case they are analysed by the Executive for presentation to the other Member States. Each optional programme (or group of programmes) is supervised by a Programme Board made up of a representative of each Member State taking part in the programme. This committee has full power to make decisions on technical, financial and calendar issues. It is governed by a specific Agreement or Arrangement drawn up between the different Member States which are participants in the programme. The decision for ESA to embark on an optional programme is ratified on a case by case basis by the Council.

Each programme is managed by a programme management team appointed by the ESA Director General. This team can in certain cases rely on teams from the national space centres (as was the case for launchers, for instance) according to terms set out in the Arrangement between the States taking part in the programme. 4

The European Defence Agency

Possibilities offered by the Agency's founding texts

Elements can be identified in the EDA founding texts ("Joint action" adopted in 2004 and updated in 2011 by the Council's decision 2011/411) on which to found a stronger initiative in the area of new development programmes.

Indeed, EDA has a clear mandate to initiate projects and programmes. The texts (articles 2 and 5) in effect state that the European Defence Agency has a mission to:

- **encourage** a harmonisation of operational needs and the adoption of effective, compatible acquisition methods,
- **propose** multilateral projects,
- **coordinate** and **plan** joint research activities and studies of technical solutions.

In practical terms, Articles 19 and 20 provide for two categories for ad hoc projects or programmes:

- Category A, which concerns all States participating in EDA (with an opt-out option), at the initiative of one or more Member States or the EDA Director.
- Category B, which can include only certain Member States (i.e. with optional participation), on the initiative of the Member States concerned but not the EDA Director.

Therefore the Agency actually has a legal mandate for initiative which it could well put into practice since it is the Agency itself that prepares the annual Work programme for approval by Member States.

It emerges therefore that the statutes provide for the Agency becoming a real force for promoting, proposing and coordinating, missions for which it was created.

The obstacles presented by certain Member States could be overcome by emulating the ESA model. It is indeed interesting to note parallels between on the one hand EDA's category A programmes and the ESA mandatory programme, and on the other hand the category B programmes of EDA and ESA's optional programmes.

Mandatory programme

The notion of mandatory programme within ESA, essentially relating to the Science programme with no equivalent

in the field of Defence, is not easy to transpose to the context of EDA.
There is however a field - that of Research and Technology (R&T) - where a mandatory budget would make real sense and would make a significant contribution to building a European Defence technology base. If EDA were to receive a significant budget (a few hundred million euros) financed by all States on the basis of their GDP without political strings, it would be able to carry out objective action in this field and thus largely contribute to the credibility of the Agency in the eyes of industrialists.
Such a mission for the European Defence Agency could prefigure a future mission comparable to that entrusted to DARPA (Defense Advanced Research Programmes Agency) in the United States, which plays a major role in developing innovation in the country by directing an ambitious policy of research contracts in broad areas of science and technology and by providing venture capital to a multitude of innovative SMEs.
It is probably premature to seek to introduce this component immediately in order to strengthen the role of EDA, and would seem more reasonable to focus on increasing the Agency's freedom of initiative to put forward and develop new weapons systems. When it has achieved concrete results in this area, it will undoubtedly be easier to plead the case for implementing an R & T programme with associated 5 budget, based on partially mandatory (linked to GDP) and partially optional (opt-in) funding as appropriate.

Optional programmes
The main political goal is here to facilitate the joint development of weapons systems in all fields. The example of ESA's organisation for optional programmes can be directly transposed here.
This means that the European Defence Agency should have complete freedom of initiative to suggest the development of new weapons systems to any Member States who may be interested. Its proposals could be based either on the progress anticipated in terms of harmonising operational needs, or on requests from certain States that have identified new needs and wish to put them forward for joint action, or more generally on its overall knowledge of capability needs and the European situation.
On a formal level, the founding texts would be relatively easy to adapt. It would be sufficient to add that category B programmes could also be launched **on the initiative of the Director of the Agency**.

After deciding on a new opt-in development programme with variable geometry, the management of the programme should logically be entrusted to a programme management team belonging to EDA. However since EDA has limited programme management capabilities it could in certain cases fall back on OCCAR (Organisation Conjointe de Coopération en matière d'ARmement) with which it concluded a cooperation agreement in 2012. Indeed OCCAR, whose purpose is to manage and conduct new weapon systems programmes decided by its shareholders (the A400M programme being the most well-known) and which has acquired a solid experience in this area could act on EDA's behalf as a programme manager by delegation. Such an arrangement, at least in its broad outline, would resemble that practised by the European Commission with ESA for management of the EU space programmes Galileo and Copernicus.
In the history of ESA, an identical arrangement was decided for the Ariane programme in the 1970s-1980s, the French space agency CNES then playing the part of programme manager by delegation from ESA because of its experience with the Diamant B programme since ESA did not at the time have the necessary experience in the field of space launchers.
In its founding texts, the European Defence Agency has a broad power for initiative which until now has been difficult to implement. The Agency is however, in its very essence, a fundamental element for implementing European cooperation in the area of armaments, which is more than ever necessary.
Revived cooperation in the area of new development would be likely to significantly enhance and strengthen European defence. The successful example of ESA's optional programmes may be a promising way forward; the proposal is thus to give the European Defence Agency a new, decisive role in proposing and implementing such programmes.

