



The Quarterly  
Bulletin of the

# CEAS

COUNCIL OF EUROPEAN AEROSPACE SOCIETIES

3AF-AIAE-AIDAA-CzAeS-DGLR-FTF-HAES-NVvL-PSAA-RAAA-RAeS-SVFW-TsAGI-VKI



Issue 1 - 2012  
April

liftoff of Vega VV01



Europe's smart supply ship on its way to the  
International Space Station



## TWO NEW MAJOR SUCCESSES FOR THE EUROPEAN SPACE AGENCY:

- 13 FEBRUARY: FLAWLESS MAIDEN FLIGHT OF "VEGA", THE NEW EUROPEAN LIGHT LAUNCH CAPACITY ROCKET
- 23 MARCH: THE THIRD ESA'S AUTOMATED TRANSFER VEHICLE (ATV-3) IS SUCCESSFULLY LAUNCHED ON AN ARIANE 5, HEADING TOWARDS THE INTERNATIONAL SPACE STATION (ISS)

## WHAT IS THE CEAS ?

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

It presently comprises 15 Member Societies: 3AF (France), AIAE (Spain), AIDAA (Italy), CzAeS (Czech Republic), DGLR (Germany), FTF (Sweden), HAES (Greece), NVvL (Netherlands), PSAS (Poland), RAAA (Romania), RAeS (United Kingdom), SVFW (Switzerland), TsAGI (Russia), VKI (Von Karman Institute, Belgium) and EUROAVIA.

Following its establishment as a legal entity conferred under Belgium Law, this association began its operations on January 1<sup>st</sup>, 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](http://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

### 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

## LINKÖPING 2013



Jean-Pierre Sanfourche  
Editor-in-Chief

At its meeting in Brussels on 1<sup>st</sup> of March, the Board of Trustees of the Council of European Aerospace Societies decided that the 4<sup>th</sup> CEAS Air & Space Conference will take place in Linköping (Sweden) in the course of autumn 2013, hosted by the Flygtekniska Föreningen (FTF), the Swedish Society for Aeronautics and Astronautics. This association, founded in 1933, counts today more than 2,200 members, mostly aerospace engineers. Besides Stockholm, the FTF has local societies in four other cities where the foremost aerospace industries are situated: Trollhättan, Gothenburg, Malmö, and the city which will host the Conference, Linköping.

Linköping is the town where Saab is located, so that it is really an ideal place to set up our every two-year Conference. SAAB (Svenska Aeroplan Aktiebolaget), which in 2012 is celebrating its 75th birthday, presents a broad-based product range now more focused on future defence needs and a safer society. It is quite active in the areas of air, land and naval defence, as well as civil security and commercial aeronautics, and among its most famous recent productions, is the Jas 39 Gripen – the first of the fourth generation fighter aircraft to enter service, whose deliveries began in 1993 and whose successes in the export field are well known: South Africa, Czech Republic, Hungary and Thailand.

So, Linköping appears to me as a first-class venue to deal not only with civil aviation, but also with air power topics. I personally take the liberty to express here to the Organising Committee members my great wish that a sufficient large part of the Conference should be dedicated to military air products and research programmes. This orientation would be extremely opportune, at a time when the European Defence Agency is strongly pushing the so-called “Pooling & Sharing” projects with a view to developing European co-operations in European integrated solutions for more and more air

defence capabilities, and is also taking measures in order to conceive more and more complementary defence and civilian security-related research programmes.

I am sure that Linköping will fully rise to the challenge of maintaining, or even improving upon, the high standards which have been established by previous CEAS conferences. For its part, the Quarterly Bulletin will do all it can to assist the organisers to achieve that success.

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## CEAS ANNUAL REPORT 2011

By Pierre Bescond



Pierre Bescond  
President of the CEAS

As I begin my second year in office after my re-election as President on the 26<sup>th</sup> of October in Venice, I realise how much we've done in 2011, but also how time flies and how much remains to be done: we want to consolidate our position as "the only general Aeronautics and Space Society in Europe" as my predecessor Joe Szodruch noted, but also to make it known to all interested parties. The best way to achieve this is to demonstrate to our member Societies and to the aerospace community at large that we are at their service and that we can bring them clear tangible benefits. Indeed all our Trustees proved how much they agreed on this goal through their highly commendable dedication all along the year.

We met three times at Board level: at Airbus Military in Getafe (31<sup>st</sup> of March) on the occasion of Aerodays 2011 in Madrid with a AIAE hosted gala dinner at the Real Madrid Football Stadium, at the Aéroclub de France in Paris (23<sup>rd</sup> of June) hosted by 3AF on the occasion of Le Bourget Airshow, and at the Giorgio Cini Foundation in Venice (26<sup>th</sup> of October) during the 3<sup>rd</sup> CEAS Air and Space Conference hosted by AIDAA. Our thanks go to all those who organised beautiful receptions in all these places.

We welcomed two new members in 2011, Aeronautica si Astronautica a României (AAAR) from Romania as a full Corporate Member and the Von Karman Institute (VKI) from Belgium as an Associate Member. On this occasion Doctor Silivestru and Professor Arts respectively introduced AAAR and VKI. Unfortunately one Member left us at the end of the year for economic reasons, Ilmailuinsinöorien Kerho (IIK) from Finland. We wish them to rapidly overcome these difficulties. We thanked Markku Roschier for his support as a Trustee and wrote him that we would be glad to welcome them back as soon as they are ready and willing. We also accepted to welcome ESA as a corporate partner of CEAS under terms of agreement which have been proposed to them and could be used for other potential partners (European organisations only).

We held a General Assembly meeting before the Board meeting in Venice and noted some changes in the Board of Trustees. Pierre Bescond who had been unanimously elected President of the Board for 2011 volunteered and was re-elected President for 2012. Therefore we had to appoint a new Vice-President Finances. Paul Bailey volunteered for this position and the Board unanimously approved his

appointment. François Gayet proposed to be replaced at the end of 2011 as VP External Relations & Publications since he retired from ASD but he accepted the Board suggestion to continue in 2012 and was unanimously re-elected in this position. The Board unanimously re-elected Dr. Kaj Lundahl as VP Awards & Membership, no change having been proposed for this position. The rest of Officers were unanimously confirmed by the Board: Dr. Christophe Hermans Chairman Aeronautics Branch, Dr. Constantinos Stavrinidis Chairman Space Branch, Mr. François Gayet Chairman PCC and Mrs Mercedes Oliver CEAS Director General.

Under the chairmanship of Mr. Gayet, the PCC is now well structured and organised and it meets regularly before the Board meeting. The Conference Programming Management Information System (CPMIS) which he developed in collaboration with ASD is now officially operational. This tool, with open access to anyone on our website, is meant to help both ASD and CEAS to better plan and manage aerospace events by regrouping them all on a single platform, thus avoiding duplication of similar events. We decided to enhance it to introduce some space for paying adverts and implement automatic workflow insertion to simplify its future management. This 2<sup>nd</sup> version would cost around € 6 000. We hope ASD will agree to continue our collaboration in developing, managing and maintaining this new version under the same terms.

As a significant step forward, and in order to develop a roadmap towards our goals, we held a strategy meeting in Paris on September 7<sup>th</sup> which resulted in an action plan along four lines, namely: develop and maintain strong relationships with relevant EU bodies, promote aerospace towards students and young professionals, disseminate knowledge through conferences, journals, and Technical Committees, and engage into organised international cooperation. The benefit of this approach is that it sets CEAS moving into a pragmatic and concrete handling of its missions, with measurable objectives. The fourth line remains to be written as a follow-up of the progress made and in view of the experience gained through the first three ones, respectively laid out by François Gayet, David Marshall and Christophe Hermans: approved with minor modifications at the October Board meeting, they are being implemented. In the frame of the action line "knowledge dissemination" it also was decided to change the Technical Committees structure, distinguishing between Technical Committees (the active ones) and Networks (the others). Thus were included in the Technical Committees two active groups which already have organised conferences under the name of CEAS, the CEAS Specialists Conference in Guidance, Navigation and Control (GNC) and the International Forum of Aeroelasticity and Structural Dynamics (IFASD).

In terms of conferences, 2011 was a very rich year for CEAS, with participation in Aerodays 2011, sponsoring



three major European technical conferences, and conducting its 3<sup>rd</sup> CEAS Air and Space Conference.

A Students Contest organised by DGLR on its behalf was a major event of CEAS at Aerodays 2011 in Madrid also supported by the Spanish association Foro Aeronáutico. Dr. Dietrich Knoerzer, EC Project Officer, Mr. Bartolomé Marqués, INTA Subdirector General and Mr. Juan Carlos Cortés Pulido, CDTI Innovation Markets Director were also present. A welcome session to the Aerodays 2011 Students Participation Programme was held at the Aeronautics School on March 29<sup>th</sup> for those students who could not attend Aerodays, during which I gave an introduction of CEAS. Then the contest itself took place in the following days with many impressive papers and the Aerodays 2011 Students Awards were given on the stage at the end of the closing plenary session in the presence of Máire Geoghenan-Quinn, European Commissioner for Research and Innovation, and all other high level Commission and Industry speakers. The CDTI Director General, organiser of the event in Madrid, congratulated CEAS for the remarkable work we did in organising this contest and the CEAS Board extended his own congratulations to DGLR: Peter Brandt, and Philip Nickenig who replaced him as a Trustee upon his departure from DGLR, and especially the project manager Carsten Holze, CEO Machtwissen and member of DGLR. To be noted also since it will give prominent visibility to CEAS, the fact that upon Dr. Knoerzer's request it is our Editor-in-Chief Jean-Pierre Sanfourche who is conducting the editorial coordination of the AERODAYS 2011 post-conference proceedings for the European Commission.