In the event of certain States being reticent about this evolution, a specific "Permanent Structured Co-operation", whose principle was introduced into the Treaty of Lisbon, could unite all States eager to promote this step. It would be governed by an Agreement between these States defining the new role of the Agency to their benefit and specifying how the opt-in, variable geometry optional programmes decided by these States would be set up and managed. The Agreement instituting this PSC should of course receive the ratification of the EDA Steering Board.
The States concerned could, at least initially, be all or some of the signatories to the LOI. Such an approach would finally pave the way to implementation of the intention expressed in the LOI, until now unheeded, to develop programmes in common.
It is essential that a real will emerge to set up a strong structure, possessing a significant budget to launch and manage the key major European programmes to come. It will reinforce the European Defence Technological and Industrial Base (EDTIB) and avoid a greater strategic dependence on the United States.

MOON VILLAGE - HUMANS AND ROBOTS TOGETHER ON THE MOON

INTERVIEW OF PROF. BERNARD FOING, SENIOR SCIENTIST AND MOONMARS EXPLORER AT ESA/ESTEC, BY JEAN-PIERRE SANFOURCHE, EDITOR-IN-CHIEF OF THE CEAS QUARTERLY BULLETIN

Prof. Bernard FOING

Jean-Pierre Sanfourche - The ESA DG has presented in 2016 the quite exciting vision: "Moon Village – Human and Robots together on the Moon". I would like to concentrate my interview with you on the unique advantages the Moon offers to us to perform quite decisive advances in science, technology and also preparation for further human spaceflights.

Bernard Foing – I will answer your questions with much pleasure, but before starting the questions-answers sequence, I feel useful to introduce the subject by saying first of all some introductory words.

Why a Moon Village?

The Moon Village has the ambition to serve a number of objectives (including planetary science, life sciences, astronomy, fundamental research, resources utilisation, human spaceflight, economic development, etc.) to the community and should be the catalyst of new alliances between public and private entities including non-space industries. Additionally, the Moon Village should provide a strong international, capacity building, workforce development and education tool for the younger generations.

This Europe-inspired initiative should rally all communities (across disciplines, nations, industries, partners, individuals) and could put it on the top of political agendas as scientific and technological, but also political and inspirational endeavour for the XXI century.

More details can be found on:

http://www.hou.usra.edu/meetings/leag2016/pdf/5084.pdf

Why the Moon?

The community and stakeholders consider five pillars (each with similar weight 20%):

(1) Inspiration & Education
(2) Science
(3) Technology
(4) Peaceful international cooperation
(5) Innovation & Economical Development

Figure 1 - Multi-dome base being constructed - Released 15/01/2013 at 12:00 pm

Description: Multi-dome lunar base being constructed, based on the 3D printing concept. Once assembled, the inflated domes are covered with a large layer of 3D-printed lunar regolith by robots to help protect the occupants against space radiations and micrometeorites; Copyright: ESA/Foster and Partners

Reference: International Lunar Exploration Working Group (ILEWG)
http://sci.esa/ilewg/47170-gluc-iceum1&-beijing-2010lunar-declaration/

Question 1 – *First of all, it would be interesting for our readers that you recall in a few words the results we got from ESA SMART-1 probe to the Moon, as lead scientist of the mission.*

Bernard Foing – SMART-1 was: (1) the first Small Mission for Advanced Research and Technology – (2) the first ESA mission reaching the Moon and providing first European views of lunar poles – (3) a demonstration of a wide range of new technologies – (4) the first lunar infrared spectrometer and new lunar X-ray spectrometer – (5) an opportunity for lunar science, elemental geochemistry, surface mineralogy mapping – (6) the first controlled impact landing on the Moon with real time observations campaign – (7) the first mission supporting goals of the International Lunar Exploration Working Group (ILEWG) in technical and scientific exchange, international collaboration, public and youth engagement – (8) the first mission preparing the ground foe ESA collaboration in Chandrayaan-1 Chang' E1 and future international lunar exploration, and future Moon Village.
More details can be found on:
https://www.cosmos.esa.int/web/smart-1 and
http://sci.esa.int/smart-1/

Question 2 – *What are the different reasons for which the Moon constitutes an ideal basis for conducting deep space science research programmes?*

B.F. – Science represents 20%. Three categories of researches are to be distinguished:

- **Of the Moon:** for planetary science, geology, geochemistry, sample analysis, history Earth-Moon;
- **On the moon:** life sciences, studying survival and adaptation of bacteria, plants, animals, human physiology, psychology, social sciences;
- **From the Moon:** with fundamental research and astronomy: multi wavelength, radio on far side, SETI (Search for Extra Terrestrial Intelligence).

Question 3 – *Could you present the concepts of the telescopes being presently envisaged, as well as the principles of their installation in a network form?*

B.F. – Different types of instrumentations are being envisaged:

- Simple telescopes such as 20 cm aperture telescope on 'Chang E3' lander observing the sky in UV
- Small telescopes to observe Earth, monitor variable stars or detect inner Earth asteroids;
- Large telescopes placed in cold polar regions for cosmology or observing first stars and galaxies;
- Large rotating liquid mirrors telescopes for deep surveys;
- Interferometric networks concepts were also proposed for hyper resolution or imaging spectroscopy of habitable exo-planets: *http://www.sciencedirect.com/science/article/pii/0273117796000889*
- Radio telescope for far side (quietest protected site from Earth radio pollution) to observe the dark ages of Universe, or SETI.

Question 4 – *What are the advantages of such a lunar astronomical observatory compared with the performances achieved by the present on-ground large telescopes? I assume that a close cooperation between on-ground and lunar observatories will be required?*

B.F. – The poles have coldest places in the Solar System: 50K, which is great to reduce noise for IR observations. The Moon is a stable platform with a transparent sky at all wavelengths due to the absence of atmosphere. We have to take special precautions for installation or operations due to lunar dust.

Question 5 – *I put you the same question concerning James Webb Space Telescope vs Lunar Observatory.*

B.F. – The Lunar observatory will be complementary to JWST and next generation Space Telescopes. It is besides

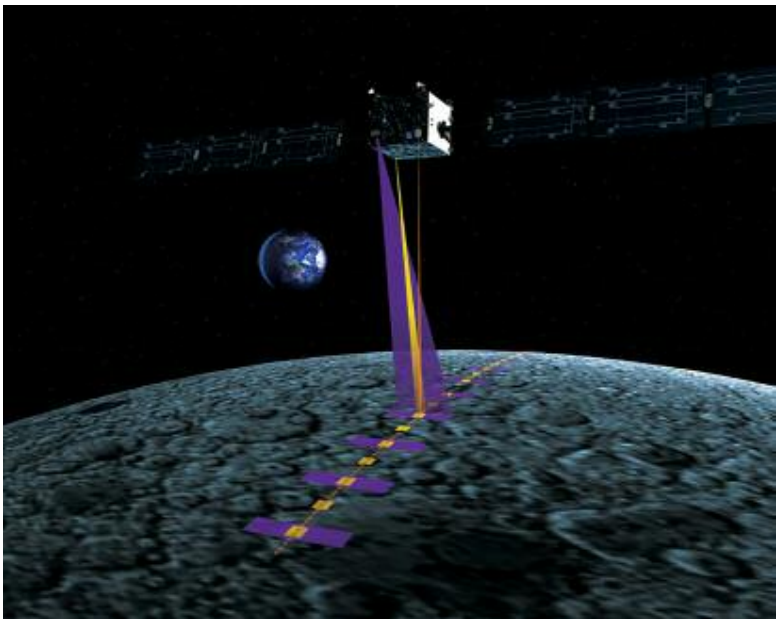


Figure 2 - Illustration of SMART-1 mapping the Moon. Date: 22 september 2010
satellite: smart-1
copyright: esa. illustration by aoes medialab