The three major European technical conferences sponsored by CEAS were very successful. At the 1<sup>st</sup> CEAS Specialists Conference in Guidance, Navigation and Control (GNC) in Munich, 13-15 April 2011, organised by DGLR, I was invited to deliver a speech at the evening reception. Co-organised by 3AF, CEAS and AIAA, hosted by 3AF in Paris, 20-23 June 2011, the International Forum of Aeroelasticity and Structural Dynamics (IFASD) 2011 celebrated its 30<sup>th</sup> anniversary, triggering an outstanding participation. And the 37<sup>th</sup> European Rotorcraft Forum (ERF), one of the premier events on the rotorcraft community's calendar, in Versiate, 13-15 Sep 2011 was very successfully organised by the Rotorcraft Committee under the chairmanship of Christophe Hermans, Chairman of our Aeronautics Branch.

Last but not least, the 3<sup>rd</sup> CEAS Air and Space Conference, hosted by AIDAA under the chairmanship of CEAS Trustee and AIDAA President Professor Franco Persiani, coincided with the XXI<sup>st</sup> AIDAA Congress, 17-21 October 2011, and was held at the Giorgio Cini Foundation in Venice. Supported by national and international organisations, it was a real success with around 350 attendees. It also incorporated a dedicated Forum Day agreed upon with ECCOMAS within the scope of the ECAero contract CEAS signed in 2009 with five partners (ECCOMAS, ERCOFTAC, EUROMECH, EUROTURBO and EUCASS), and a seminar organised by the Associazione Arma Aeronautica, SESAR

and the Military: Implications of the Single European Sky Implementation on the Military Air Component". Our most sincere congratulations go to the organisers Professor Franco Persiani and Doctor Sara Bagassi of Bologna University.

Speaking of ECAero, it is worth mentioning that the 6 partners of the current contract met in Brussels on November 23 to better manage this contract and be up to the European Commission expectations, the main objective being to bring the European efforts together to further harmonize the European Aeronautical Research landscape. We convened to meet every 2 to 3 months to consolidate our collaboration. Also, again within ECAero and in line with our action plan to promote aerospace towards students and young professionals, the Board decided to bid in a new FP7 EC Call, the RESTARTS 2 project as part of a consortium with our member VKI.

Awards too gave excellent visibility of CEAS in 2011. During the Venice Conference Gala Dinner the CEAS Gold Award 2011 was handed over to Professor Stamatios Krimigis, a Greek-American scientist who contributed to the majority of the United States' unmanned space exploration programs of the Solar system and beyond. And upon a nomination proposed by RAeS and endorsed by DGLR, the Board of Trustees decided to extend the CEAS 2012 Award to Professor Manfred Fuchs, CEO of OHB-System AG. In addition CEAS answered positively to a proposal received from DGLR and IFASD 2011 organisers to pay tribute to one of the IFASD first two organisers in 1981, Dr. Otto Sensburg, an engineer who spent all his professional life in MBB, lately DASA, and then EADS, and who has been a member of the IFASD Programme Committee ever since. To this effect I presented a silver medal for Dr Sensburg at the 30th IFASD Anniversary Cocktail party on the Eiffel Tower in Paris. To be remembered also is the sponsoring of the European Rotorcraft Forum Cheeseman Award in the form of a dedicated plaque with both CEAS and ERF logos.

2011 was a landmark for CEAS publications: the first two issues of both the CEAS Aeronautical and Space Journals were published in the second semester along the lines of the contracts signed with Springer thanks to the hard work of our past President Joe Szodruch and our ESA representative Constantinos Stavriniadis. The four issues of the CEAS bulletin were again distributed on time under the remarkable management of our Editor-in-Chief Jean-Pierre Sanfourche: distributed to representatives of the European Commission, European Parliament, European professional organisations, research establishments and industry, it is an excellent promotional vehicle for both CEAS and indeed European aerospace. And finally the website [www.ceas.org](http://www.ceas.org) was diligently renovated by our Director General Mercedes Oliver who also regularly updates the information it contains.

AIAA is our major international partner and we invited

Mr Klaus Dannenberg, Deputy Executive Director and Chief Strategy Officer of the AIAA, to join our June Board meeting in Paris to further discuss updating of our agreement with them concerning the organisation in Europe of our joint conferences like the AIAA - CEAS Aeroacoustics Conference organised every three years in a European city by the CEAS ASC (Aeroacoustics Specialists Committee).

In conclusion I think we all should be proud of what we achieved in 2011. I am very glad we managed to conduct the brainstorming session I advocated in March in order to elaborate a strategic plan, since we now have concrete action lines along which we will work. We also are well geared in terms of communications with the Bulletin, the two journals, the website and the CPMIS tool. All this, as well

as our successful conferences and participation in the ECAero programme, should help increase the visibility and image of CEAS, build a trustworthy relationship with the European Commission, contribute to attracting students and young professionals, and in turn benefit aerospace and our members. The excellent European team spirit which animates us allows me to hope that we shall realize some outstanding achievements in the coming months.

■  
**Pierre Bescond**  
*President of CEAS in 2011*  
*February 2012*

## ABOUT THE CEAS 2011 CONFERENCE “FLYING TO THE FUTURE”, VENICE 24-28 OCTOBER 2011

### The message of CEAS 2011 Chairman



Prof. Franco Persiani,  
AIDAA President  
CEAS-2011 Chairman

It was a pleasure to host the International Aerospace Community at CEAS 2011: the event in which the 3<sup>rd</sup> CEAS Conference is merged with the 21<sup>st</sup> AIDAA Congress.

Celebrating this conference in Venice, in a unique frame of art, history and culture, we supported the vision of a Great Europe as a major player in the Global Aerospace Scenario.

The programme structure, consisting in 58 technical and scientific parallel sessions, 6 invited lectures, a round table, technical tours and embedded events, such as the CFD Industry Forum and SESAR and the Military forum, aims at covering cutting edge topics of both aeronautics and space.

A wide number of abstract were submitted, covering a wide range of topics. The scientific committee had a hard work to select the number of scientific contributions for oral and poster presentations. The final result was characterized by a high level of presented papers.

Among the 350 delegates who attended the Congress,

there were representatives of the major European Air and Space R&D institutions, Universities and Industries, underlining a positive inclination to scientific dissemination. In particular delegates from ESA (European Space Agency), ASI (Italian Space Agency), DGLR (German Society for Aeronautics and Astronautics), EADS (European Aeronautic Defense and Space Company), Clean Sky, NLR, CEPAD, ACARE were present and took part to the opening session, the round table and some general lectures.

The famous space scientist, Tom Krimigs was awarded with the prestigious acknowledgement “CEAS Gold Medal Award” for the great contribution he provided to space exploration programmes of the Solar System and beyond. He is an excellence in the space scenario and he gave a very interesting speech entitled “Voyager 1 and the edge of the heliosphere flight”.

It is important to point up also the presence of many sponsors in particular Finmeccanica Group, Airbus, ASI, Cleansky, Dassault Systèmes, DLR, ESA, IBM and Piaggio Aereo Industries.

Considering CEAS 2011 conference as a real success concerning to the number of submitted paper and their quality level, the number of participants and outstanding participations, it is important to thank CEAS and its president, Pierre Bescond, for their support in the Conference Organisation and the great opportunity given to AIDAA.

■  
**Franco Persiani**  
*President of AIDAA*  
*CEAS 2011 Chairman*

## IN VENICE TO FLY INTO THE FUTURE

By Francesca Lucchi



Francesca Lucchi  
Bologna University

Giorgio Cini Foundation has been the wonderful frame for CEAS 2011 Conference, which took place in Venice from the 24<sup>th</sup> to the 28<sup>th</sup> October 2011. This event, hosted by AIDAA (Italian Association of Aeronautics and Astronautics) in collaboration with CEAS (the European Council of Aerospace Societies), drew the attention of the major representative of Aeronautics and Space world.

As Pierre Bescond (CEAS President) said during the opening ceremony, pushing Europe in the Aerospace community is a great opportunity for Europe itself. The challenges

Giorgio Cini Foundation



Opening ceremony: From the left to the right: Eric Dautriat, Detlef Müller Wiesner, Pierre Bescond, Franco Persiani, Biagio Ancarola, Giovanni Bertolone, Franco Ongaro, Marcello Spagnulo

that Aerospace Community is facing, deal with environmental issues, technological breakthrough, competition (in particular in connection with today economic conditions) and emerging countries coming up.