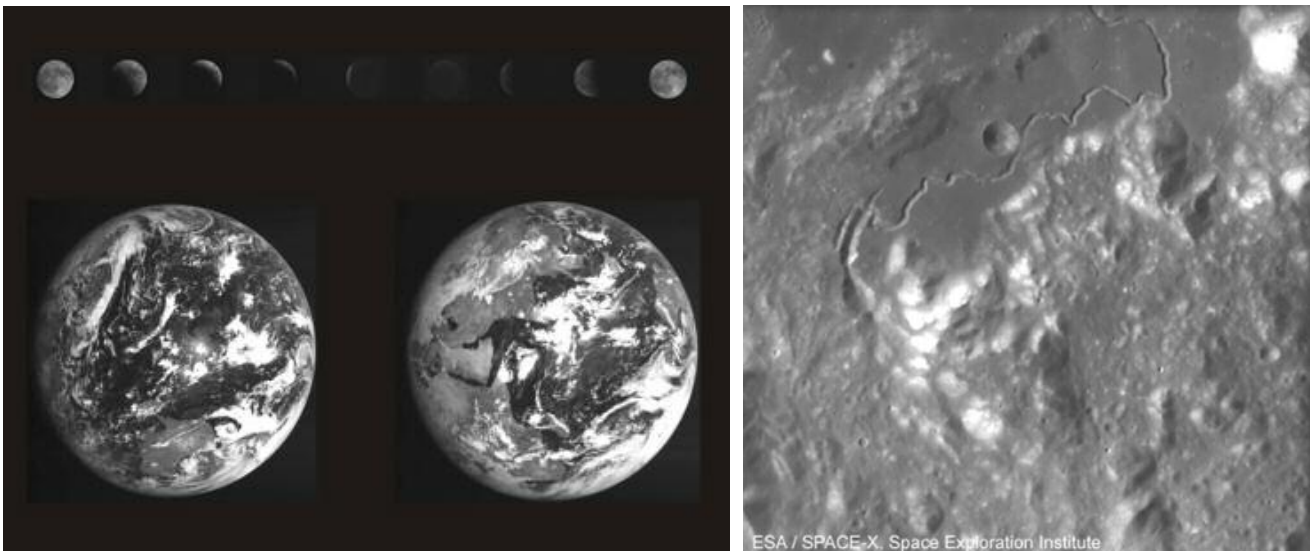


Figure 3 – SMART-1 mapping the Moon – Left: Earth-Moon family portrait; right: view of Hadley Rille (near Apollo 15 landing site) from SMART-1. Credit: ESA/SMART-1/AMIE

to be noted that JWST cannot be serviced by astronauts (contrary to Hubble Space Telecope) whist lunar space telescope allows upgrade of instruments and maintenance.

Question 6 – *How do you see the sharing of works between robots and human astronauts; perhaps only robots in a first phase and both afterwards?*

B.F. – We see successive phases for the Moon Village:

- Robots in a first phase, with small landers, rovers
- Large rovers deploying large systems, cargo, embryo of habitats;
- Then human short visits (1 week daytime) with robotic partnerships;
- Then a few months stay including lunar night time ;
- And in the end 6 month crew rotations with permanent human presence.

Question 7 – *Would astronomers have to be present on moon, or would all telescope operations be performed by space mission specialists?*

B.F. – In a first phase instruments will be teleoperated, astronomers staying on Earth. Then in a second phase engineers astronauts can install equipment, maintain and upgrade them.

Question 8 - *What are other scientific domains for which a manned lunar station would allow achieving quite decisive advances: technology, microgravity, medicine…?*

- Concerning Science on Moon: (i) effect of radiation and vacuum life sciences, survival bacteria, plants; (ii) Partial gravity and medicine, animals, human physiology; (iii) Isolation: psychology, social sciences;
- As regards Technology (20%): rockets, landers, robotics, instruments, resources utilisation, 3D printing and manufacturing, water prospection and extraction, living of land habitats, life support systems, communications.

Question 9 – *could you say some words about the lunar ground resources able to be exploited as energy sources for the lunar village?*

B.F. – There are many domains including:

- Solar energy;
- Mineral resources – silicates, rare Earth elements;
- Soil to build in situ and for 3D printing and manufacturing;
- Water protection and extraction for life support, manufacturing, as well as fuel for rockets;
- Helium 3 for clean fusion (a cargo of 10 tons He 3 could give energy to Europe for 1 year!).

Question 10 – *You probably have in your mind a possible/realistic roadmap for this wonderful project: how do you see it?*

B.F. – I see the roadmap as follows:

1. Last lunar decade orbital fleet (2003-2017) SMART-1, Kaguya, Chang E 1, Chandrayaan1, LRO (in operation since 2009), Chang E 2, GRAIL, ARTEMIS, LADEE
2. Robotic village with landers: Change 3 since 2013, and from 2017 Google Lunar X Prize GLXP commercial missions (6 teams), India Chandrayaan-2, Japan SLIM, Korean, Lunar Ressource Prospector, Russia-ESA Luna27 polar lander
3. Humans in lunar orbit from 2020 (including 4crew mission with Orion and ESA service module in 2022)
4. From 2025 Humans on surface working with robots
5. 2030: Sustainable Moon Village: 10 Humans permanent surface presence and operationwith robots, for multiple uses and multiple users
6. 2040: more than 100 humans. First children born on the Moon.
7. 2050 Moon Cities
8. 2057: Republic of the Moon

IRIS: SATELLITE COMMUNICATIONS ENABLING SAFER SKIES

By Paolo Burzigotti, Iris Development manager at ESA/ESTEC

Satellite communications is a cornerstone of the future air transport system. In this context, the European Space Agency is helping to provide the satellite communications (satcom) technology that forms part of SESAR: the Single European Sky Air traffic management Research programme launched by the European Commission and embarking key stakeholders (Eurocontrol, airport operators, air navigation providers airlines and aerospace companies), aims to improve the efficiency, capacity and performance of air traffic management in Europe and worldwide.

The mechanism for doing this is Iris, an ESA supported programme that, complements SESAR with ESA recognised satellite system expertise.

In September 2016 a Memorandum of Cooperation was signed by Magali Vaissiere, ESA's Director of Telecommunications and Integrated Applications, and Florian Guillermet, Executive Director of the SESAR Joint Undertaking. By fostering close ties between their technical programmes and aligning key milestones, this cooperation lays the foundations for a smooth transition to satellite-based air-ground communications for future air traffic management.

By 2018, Iris will provide the technology for the air–ground communications for initial '4D' flight path control, pinpointing an aircraft in four dimensions: latitude, longitude, altitude and time. This will enable a more efficient management of air traffic within the European limited capacity and dense airspace.

Data link is recognized as the key enabler to fulfilling SESAR requirements for communications between controllers and cockpit crews with voice communications (the current main technology) used only for specific operations. High-capacity digital data links via satellite, carrying this information to cockpit crews in continental and oceanic airspace, are expected to be one of the key technology in the future when the terrestrial means reach their capacity limits.

Captain Mary McMillan (Inmarsat Vice President of Aviation Safety and Operational Services) said, "As air traffic volume continues to increase, the digitalisation of the cockpit is one of the ways to alleviate current congestion on traditional radio frequencies and to optimise European airspace.

"Using the power and security of satellite connectivity through Iris clearly changes the game in comparison to the ground technology in use today."

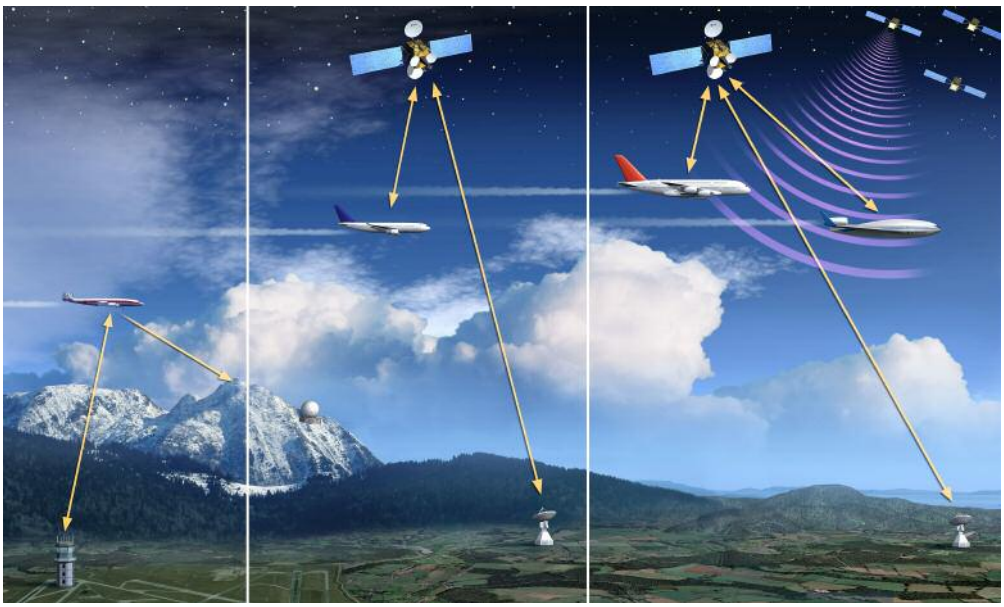
By 2025, Iris will evolve to enable operations over airspaces across the globe with the convergence to global standard between Europe and the rest of the world.

Also known as Satellite Communication for Air Traffic Management, Iris is one of the elements in ESA's programme of Advanced Research in Telecommunications Systems (ARTES).

Iris supports a long-term vision for satellite-based, safe and cyber-secure communications. This vision is in continuous evolution and according to the EC strategy roadmap it will bring Europe towards the full deployment of the future European Air Traffic Management System (EATMS).

Since 2008 the Iris programme has launched a series of timely initiatives in close coordination with SESAR JU and EASA to help guarantee the overall reliability and capacity required in Europe, by providing the satcom component as complementary technology to the terrestrial infrastructure in the EATMS.