The four days dense program was composed of an aeronautics and a space agenda, which took place during 58 parallel sessions and 6 general lectures. The Call for Papers attracted more than 340 submissions from 27 countries. About 190 papers were presented in 8 parallel tracks and about 30 papers were discussed in a poster

session. “*Flying to the future*” was the main debating point during the opening ceremony, introduced and chaired by Franco Persiani (AIDAA President and CEAS 2011 Conference Chairman). Pierre Bescond, Giovanni Bertolone (Finmeccanica group), Detlef Müller Wiesner (EADS), Franco Ongaro (ESA), Marcello Spagnulo (ASI), Eric Dautriat (CleanSky) and Biagio Ancarola (Counselor of the Italian Ministry for Research and Education) took part to this session, contributing to introduce many Aerospace topics.

During the whole event, many outstanding participants gave interesting speeches: in the aeronautical context, George Bridel took an interesting lecture entitled “*What future for the European combat Aircraft Industry*”, in which he considered what kind of aerial combat systems (manned or unmanned) will be required to guarantee Europe’s future security.

Jean Botti, EADS Chief Technical Officer, took another interesting general lecture in which he developed a comparison between civil and military technologies. Dave Tyler, from AugustaWestland, gave a speech about “*More electric rotorcraft: Challenges and achievements*”.

“*Flying to the Future*” was also the title of an interesting round table, chaired by Giovanni Bertolone. Detlef Müller-Wiesner (EADS Chief Operations Officer Innovation), Eligio Trombetta (Piaggio General Director), Philippe Forestier (Dassault Systemes Vice President), Gerardo Zuliani (IBM A&D Industries Global Vice President), Nazario Cauceglia (Alenia Aermacchi) and Eric Dautriat (Clean Sky Executive Director) attended to the round table. Innovation has been identified as the solution to overcome crisis with a technical and social approach. Aeronautics and air transport are key points for European society and economy. Aviation is a catalyst for European growth and it placed in the heart of the Europe 2020 strategy; moreover, it is an important enabler of wealth creation for the Member States, by stimulating development, opening new markets, boosting international trade and encouraging companies to invest. Under these assumptions the round table concentrates on the reconfiguring the industrial figure, to win the challenges against new and old competitors, to the evolution of design and mock-up. Multidisciplinary design and developments tools are used routinely to support a high level of integrated system design and this can due to timescales and costs reduction. In this context aerospace industries’ point of view is analyzed in different aspects: manned and unmanned UAS and all type of rotorcraft operate simultaneously in the same airspace, and through new training processes and technologies that support decision-making the occurrence and the impact of human error can significantly be reduced. Moreover, another key discussing point regards how technology fit social needs in terms of ecology, safety and efficiency.





Tom Krimigis during his lesson "Voyager 1 and the edge of the heliosphere flight".

A detailed agenda, planned by Constantinos Stavrinidis (Head of CEAS Space Branch), was arranged for the space branch. The main space topics were debated during 15 sessions, at the presence of the major representatives of the Space Community. The main topics referred to Space infrastructures and applications (Chairman: C. Stavrinidis – ESA), Technologies for Space Exploration (this session was chaired by Giorgio Saccoccia, ESA), Business Incubation and Innovation (chaired by F.M. Salzgeber), Space Disruptive Technologies & Public Private Partnership (Chaired by A. Cotellessa – ESA). On Wednesday 26<sup>th</sup> October, a Space Industry Day took place, under F. Ongaro (ESA) chairmanship. Moreover, the presence of the famous scientist Tom Krimigis was a great success and he took a lecture titled "Voyager 1 and the edge of the heliosphere flight". During the Gala Dinner at the historical Ca' Vendramin Calergi Palace, Professor Krimigis was awarded a CEAS gold medal for his outstanding scientific activity. Gerard De Groot, from University of St. Andrews, delivered an interesting speech, titled "Lecture on the USA/Russia Space Race, on the occasion of 50 years of manned space flight".

E-CAERO (European collaborative dissemination of aeronautical research and applications) 2 days CFD Forum is a testimonial of the European Commission involvement during CEAS 2011 conference. CFD Multi-Physics methods, tools, modeling, simulation and software were debated: Dietrich Knoerzer and Remy Denos, from the European Commission, introduced the sessions.

The closing session introduced the final seminar "SESAR and the Military", which took place on Friday October 28<sup>th</sup> and attracted about 100 more delegates to the conference venue. The workshop was about the implications of the single European Sky implementation on the military air component and it was introduced by Prof. Franco Persiani, Gen. Nazzareno Cardinali (CESMA Director) and Maj. Gen. Carlo Magrassi (Deputy AF Commander). These topics were debated in two different panels: the first one was about SESAR project and its implications on the Military Air Component; the second one was focused on technological and financial challenges.



Giovanni Bertolone (Finmeccanica Group) speech

## Aerospace Industry Vision

CEAS 2011 was described by all industry representatives as an important opportunity for Aerospace Industries, Academia, organisations and associations to communicate, share and debate innovative concepts and technical solutions and promote the establishment of knowledge and technical networks with the aim of increasing European competitiveness in the field of aerospace. In this context, Finmeccanica Executive Vice-President Giovanni Bertolone declared that Finmeccanica intent was not just sponsoring CEAS event, but also promote and support the participation of its experts. The major part of scientific papers presented by Authors from Finmeccanica was done in conjunction with Italian and European academic experts.

## European Collaboration

Aviation and space are worldwide recognized to produce economic growth, jobs and innovation, responding to the society mobility needs. Aeronautics and Air Transport System have also beneficial indirect effect in other economic, business and industrial sectors. In Europe Aviation gives an important contribution to society cohesion. The development of aeronautics and astronautics is based upon research, innovative technologies, integrated in industrial competitive products.

The whole cycle of aviation products, at last 20 – 30 years, requires continuous investments for initial development and mid-life upgrading and for this reason the public support for coherent transport policy is needed. European Aviation is very active in research and innovation activities to reach the goal of green, safe and smart transport system. Relevant private investments have been dedicated to develop new technologies, products and transport operations. Public money at both National and European levels have been invested: to increase research and innovation capabilities; to develop innovative technologies; to create a safe and secure transport system; to develop infrastructures. Currently, the aviation community is sharing the Europe's vision for 2050 aviation and it is building a strategic agenda for research and innovation in order to implement activities and remove obstacles for innovations.



## Status of Military Aerospace

In Europe, defense agencies face shrinking budgets: this fact sent out the wrong signal that European States are generally safer and more comfortable, while they are getting more and more dangerous, in a world which is itself getting more and more uncertain.

Any projection regarding the next generation of combat air systems is necessarily based on anticipated future conflict scenarios. At the present, asymmetric warfare, dealing with many terrorist organisations and multinational interventions are in the spotlight. However, as can be seen in the current crisis of Libya, even in asymmetric conflicts, sophisticated air combat forces are essential, in order to identify targets, ensure strike accuracy, be efficient on mobile targets, and avoid collateral damages. In addition, growing economic competition, dwindling resources and consequences of climate changes, may generate conflicts, between nations and continents, going far beyond current conflict scenario. Moreover, since the second war, European nations have developed and produced several generation of competitive combat systems; today three aircraft – Eurofighter, Gripen and Rafale – are currently produced, fulfilling European defence needs and securing industrial and strategic independence. This industrial heritage should be optimized to propose a single successor to these three combat aircraft, but, so far, no movement is yet visible to secure this crucial European strategic asset in the future.

European air capabilities are sustained by a large spectrum



Alenia Aermacchi: M 360

of supplier industries comprising engine, electronics, and weapons systems manufacturers.

## Status of Commercial Aerospace

Over the past 40 years, European aeronautic industries are successfully grown to a world leading. Industries tend to collect European efforts, public and private investments, major companies involvement, thousands of small or medium enterprises, academia and research laboratories. Their products include aircraft, rotorcraft engines, avionics and systems as well as leading operations and services. Commercial aeronautics continues to be a point of importance in the integrated high technologies and develop-



Agusta Westland can satisfy the needs of both commercial and military customers with integrated helicopter systems.

ments in research. However, this industrial competition is becoming ever stronger from both sides: established traditional rivals' competitors, such as USA, and even more from new and strong challengers (notable are Brazil, Canada, China, India, Russia and maybe Korea). Regions, such as Middle East and Asia, are emerged as strong competitors for air services and infrastructures. Europe technological leadership will continue to be the major competitive differentiator, but substantial and sustainable investments in technologies of today and tomorrow are needed, to assure future in Europe.

In conclusion, the industrial competition of the European companies is becoming stronger than ever, the defense budgets are shrinking, but the technological leadership must be the major competitive differentiator: technological breakthrough must be required to ensure future competitive advantage.

CEAS is in many aspects a community of scientists, researchers and engineers, that do not take care about the States boundaries in Europe, so its contribution can be very effective, not only in developing winning technologies, but also in pushing relevant States toward a real unified European aerospace network.

## EADS Vision



Jean Botti – EADS Chief Technical Officer

## for civil and military aerospace

Introduced by Finmeccanica CTO Lorenzo Fiori, Jean Botti – EADS Chief Technical Officer delivered an interesting speech titled “Civil & Military Aerospace: converging or diver-



Airbus 400M



Airbus 380

ging technologies?". He covered many aspects of this issue, he discussed the constraints about this dilemma, the partnership that can foster the convergence and what EADS vision is about. Over the last decades many aspects and events brought to an increase in convergences, such as the cold war ended during the 90<sup>th</sup>, military budget reduction, military operations extended to the security operations following the increase in using electronics in aerospace. Today, since military budgets are shrinking, it is really important beginning to think about getting more and more dual applications.