This effort includes system design, implementation, valida-



Controlling flight paths with 4D is safer
By 2028, the Iris long-term service will enable full 4D management over airspaces across the globe and the data link will be the primary means of communications between controllers and cockpit crews. © ESA

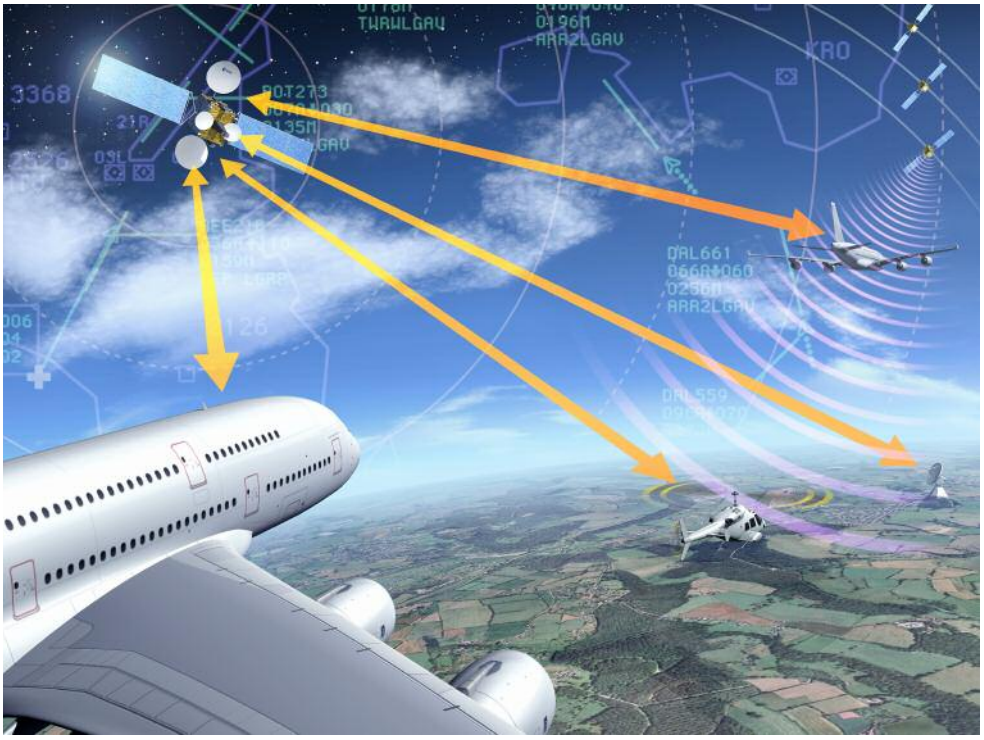
Digital data links via satellit
The Iris Precursor service will provide air–ground communications for initial 4D flight path control by 2018.. © ESA–P. Carril

tion and operational demonstration of the Iris system in coordination with the EC's technical bodies, principally the SESAR JU, and in preparation of the deployment under EC responsibility.

Iris also provides a great opportunity for European space industry to contribute to the future of aviation safety. The Iris Programme is run in partnership with the UK satellite operator Inmarsat, successfully gathering major European expertise related to space communications, and with the active participation of airframe manufacturers, Air Navigation Service Providers (ANSPs) and Airlines. It shows how a public-private-partnership model can positively address public service needs whilst optimizing the public investment, thereby ensuring the implementation of a SATCOM infrastructure that is viable from both technical and economical standpoints.

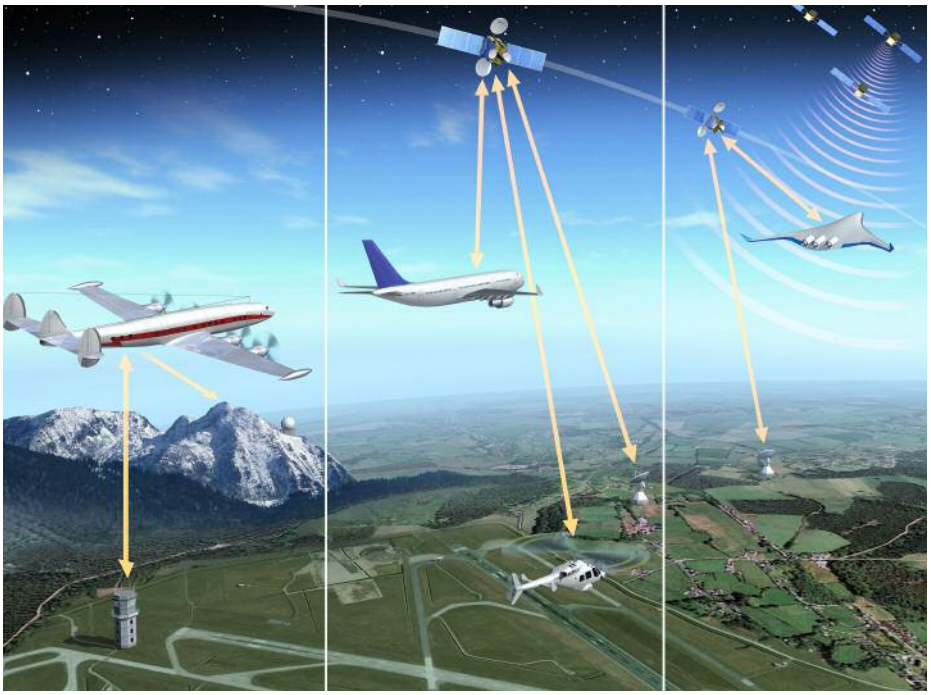
Under a contract awarded in November 2014 for the Iris Precursor project, the industrial team led by Inmarsat is designing and developing the technology for an initial set of satcom services that meet the aviation industry's short-to-medium term needs. The outcome will be, by end 2018, validated, secure digital data links via satellite for air–ground communications for cockpit crews over European airspace, supported through Inmarsat's SwiftBroadband Safety network.
The Iris Precursor team has recently completed its first flight trials. One aircraft from the Netherlands Aerospace Centre used a prototype Iris terminal connected to Inmarsat's next-generation SwiftBroadband-Safety satellite service, and performed several flights from Amsterdam towards different destinations in Europe.
During the flights, the connection between the aircraft and ground networks was tested extensively and air traffic control messages were exchanged. The connection was maintained even when the aircraft switched satellite beams.
With the benefit of strong support from ESA Member States in ESA's Ministerial Conference at the end of 2016, Iris is now entering the implementation phase to achieve a complete operational demonstration.
To this aim, a new project is about to be launched, called Iris with Initial Operational Capability.

Enhancements and upgrades to existing Iris technology, as well as new developments, will be implemented on both the ground and user terminal segments.
Furthermore a validation activity will be performed in collaboration with some European airlines, where up to 20 aircraft will be equipped with certified Iris avionics on revenue flights, connecting national service providers (ANSPs) with Airlines Operations Centre.
The Iris "Pilot" flight trials will take place in the core area of Europe with the scope to demonstrate Iris performance in one of the busiest European areas. At the same time it will be possible to show the potential Iris capability to harmonize oceanic and continental areas with a single solution, by allowing a seamless transition between the two.
The final target is to validate the end-to-end system at operational level, including both safety-oriented (e.g. air traffic control) and commercial-oriented (e.g. AOC) services. The



Iris programme for air traffic management

Iris, element 10 of the ARTES programme, aims to develop a new air-ground communication system for air traffic management. It is the satellite-based solution for the Single European Sky ATM Research (SESAR) programme. By 2020 it will contribute to the modernisation of air traffic management by providing digital data links to cockpit crews in continental and oceanic airspace. © ESA-P. Carril



Iris programme for air traffic management

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Iris system will then have demonstrated its compatibility with the EC's deployment strategy for initial 4-dimentional traffic management.

In the same contract, system design activities will also be conducted in preparation for future developments, with the ultimate aim of delivering full operational capabilities for the longer term performance requirements. In this way the Iris programme, through its partnership approach, will provide continuity to the vision of delivering satellite-based, safety and cyber-secure services.

Progress to date is perhaps best summed up by the comments of Magali Vaissiere, Director of Telecommunications and Integrated Applications at ESA. "ESA's Iris programme is forging ahead as part of Europe's long-term goal to modernise air traffic control. A stepped approach and good collaboration between public and private partners is bringing excellent results."

AMONG UPCOMING AEROSPACE EVENTS

06-09 March • **AIAA** – 21st AIAA International Space Planes and Hypersonic Systems – Xiamen (China) University Xiamen – www.aiaa.org

07-09 March • **CANSO** – World ATM Congress 2017 – Madrid (Spain) – IFEMA Feria de Madrid www.worldatmcongress.org/2017

14-16 March • **IATA** – 11th World Cargo Symposium - Abu Dhabi (UAE) – National Exhibition Centre www.iata.org/events/

21-22 March • **CLEAN SKY** – Clean Sky Forum – Brussels (Belgium) – www.cleansky.eu/event/

27-29 March • **3AF** – 52nd 3AF International Conference on Applied aerodynamics progress in Flight Control Lyon (France) – ECL – http://3af-aerodynamics.com

03-06 April • **Space Foundation** – 33rd Space Symposium – Colorado Springs, Colorado (USA) – Space Foundation/HQ – http://www.spacesymposium.org/

03-06 April • **ERCOFTAC** – European Drag Reduction and Flow control Meeting – Monte Porzio Cantone –Italy) Villa Mondragone – www.ercoftac.org/events

03-07 April • **EUROTURBO** – 12th European Turbomachinery Conference (ETC) – Stockholm (Sweden) – KTH www.euroturbo.eu

05-08 April • **AERO Friedrichshaffen** – AERO Friedrichshaffen 2017 – Messe Friedrichshaffen - www.aero-expo.com

11-13 April • **NBAA** – ABACE 2017 – Asia Business Aviation Conference & Exhibition – Shanghai (China) Shanghai Hongqiav Airport – www.abace.aero