Actually EADS is one of the most examples in Europe of an effective integration between civil and military research, both in terms of developments and production, and for some companies today it is difficult to remain only in one sector.

Now, in order to project into the future, the flight test programs and the military certifications should be developed to avoid repetitions in different countries: it is convenient to get a common certification and to try to avoid too many customizations.

Many technological developments are connected with the growing of convergences between military and civil aerospace. An example is given by commercial UAVs, unmanned aircrafts, navigating in the same airspaces than aircraft piloted by human beings: the challenge is how we can make it safe, certifiable, and when it will happen. Other aspects for convergences regard a wide employment of HUD technology, hypersonic propulsion, electrification of aircrafts, fuel cells and biofuels. It is significant that the biggest spender on research in biofuels is US Air Force.

In summary, there is a big shift from the cold war and after

the cold war: convergences between the two markets, civil and military, are becoming stronger and stronger, and this is mainly due to budget issues. In this context a key point is that aerospace and defense companies and governments should work together: public and private collaboration is absolutely necessary to optimize future outcomes and to avoid policy in conflict. At the moment, USA is the major planner in the defense scenario and Europe unfortunately is not yet able to organize itself and to understand that a faster decision process is necessary, driven by some leader nations. Europe needs about some big programs (Apollo like), and big companies and States have to move and tend to reach their objectives, so a public and private cooperation is absolutely necessary in order to coming up.

## Vision for research: Netherlands, Spain



Fred Abbink arrival at conference venue

## and Italy perspectives

Fred Abbink, Leandro B. Fernández Sáinz and Bruno Mazzetti discussed the Vision for research from Netherlands, Spain and Italy perspectives, where they reported their national experiences considering R&D institutions and their research.

Fred Abbink (NLR – The Netherland National Aerospace Laboratory) in “*Survival of the Fittest: 90 Years of Dutch Aeronautics RDT&E in a Globalizing Environment*” focused on Royal Dutch Airlines (KLM), Fokker Aircraft Industry and The National Aerospace Laboratory (NLR) foundations, their histories and political and technological developments that brought them into today’s form and structure.

The main developments consist in the consolidation of the multiple national aircraft industries (through National Champions and Joint Ventures between National Champions into European aerospace industries), the consolidation of the multiple national airlines (through national flag carriers, airline alliances and mergers into global airlines), the consolidation of Europe and the development of European organisations, agencies and European and international cooperation in aeronautical research.

Against these global and European developments, his lecture addressed the development and implementation of new technology to support the Netherlands Aeronautical Industry, and civil and military operators in the changing environments of the periods between the First and the



DLR Aircraft Model,  
in CEAS 2011 exposition area

Second World Wars, during the Cold War and during the post Cold War.

Furthermore Fred Abbink concentrated on how NLR increases its RDT&E efficiency by increased participation in the EU Framework Programs, AGARD/RTO, GARTEUR, ACARE and the Association of European Research Establishments in Aeronautics, and in the field of wind tunnels, by jointly building, operating and exploiting large wind tunnels like the Large Low-speed German-Netherlands Windtunnel (DNW-LLF) and the European Transonic Windtunnel (ETW).

Leandro B. Fernández Sáinz (Professor at CEPADE – polytechnic academy in Madrid) reviewed the majors events and factors that have affected the Spanish Aeronautical Sector in the past ten years, and foreseen the future scenario for manpower education and training that would be required throughout the whole Aeronautical Mix, and in particular, in the case of Spain.

More than ten years of the present century have already passed and in that time a major restructuring in the Aeronautical Industry of Europe has taken place: the creation of the pan-European company EADS out of the most important French, German, British and Spanish aeronautical firms at the time. During this time new aircrafts have been developed and put into market that have changed the balance of power between the major aircraft manufacturers. Industries producing Engines – Electronics on board and Ground Equipment – have also been merged and restructured. Due to the new features of modern aircrafts, all related activities and infrastructures have also been forced to change quickly, impacting on Operators, Airports and Navigation Authorities. It has also been necessary to implement new Safety and Security Regulations. The financial resources to support the whole sector are under review; this brings to the development of a new air transport policy.

At the same time a new world economic scenario appeared, due to innovations in technology. Increased manpower and economic growth in the Emerging Countries has caused a shift in the localisation of the most dense operations scenario from the North Atlantic towards the Pacific Rim. Forecasts of the future number of passengers and recent

atmospheric emission data brought about new concerns about the impact of the increasing air traffic volume. The impact of future atmospheric regulations will eventually bring about new aircraft configurations, leading to the redesign of engines models, search of new combustibles, and new financial stress will be placed on the other elements of the Aeronautical Mix.

Bruno Mazzetti (ACARE-Italia – Advisory Council for Aeronautics Research in Italy) presented a report about ACARE technological R&D Programme. An innovation and research activity is extremely necessary, in order to strengthen Italian aeronautical industries in the international scenario and to increase its competitiveness, through technology development and cooperation between all different fields inside the aeronautical division. In this context, ACARE – Italy suggests a technological R&D programme, which would answer to branch and countrywide requirements and objectives.

ACARE – Italy was born in 2003 in the context of the European Technology Platform of ACARE, and is a reference point for Italian stakeholders, giving them the possibility to debate about research and technological development activities. National needs and policy from the main international programmes, such as the 7<sup>th</sup> FP, Clean Sky and SESAR, are drivers for the decision of all chosen thematic area, in the research programme.

The work schedule is composed by 36 projects divided in 8 different areas and performed in 4 years with a budget of Euro 330 million. Among the 8 topics, 4 thematic areas are connected with technologies and instruments (greening technologies, systems for air and traffic management, materials and design tools), the other 4 topics refer to system's applications (avionics and equipment, safety and security, innovative aircraft concepts and unmanned flight). The main goals in Civil Aeronautics and Air Transport consist in national competitiveness increasing (connected with an increase in product and service quality, costs' reduction and innovations), environmental impact reduction (both acoustical and exhaust emissions), air transport efficiency increasing (which consists in an increasing in systems' capacity times and costs optimizations) and



## SPACE RELATED ACTIVITIES IN THE VENICE CONFERENCE

By Constantinos Stavrinidis

The space activities received prominent role in the 3<sup>rd</sup> CEAS Air & Space Conference attracting high level of attention by speakers and participants. At the Conference opening there were three keynote space presentations: Mr F. Ongaro, Director of ESA/ESTEC presented an impressive range of recent achievements by the European Space Agency, and ambitious missions currently being prepared.



The European Space Research and Technology Centre (ESTEC) in Noordwijk (NL) (Credit ESA).

Prof. G. De Groot presented a remarkable lecture on the USA/Soviet Union space race on the occasion of the 50 years manned space flight, contributing much interesting information from that era not readily available to the public. Prof. T. Krimigis presented a most memorable lecture on the unique flight of the two Voyager spacecraft at the edge of the heliosphere as described clearly by the title of the presentation "A modern Odyssey: the Voyagers 34-Year trek to the Edge of the Solar System". In recognition of the exceptional contributions by Prof. Krimigis in space endeavours, he was awarded the prestigious CEAS Gold Medal in the special ceremony held at the Conference Gala Dinner.

The space developments were well covered in the various technical sessions. In addition there were special space panel sessions where the respective subjects were addressed by leading space figures and subsequently the panels were open for discussion with session participants.

The Panel Session on "Space Infrastructure and Applications":

- Mr B. Patti (ESA) on European contributions to the International Space Station (ISS), and ISS utilisation issues;
- Mr M. Doubovick on the current manifest of Arianespace, and future launcher plans;
- Mr J. Aschbacher (ESA) on Earth Observation and GMES satellites being developed;
- Mr P. Weissenberg (EU) on Navigation efforts being undertaken by the EU, and future global European infrastructure aspirations in this area;
- Mr J.F. Bureau (EUTELSAT) on user applications from the point of view of a commercial satellite operator.

The Panel Session on "Technologies for Space Exploration" which was organised by Mr G. Saccoccia (ESA) included illuminating presentations on the subject from:

- Mrs I. Duvaux-Bechon, and N. Peter (ESA) on "Building a European Space Policy for Exploration: current activities";
- Mr J. Parrish, and Mr W. Abdalati (NASA) on "The Role of Science and Technology in furthering Space Exploration"
- Ms D. Di Cara (ESA) on "Technology Demonstration Missions for Space Exploration: ESA's reference studies";
- Mr K. Rajan (Monterey Research Institute) on "Exploring the Deep: Autonomy from Outer to Inner Space";
- Prof. J. Andreucci (ALTA) on "High Power Electric Propulsion: Key to Future Space Transportation and Exploration";
- Mr J.P. Leroy (ASTRIUM), Mr J. Brunet (SHERPA), Mr G. Perna (ENGISOFT), and Mr C. Lasseur (ESA) on "ALisse: A metric to evaluate life support system architecture".

The Panel Session on "Space Industry Day" attracted leading figures from European Space Industry Dr A. Lindenthal (ASTRIUM CEO), Mr M. Comparini (Thales CTO), Dr F. Merkle (OHB CTO), Mr P. Davies (SSTL) and Mr J.J. Tortora (General Secretary of ASD EUROSPACE). Subjects discussed by the Panel included current best practice, expected system architecture evolution in various types of satellites, priority technology developments, increasing competition in commercial satellites, and sources of funding for future space missions.