24-25 April • **RAeS** – The Architecture of Air Travel. Designing for Human Behaviour – London (UK) – RAeS/HQ www.aerosociety.com/events

24-26 April • **IATA** – Safety and Flight Ops Conference – Seoul (South Korea) – Grand Hyatt Hotel www.iata.org/events

25 April • **Financial Times** – Business of Aerospace and Aviation Summit – Digital Disruptive Technologies – London (UK) – Hilton Tower Bridge Hotel – http://live.ft.com/Events/2017

25-27 April • **CEAS** – EuroGNC 2017 – 4th CEAS Specialist Conference on GNC – Warsaw (Poland) – WUT http://www.ceas-gnc.eu/

16-18 May • **ICAO/ACI** – Wildlife Strike Hazard Reduction Symposium – Monréal (Canada) – ICAO/HQ www.icao.int/Meetings/

16-18 May • **IATA** – Aviation Fuel Symposium – St Petersburg (Russian Federation) – Park Inn Pribaltiyskaya www.iata.org/events

22-24 May • **EBAA** – EBACE 2017 – Geneva (Switzerland) – Palexpo – www.ebace.aero/2017

29-31 May • **AESS/IEEE** – 24th Saint Petersburg International Conference on Integrated Navigation Systems – Saint Petersburg – Concern Central SRIE – www.elektropribor.spb.ru

29-31 May • **ERCOFTAC** – DLES 11 Direct and Large Eddy Simulation – Pisa (Italy) – www.ercoftac.org/events

AMONG UPCOMING AEROSPACE EVENTS

29 May-02 June • **ESA** – 10th International Conference on Guidance, navigation and Control – Salzburg (Austria) – Crowne Plaza Salzburg - www.esaconferencebureau.com/list-of-events

05-10 June • **AIAA** – AIAA AVIATION 2017 Forum - Aviation and Aeronautics Forum and Exposition – Denver, CO (USA) – Sheraton Denver Downtown Hotel – www.aiaa-aviation.org/

05-10 June • **AIAA/CEAS** – 23rd AIAA/CEAS Aeroacoustics Conference – Denver, CO (USA) – Sheraton Denver Downtown Hotel – www.aiaa.org/aeroacoustics/

06-07 June • **FSF/EUROCONTROL** – 5th Annual Safety Forum – Brussels (Belgium) – EUROCONTROL/HQ https://flightsafety.org/event/2017

12-14 June • **ACI** – ACI – Europe 27th General Assembly Congress and Exhibition – Paris (France) – Salle Wagram www.aci-europe-events.com

13-14 June • **RAeS** – Benchmarking for Improving Flight Simulation – London (UK) – RAeS/HQ www.aerosociety.com/events

13-15 June • **3AF/SEE** – ETTC'17 – Toulouse (France) – Centre de Congrès Pierre Baudis. https://www.see.asso.fr/

25-28 June • **EUROMECH** – Euromech Turbulence Conference (ETC) 2017 – Porto (Portugal) – University – Faculty of engineering – www.euromech.org

19-25 June • **ISAE/GIFAS** – IPAS 2017 International Paris Air Show – Le Bourget Airport – www.siae.fr

27-29 June • **3AF** – IAMD 12 – 12th International Conference 3AF Integrated Air and Missile Defence – Stockholm (Sweden) – http://3af-integratedairmissiledefence.com

03-06 July • **EUCASS** – EUCASS2017 – 7th European Conference for Aeronautics and Space Sciences – Milan (Italy) – Politecnico di Milano – www.eucass.eu

10-12 July • **AIAA** – AIAA Propulsion and Energy 2017 forum – Atlanta, GA (USA) – Hyatt Regency www.aiaa-propulsionenergy.org

12-14 September • **AIAA** – AIAA SPACE 2017 Forum – Orlando, FL (USA) – Hyatt Regency – www.aiaa-space.org

12-15 September • **ERF** – ERF2017 – 43rd ERF – Milan (Italy) – Politecnico di Milano – Campus Bovisa https://www.erf2017.org

18-22 September • **COSPAR** – 3rd Symposium COSPAR – Jeju Island (South Korea) – ICC Jeju https://cosparhq.cnes.fr

25-29 September • **IAF** – 68th International Astronautical Congress – Adelaide (Australia) – Adelaide Convention Centre www.aiaa-space.org

16-20 October • **CEAS** – Aerospace Europe 2017 Conference – 6th CEAS Air & Space Conference – Bucharest (Romania) Parliament of Romania – www.ceas2017.org

25-29 October • **ESA** – 6th international Colloquium on Scientific and Fundamental Aspects of GNSS/Galileo – Valencia (Spain) – TU Valencia – http://esaconferencebureau/list-of-events