The Panel Session on "Disruptive Technologies and Public Private Partnership (PPP)" included presentations by leading international figures on major satellite and launcher developments currently in progress:

- Mr A. Hegyi (ASTRIUM) on the development of the European Data Relay Satellite (EDRS);
- Mr R. Longstaff (Reaction Engines on the SKYLON) hypersonic vehicle, and its SABRE air breathing and revolutionary heat exchanger engine which is being readied for test;
- Mr D. Bestwick (AVANTI Plc.) on the experiences from the PPP development of the HYLAS payload;
- Mr C. Bauer (SPACEX) on the remarkable developments of the FALCON launchers;
- Mr M. Roux (ASTRIUM on the impressive ASTRIUM& THALES) joint development of AlphaBus/AlphaSat also in the context of PPP.

Finally there was active participation by young professionals in the Panel Session on "Business Incubation and Innovation" organised by Mr F. Salzgeber, Head of the Technology Transfer Programme in ESA. This session included presentations on "GMES Masters and Galileo Masters, from an idea to a company" by Mr T. Rudolph, "Technology and Innovation" by Mr P. Vernon, and "Space for regional development" by Mr M. Ponthieu. ■

# WHAT FUTURE FOR THE EUROPEAN COMBAT AIRCRAFT INDUSTRY? A DEATH FORTOLD?

By Dr Georges Bridel  
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Member of the Board ALR Aerospace Project  
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**Keywords:** Combat Aircraft, European Industry, Industry, European Defence

## Abstract

*Production of the 3 new generation European combat aircraft Eurofighter, Gripen and Rafale lasting some more years, the fundamental question arises: what kind of combat aircraft<sup>1</sup> (manned or unmanned) will be required to guarantee Europe's future security? Focussing on production capability only, the design and development capabilities however erode, if there are no measures taken. Maintaining design and development capability of modern combat aircraft requires therefore continuous work in this technical and operational area on products and operational/technology demonstrators. The paper presents an evolution of the position paper [1] issued by the Air and Space Academy on June 30 2011 to the 26 EU Member State Ministries of defence, European authorities and industry leaders.*

## 1. Aircraft warfare scenarios without advanced combat aircraft are no longer feasible

In Europe, Defence budgets are shrinking. This fact sends out the wrong signal that European States are generally feeling safer and more comfortable in a world which is itself getting more and more uncertain.

Any projection as regards the next generation of combat air systems is necessarily based on anticipated future conflict scenarios. At present, asymmetric warfare dealing mainly with terrorist organisations and multinational interventions in failed states are in the spotlight. In many such cases, mission aircraft, light aircraft and UAVs are up to the job. However, as can be seen in the current crisis in Libya, even in asymmetric conflicts, sophisticated air combat forces are essential in order to identify targets, ensure strike accuracy, be efficient on mobile targets and avoid collateral damage.

In addition, growing economic competition, dwindling resources and the consequences of climate change might generate multi-polar conflicts between nations and continents going far beyond current conflict scenarios. This is another reason why Europe must take care to maintain an advanced combat aircraft industry.

Finally diplomatic and economic pressures supported by the presence of military forces and, at the worst, armed conflicts involving mostly sophisticated air power are likely to emerge in out-of-area scenarios where resources are a key to Europe's economic and political survival.

## 2. Today, Europe runs the risk of losing its air power independence

A state nowadays relies for its independence on its capacity to project power, which itself depends on an advanced air combat force.

Since WWII, European nations have developed and produced several generations of highly competitive combat aircraft. Today three aircraft – Eurofighter, Gripen and Rafale – are currently produced, fulfilling European defence needs and securing industrial and strategic independence.

Of course, this industrial heritage should be optimised to propose a single successor to these three combat aircraft but, so far, no movement is yet visible to secure this crucial European strategic asset in the future.

At the same time, in addition to the USA which has already developed the F-22 and is developing the new JSF/F35 combat aircraft with financial support of some European countries, emerging powers worldwide are now building up forces equipped with their own advanced systems such as high performance combat aircraft which are developed, procured and soon exported in considerable numbers all over the world.

In the coming decades, the introduction on the market of advanced 5<sup>th</sup> Generation combat aircraft such as the T-50 (Russia, India), J-20 (China), KFX (Korea, Indonesia) combined with in-flight refuelling capacity allowing for out-of-area interventions, with demonstrate these strategic ambitions (figure 1).

Europe's strategic independence is therefore at stake, if no action is taken to secure independent air power capabilities.

## 3. A strong European Industrial Base is mandatory to Support Operations and Upgrades

Another factor of growing importance that must be taken into account is the efficient use of advanced systems in operations. Continuous and close industrial support is absolutely essential during air operations. Such support services are equally needed to maintain air capabilities through future upgrades. This twofold support comes mostly from the industry having produced the systems.

Growing difficulties investing in upgrades of European

1. For "combat aircraft", read "aerial combat system", onboard or not, which includes both combat aircraft and combat UAV and encompasses airframe, engine, equipments and weapons systems.

combat aircraft are a warning that the European air operations capacity is going to shrink.

Acquisition or even participation in a foreign development and production programme – an example is given with the F-35 Joint Strike Fighter JSF – will never be sufficient to maintain overall European airpower capability since key technologies and fundamental air power characteristics will remain exclusively with the leading partner, in the case of F-35 with the USA.

It is now clear that the JSF/F-35 process has significantly weakened the independent capacity of the European combat aircraft industry as a whole. It is urgent for Europe to react.

**4. The Combat Aircraft Industry is a driving force for advanced technologies and qualified employment**

It is not only European air power capabilities that are at stake: the European combat aircraft industry has become an important factor in employment and technology, enriching the civil aircraft sector as well as many other high technology industries, research institutions and universities. And these capabilities are sustained by a large spectrum of supplier industries, with engine, electronic and weapons systems manufacturers in pride of place (figure 2). All over Europe, some 120,000 highly qualified people are employed in the combat aircraft industry.

A complete industrial network is therefore under threat of being destroyed.

**5. Fundamentals to secure the European Combat Aircraft Industry**

It is common knowledge that maintaining these capabilities requires continuous work on concrete programmes involving the research for new technologies and related know-how in design, development and production.

It goes without saying that European manufacturers cannot maintain such capabilities on a purely national basis, given that no single government will commission for instance a new combat aircraft programme of its industry. The related-investments are too high and the single national market is too small. We obviously must think on a European scale.

It is generally acknowledged, in Europe as well as in the USA that such combat aircraft capabilities can only be maintained through affordable demonstrator projects and new programmes, initiated roughly every 15 and 30 years respectively, going well beyond existing European TDPs (Technology Demonstrator Programmes). It must be remembered that demonstrator variants of today’s European combat aircraft have flown for the first time some 25 years ago already.

If no decision is taken on a European level, the industrial capability to design and produce combat aircraft will rapidly be lost and could only be rebuilt by means of a tremendous effort lasting decades.

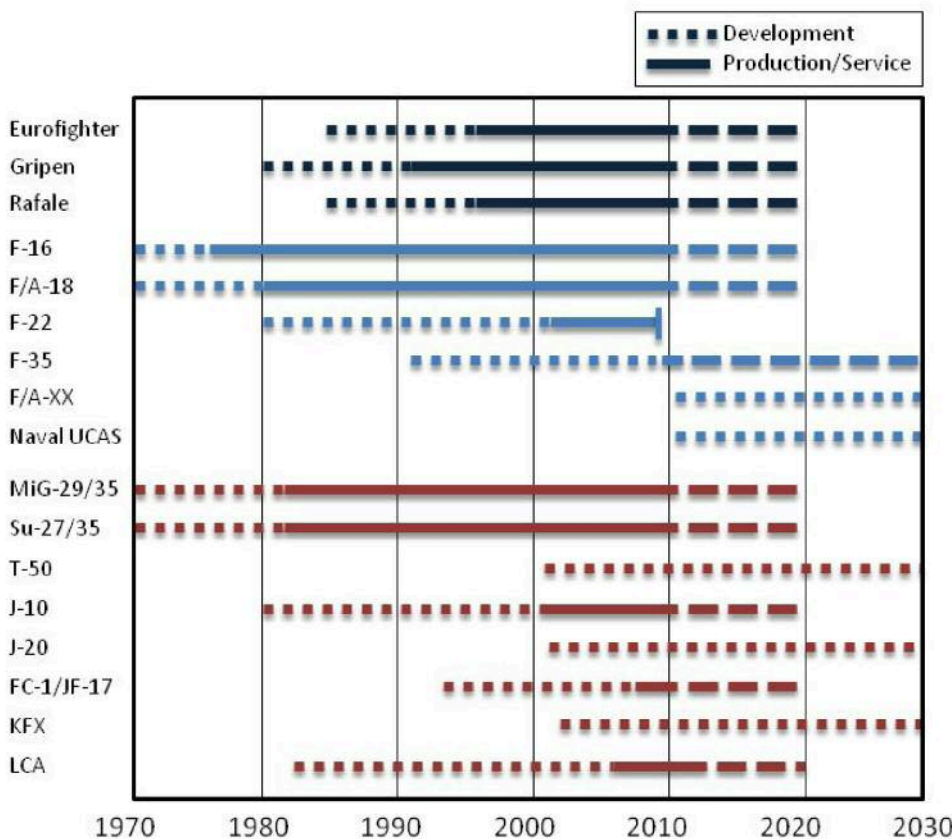
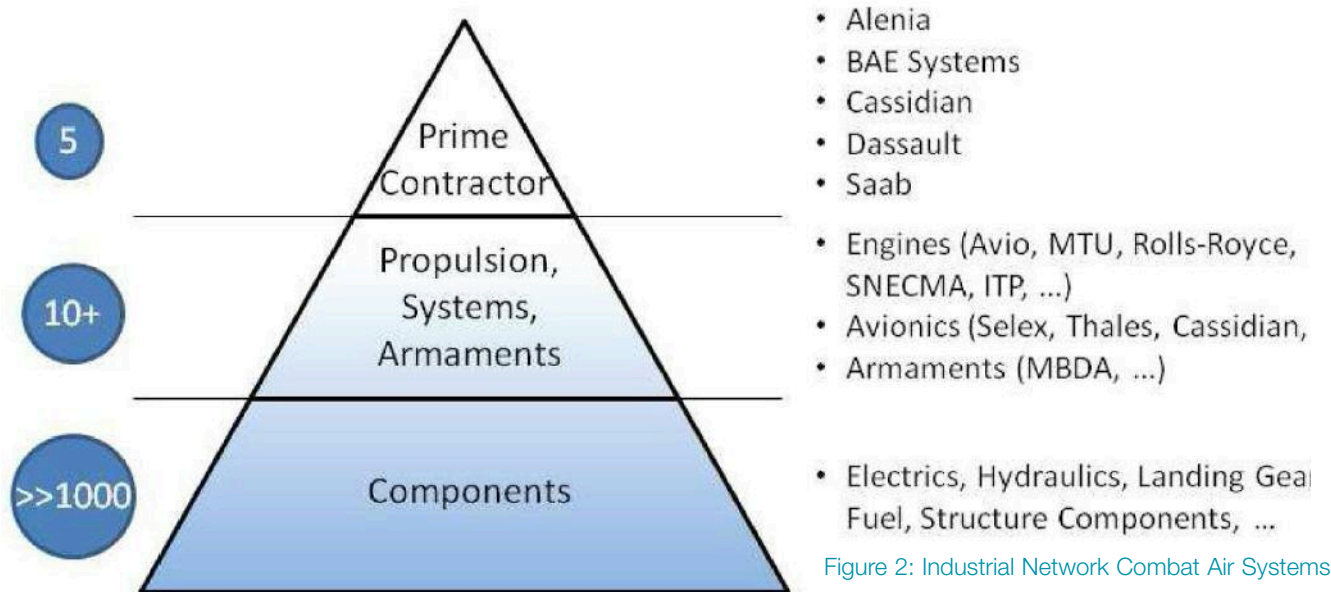


Figure 1: Combat Aircraft Generations, Development and Production





## 6. Actions required in order to secure Industrial European Combat Aircraft Capability

The Air and Space Academy strongly believes that, in order to avoid the future death of the independent European combat aircraft industry, the following solutions should be urgently implemented:

Any definition of a future European combat aircraft programme must stem from the expression of joint operational needs and clearly specify the required industrial capabilities; this approach must be reinforced by technical and operational simulations on a global scale.

Urgent actions must be taken in Europe in order to ensure the survival of the avionics (radars, sensors, on-board systems) and weapons industries, the latter of which is currently losing the battle against its competitors. Major weapons programmes will secure the technology level but upgrade programmes are also essential to secure the survival of this industry.

Further consolidation of European industry is required in order to develop new technologies, demonstrators or capabilities. With this aim in mind, it is necessary to go beyond classical cooperation models, and investigate new forms of industrial organisation:

- creation of an industrial integrated structure for each programme;
- or the creation of a European integrated company for the air combat industry.

Experience shows that any attempt at industrial consolidation remains artificial and is likely to fail if it is not based on a major programme.

The best way of putting together a successful multinational programme is to include a limited number of cooperating countries (2 or 3) in its launch, all of which should agree on their respective roles and be prepared to encourage other states to join in by providing attractive conditions.

A European operational demonstrator programme with 5<sup>th</sup> generation technology should be launched immediately, taking advantage of the various technology demonstrators already in development and being tested in Europe, thus bridging 15 years gap mentioned above. At the same time, in order to validate the new operational capabilities envisaged, it would be advisable to develop functional demonstrators.

Lastly, a comprehensive long-term investment plan must be set up, sponsored by industry and European as well as national institutions in order to secure Europe's future capacity to design, develop, produce and operate a new generation of combat aircraft. The EDA project "Future Air System for Europe<sup>2</sup>" presents a comprehensive capability road-map enabling future developments.

## 7. Conclusion

To-day Europe can still rely on a strong aeronautical industrial base. Tomorrow Europe will be able to secure its future strategic air power independence only if actions are urgently decided and funded. This is the price to pay now if Europe is to maintain its place in the newly emerging multi-polar world.

## References

[1] Air and Space Academy, "What future for the European combat aircraft industry?", 2011 (also available in French, German, Italian and Spanish)

[2] FAS4Europe Study: Future Air Systems for Europe

# GERMAN DEVELOPMENT OF THE SWEEP WING: 1935-1945

Edited by Hans-Ulrich Meier

Published by the AIAA (American Institute of Aeronautics and Astronautics, USA) in cooperation with the DGLR in the end of 2010.

Distributed by Transatlantic Publishers Group, unit 242, 235 Earls Court Road, London, SW5 9FE (Tel: +44 (0)20 7373 2515 - E.Mail richard@tpgltd.co.uk 733 pp. illustrated. ISBN 978-1-60086 - 714-9.



Seven authors describe the development of high speed aircraft and anti-aircraft missiles in Germany in the decade 1935-1945. Each author is an authoritative expert in his field so that the book is a reference on the activities conducted at that time. The authors have consulted an impressive number of original documents, not known or hardly available, and succeeded in producing a detailed and comprehensive presentation. Facsimiles of many documents are provided with an English translation.

The book's title seems restrictive because the subjects go well beyond the swept wing. Aerodynamics holds an important place and even today this is a key element in the design of an aircraft. The first two chapters are precisely devoted to aerodynamics. Hans-Ulrich Meier, coordinator of the project, proposes a historic review of the work performed by Ludwig Prandtl and his collaborators and describes the development of the swept wing concept. This chapter is followed by a very detailed presentation of the experimental program set up in Germany. The next chapter is devoted to the development of turbojets which led in particular to the production of the first jet fighter, the famous Messerschmitt Me 262, which outperformed existing aircraft. The Me 262 was the result of a successful synthesis of aerodynamics and propulsion. In the transonic regime,

new problems arose in the field of aeroelasticity. Thanks to the theoretical and experimental study of wing flutter, the achievement of high-speed aircraft has been made possible. The knowledge of the effects of compressibility was greatly improved with the experience acquired with flights of prototypes or production aircraft at high speed. This exploration of new domains is described in two chapters devoted to high Mach numbers and to the experience gained with aircraft equipped with swept wings. Another chapter is devoted to the development of anti-aircraft missiles equipped with swept wings or low aspect ratio wings. The last chapter relates the transfer of technology from Germany to the Allies. Very soon, the Allied technicians understood that considerable progress had been made in aeronautics and that it could be the source of a new expansion of the aeronautical industry in their countries. It is shown that this transfer raised many problems among the Allies who each wanted to collect the maximum of information for their side. In addition, human problems were raised when thousands of people were moved, voluntarily or by force, to transfer their knowledge.

The history of aeronautics started very early in Germany. Notwithstanding the restrictions of the Versailles Treaty, fundamental progress in fluid mechanics and aerodynamics was made due to Ludwig Prandtl and his collaborators. We can cite the boundary layer theory, the lifting line, and the lifting surface theories. The rules on the influence of compressibility are also basic elements of aerodynamics.

Directly related to the subject of the book, the year 1935 was the beginning of a very fruitful period in Germany. Selected people were invited to participate in the Volta meeting in Roma and a few young people were also recommended, among them Adolf Busemann. This gave him the opportunity to present his concept of the swept wing aircraft (figures 1 and 2). These researches were not undertaken by accident because even before 1935, emphasis was placed on high-speed flight in Germany. Nowadays, it is well-known how important the idea of the swept wing is as regards the increase of the critical Mach number and the associated drag reduction. At that time, this concept was not well understood outside Germany. With the turbojet, the swept wing was another key technology for flight at high speed. Today, the contribution of Busemann is fully recognized in most of aerodynamics books.

This is not the case of other fundamental ideas. For example, the discovery by Otto Frenzl of the area rule is practically never cited. Frenzl formulated this law consequently to the analysis of many wind tunnel tests, in the years 1943-1945. Today, this law is attributed to Richard T. Whitcomb (1952). A patent was granted with the names of Hertel, Frenzl and Hempel (1944) but the political situation and the secret imposed to this research explain why the German contribution has been forgotten. As suggested by H.U.

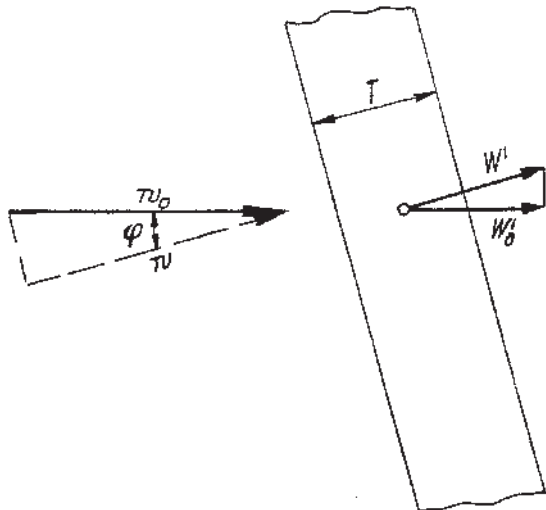


Abb. 14 Schräg angeblasener Tragflügel nach Adolf Busemann, vgl. Anhang A.

Figure 1. The above drawing is extracted from the initial publication where Dr A. Busemann presented his swept wing concept.

Meier, a review of the history of the origin of the area rule is deemed advisable.

Another contribution which is often forgotten is related to the design of airfoils which have a good behaviour in the transonic regime. Following the experimental work of Göthert and using the potential method of Theodorsen and Garrick (1933), Kawalki investigated the performance of an airfoil (1940). The result was close to supercritical airfoils developed by Richard Whitcomb. This study led to a patent which had important consequences for the European aeronautical industry. In 1972, an American patent was filed by the NASA in order to protect the supercritical airfoils. This was precisely the period of development of the Airbus A310, the first jet equipped with a swept wing having a



Figure 2. The book contains considerable material on aircraft swept wing with the definite intention of improving the critical Mach Number condition. One of the most interesting is the forward-swept wing Junker 287: see above a picture of the Ju 287 prototype.

supercritical airfoil. Fortunately, thanks to the work of Kawalki, the objection against the American patent was accepted. Otherwise, the economic consequences would have been very detrimental to Airbus.

The experimental facilities played a first role in the development of high-speed flight. Many wind tunnels were built in Germany for this purpose. The most important project was a very large transonic wind tunnel. In May 1945, the project was under construction in Ötztal and was discovered first by American troops and after by a French group. After discussions between French and American officials, it was decided to dismantle the installation and to reconstruct it in France (Modane) where the facility is still in operation today. The studies conducted in Germany resulted in ambitious projects such as the experimental aircraft Messerschmitt P1101 and the bomber Junkers Ju 287. These two aircraft were equipped with a swept wing but the Ju 287 possessed a forward swept wing.

In a general way, the progress made in Germany between 1935 and 1945 was a valuable basis for many countries in the following years. After the war, it was very soon recognized that Germany had succeeded in a unique combination of basic, experimental and applied research. The direct relation between the aircraft and rockets we know today and those studied in Germany is very obvious.

This book is not the work of historians but it contributes to restore a more correct view of the history of aeronautics. In addition, the book relates how important discoveries came about. Many reproductions of original documents and individual or collective photographs of many people who contributed to the technical progress render the reading very lively. All the people interested in aeronautics and space will be satisfied including the youngest who are being introduced to these fields.

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## AMONG THE AEROSPACE NEWS OF THE 1<sup>ST</sup> QUARTER 2012

### CIVIL AVIATION

#### SESAR: EUROPE'S ATM MODERNISATION PROGRAMME

- 10 February: the Airbus A320 test aircraft performs the world's first I-4D (first four-dimensional trajectory management) validation exercise, flying from Toulouse to Copenhagen and Stockholm and back. I-4D represents a key element in the transition from constrained flights in the current ATM system to optimised flights in the future Single European Sky. It was the culmination of months of preparation between SESAR partners, including aircraft, avionics and equipment manufacturers as well as air navigation service providers (ANSPs).



Airbus A320 test aircraft performing the world's first I-4D flight © Airbus 2012

- 6-8 March: the 22<sup>nd</sup> edition of ATC Global took place in Amsterdam. Participants showed again great interest in SESAR. Particular attention was paid to the presentation of first results coming from Europe's ATM modernisation programme. A total of 1,000 ATM experts attended the SESAR Forum and three technical workshops.

#### AVIATION BIOFUEL COMMERCIALISATION

- 22 March, at the Air Transport Action Group (ATAG) Aviation and Environment Summit in Geneva: EADS/Airbus, Boeing and Embraer signed a Memorandum of Understanding (MoU) to work together on the development of drop-in, affordable aviation biofuels. The three leading airframe manufacturers agreed to seek collaborative opportunities to speak in unity to government, biofuels producers and other key stakeholders to support, promote and accelerate the availability of sustainable new jet fuel sources. The collaboration agreement supports the industry's multi-pronged approach to continuously reduce the industry's carbon emissions. All three companies are affiliate members of the Sustainable Aviation Fuel Users Group ([www.safug.org](http://www.safug.org)), which includes 23 leading airlines responsible for about 25% of annual aviation fuel use.

### DEFENCE

- Following the Franco-British summit, 17 February, France reaffirmed its interest in the Watchkeeper UAV, developed by Thales UK, the British subsidiary of French electronics, Elbit and the Israeli group. Selected to equip the British armed forces, this machine, which shortly to enter into service, can fly 18 hours.



Thales Watchkeeper UAV credits THALES

In meanwhile, France and UK will continue to work on developing a new UAV MALE (Medium Altitude Long Endurance).

Paris and London have also confirmed their willingness to work on defining a future unmanned combat Air vehicle (UCAV), whose implementation service is envisaged in 2030. Dassault Aviation and BAE Systems are already working on demonstrators: Neuron (Dassault) and Taramis (BAE).

Based upon the experiences acquired on both sides of the Channel, a new Franco-British demonstrator could be undertaken from 2013.

### SPACE



Liftoff of Vega VV01. Credit ESA



ATV-3 Launch on Ariane

- 13 February: ESA's new Vega launcher scores success on maiden flight.

The first Vega lifted off at 10:00 GMT from the new launch pad in Europe's Spaceport in Kourou, French Guiana, and conducted a flawless qualification flight. Vega's light launch capacity accommodates a wide range of satellites – from 300 kg to 2500 kg – into a variety of orbits, from equatorial to Sun-synchronous. Its reference mission is 1500 kg into a 700 km – high circular Sun-synchronous orbit.

Vega will add to Europe's set of launch services next to Ariane 5 heavy lifter and the Soyuz medium-class launcher.

- 23 March: ATV-3 Edoardo Amaldi lifted off from Kourou at 04:34 GMT on an Ariane 5 launcher operated by Arianespace, heading towards the International Space Station (ISS): rendezvous on 28 March, docking under its own control with Russia's zvezda module. The Automated Transfer Vehicle will deliver essential supplies to the orbital outpost. It will reboost the ISS's orbit while it is attached for about five months.

"Europe providing an annual service to the Station becomes a reality due to the dedication, competence and interaction of our space industry, national agencies and ESA", said Jean-Jacques Dordain, ESA's Director General.



## PROFESSOR SERGEY CHERNYSHEV HAS BEEN AWARDED THE FRENCH NATIONAL ORDER OF MERIT



Sergey Chernyshev, Chief Executive of the Central Aerohydrodynamic Institute Russian Aerospace Society (TsAGI), Founding Member and Board Member of EUCASS (European Conference for Aero-Space Sciences) has been awarded the French National Order of Merit. The ceremony took place at the ONERA Meudon Centre (France) on 31 January 2012. The medal was bestowed on Sergey Chernyshev by Denis Maugars, CEO of ONERA, in the presence of Jean-Jacques Dordain, Director General of ESA and EUCASS Honorary Member, and several other personalities from the EU and Russian Embassy.

Sergey Chernyshev is Trustee of the Council of European Aerospace Societies (CEAS). The CEAS President Pierre Bescond and the members of his management team congratulate him very warmly.

## THE CEAS MEMBER SOCIETIES

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YEAR 2012

- 17-18 April • **AAE, Collège Polytechnique, 3AF** – Meeting International Scientific Aerospace Education for Aerospace Professionals – ISAE, Toulouse (France) - [sciences@collegepolytechnique.com](mailto:sciences@collegepolytechnique.com)  
[www.entretienstoulouse.com](http://www.entretienstoulouse.com)
- 18-19 April • **FSF** – Corporate Aviation safety Seminar – EASS – San Antonio (TX, USA) – Grand Yatt San Antonio  
[www.flightsafety.org](http://www.flightsafety.org)
- 18-20 April • **ICAO** – ICAO Air Transport Symposium – ICAO – Montréal (Canada)  
[www.icao.int/Meetings](http://www.icao.int/Meetings)
- 23-25 April • **ACI Europe** – 21<sup>st</sup> ACI Europe Airport Trading Conference & Exhibition – Oslo Airport – Oslo (Norway) –  
[www.aci.conferences](http://www.aci.conferences) - [www.aci-europe.org/events.html](http://www.aci-europe.org/events.html)
- 23-26 April • **AIAA/ASME/ASCE/AHS/ASC** – 53<sup>rd</sup> Structures, Structural Dynamics and Materials Conference – 20<sup>th</sup> AIAA/ASME/AHS Adaptive Structures Conference – 14<sup>th</sup> AIAA Non-Deterministic Approaches – 13<sup>h</sup> AIAA Gossamer systems Forum – 8<sup>th</sup> AIAA Multidisciplinary Optimization Specialist Conference – Sheraton Waikiki, Honolulu, Hawaii – [www.aiaa.org](http://www.aiaa.org)
- 23-27 April • **ESA** – GMES Sentinel-2 Preparatory Symposium – ESA/ESRIN - Frascati (Italy) – [www.esa.int](http://www.esa.int)
- 26 April • **EASA** – Annual EASA meeting with the European civil Aviation Investigation Authorities – Cologne (Germany)  
[www.easa.europa.eu/events/events.php](http://www.easa.europa.eu/events/events.php)
- 2-4 May • **ESA** – ISS User Symposium – Berlin (Germany) – [www.esa.int](http://www.esa.int)
- 3-4 May • **ROSA, ESA** – GMES New opportunities for Eastern Europe – Bucharest (Romania) – Palace of the Parliament  
[www.events.rosa-rc-ro/indico](http://www.events.rosa-rc-ro/indico)
- 07-09 May • **IATA** – 25<sup>th</sup> IATA Ground Handling Council – Prague (Czech Republic) – [www.iata.org](http://www.iata.org)
- 07-10 May • **3AF, ESA, CNES** – Space Propulsion 2012 – Bordeaux (France)  
[sophie.videment@aaaf.asso.fr](mailto:sophie.videment@aaaf.asso.fr) - [www.propulsion2012.com](http://www.propulsion2012.com)
- 14-16 May • **EBAA/NBAA** – Business Aviation EBACE 2012 – Geneva (Switzerland) – International Airport –  
[www.ebace.org](http://www.ebace.org)
- 21-22 May • **EASA** – EASA Conference on Aerodrome rules – Cologne (Germany) –  
[www.easa.europa.eu/events/events.php](http://www.easa.europa.eu/events/events.php)
- 22-24 May • **AIAA** – Global Space Exploration Conference – GLEX – Washington DC (USA) – [www.aiaa.org](http://www.aiaa.org)
- 22-25 May • **IAF/AIAA** – Global Space Exploration Conference – L'Enfant Plaza Hotel – Washington DC (USA) –  
[www.iaf.com](http://www.iaf.com)
- 04-06 June • **AIAA/CEAS** – 18<sup>th</sup> AIAA/CEAS Aeroacoustics Conference – Colorado Springs (CO, USA) – [www.aiaa.org](http://www.aiaa.org)
- 10-12 June • **IATA** – IATA's Annual general Meeting – Beijing (China) – [www.iata.org](http://www.iata.org)
- 11-14 June • **NVvL/SFTE** – 23<sup>rd</sup> Society of Flight Test Engineers SFTE Symposium – Amsterdam (NL) – National Aerospace Laboratory NLR – [Christophe.Hermans@nlr.nl](mailto:Christophe.Hermans@nlr.nl)
- 18-20 June • **AIAA** – 3<sup>rd</sup> International ATOS and 6<sup>th</sup> IMAPP (Product support Process) – Delft (NL) –  
[www.aiaa.org/events](http://www.aiaa.org/events)

- 18-20 June • **AIAA/IAC** – 3<sup>rd</sup> International Air Transport and Operations Symposium (ATOS)/6<sup>th</sup> International Meeting for Aviation Product Support Process (IMAPP) – Delft University of Technology – Delft (NL) – [www.aiaa.org](http://www.aiaa.org)
- 24-26 June • **AIAA** – AIAA Missile Sciences Conference – Monterey, CA (USA) – [www.aiaa.org/events](http://www.aiaa.org/events)
- 25-28 June • **ESA** – Toulouse Space Show – Toulouse (France) – [www.esa.int](http://www.esa.int)
- 25-28 June • **AIAA** – 42<sup>th</sup> AIAA Fluid Dynamics Conference – Sheraton – New-Orleans (USA) – [www.aiaa.org/](http://www.aiaa.org/)
- 25-28 June • **AIAA** – 28<sup>th</sup> Aerodynamics Measurement and Ground testing Conference – Sheraton – New Orleans, Louisiana (USA) – [www.aiaa.org/](http://www.aiaa.org/)
- 03-06 July • **3AF, Astrium, Thales** – Symposium “7<sup>th</sup> Missile Defence 2012” – Paris (France) [sophie.videment@aaaf.asso.fr](mailto:sophie.videment@aaaf.asso.fr) – [www.missile-defence.com](http://www.missile-defence.com)
- 09-15 July • **Farnborough Org** – International Farnborough Air Show – Farnborough (England) [www.farnborough.airshow](http://www.farnborough.airshow)
- 14-22 July • **COSPAR** – 39<sup>th</sup> COSPAR Scientific Assembly – Mysore (India) – N Murthy Centre of Excellence – [www.cospa2012india.org/](http://www.cospa2012india.org/)
- 17-19 July • **RAeS** – RAeS Annual Applied Aerodynamics Conference – Bristol (UK) – [www.aerosociety.com/Events](http://www.aerosociety.com/Events)
- 30 July-1<sup>st</sup> august • **AIAA, ASME, SAE, ASEE** – 48<sup>th</sup> Joint Propulsion Conference and Exhibit (JPC) – Atlanta, GA (USA) – [www.aiaa.org/events/jpc](http://www.aiaa.org/events/jpc)
- 13-16 August • **AIAA** – AIAA Conferences: GNC - Aerospace Modeling and Simulation Technologies – Atmospheric Flight Mechanics – Astrodynamics Specialist – Minneapolis (Min, USA) – Hyatt Regency – [www.aiaa.org/](http://www.aiaa.org/)
- 31 August- 02 September • Canadian International Air Show – CIAS 2012 – Toronto (Ontario, Canada) – National Exhibition Toronto – [www.milavia.net/airshows/calendar/](http://www.milavia.net/airshows/calendar/)
- 03-07 September • **EUMETSAT** – 2012 EUMETSAT Meteorological Satellite Conference – Sopot (Poland) – [www.conferences.eumetsat.int](http://www.conferences.eumetsat.int)
- 04-07 September • **NVvL/CEAS** – European Rotorcraft Forum – ERF 2012 (38<sup>th</sup> ERF) – Amsterdam (NL) – Amsterdam Marriott Hotel - [hermans@nlr.nl](mailto:hermans@nlr.nl) [ERF2012@nlr.nl](mailto:ERF2012@nlr.nl) - ERF 2012 Chairman: Kees Baker [k.bakker@concepts.nl](mailto:k.bakker@concepts.nl)
- 09-14 September • Japan International Aerospace Exhibition 2012 – Nagoya (Japan) – Aerospace Exhibition Center [www.milavia.net/airshows/calendar](http://www.milavia.net/airshows/calendar)
- 11-13 September • **AIAA** – AIAA Space 2012 Conference and Exposition – Pasadena (Cal, USA) – Hilton Convention Center – [www.aiaa.org/](http://www.aiaa.org/)
- 11-16 September • **BDLI Messe Berlin** – ILA Berlin 2012 – Brandenburg Airport – Berlin (Germany) [www.ila-berlin.de/ila2012/home/index.cfm](http://www.ila-berlin.de/ila2012/home/index.cfm)
- 12-13 September • **SAE International** – SAE 2012 Safety Management Systems Symposium for Aerospace design and Manufacturing – Madrid (Spain) – [www.sae.org/events/aerospace/](http://www.sae.org/events/aerospace/)
- 12-14 September • **ICAO** – High-Level Aviation Security Conference – ICAO – Montréal (Canada) – [www.icao.int](http://www.icao.int)

- 23-28 September** • **ICAS** – ICAS2012 Congress – Brisbane, Australia - [secr.exec@icas.org](mailto:secr.exec@icas.org). Call for Papers is now downloadable. ICAS Secretary: Mr Axel Probst – ICAS Secretariat: c/o DGLR – Godesberger Allee 70 – 53175 Bonn, Germany. Tel.: +49 228 3080519 – [www.icas.org](http://www.icas.org)
- 24-27 September** • **3AF, AIAA** – 8<sup>th</sup> AIAA International Space Planes and Hypersonic Systems and Technology Conference – Tours (France) – [sophie.videment@aaaf.asso.fr](mailto:sophie.videment@aaaf.asso.fr) – [www.aiaa.org/Hypersonice2012](http://www.aiaa.org/Hypersonice2012)
- 24-28 September** • **EAAP** – Aviation Psychology and Applied Human Factors – Working towards zero accident – with a special session on aviation economics – Villasimius (Sardinia, Italy) – ATA Hotel Tanka Village – [www.conference.eaap.net/register.html](http://www.conference.eaap.net/register.html)
- 24-29 September** • **ESA, CNES** – 20 years of Progress in Radar Altimetry – Venice (Italy) [www.esa.int/esaLP/LP\\_calende.html](http://www.esa.int/esaLP/LP_calende.html)
- 26 September** • **RaeS** – 7<sup>th</sup> Annual International Flight Crew Training Conference – RaeS/HQ – London (England) [www.aerosociety.com/Events](http://www.aerosociety.com/Events)
- 27-29 September** • **DLRK** – German Aerospace Association Home Event 2012 – Bremen (Germany) [www.dlrh2011.dglr.de/](http://www.dlrh2011.dglr.de/)
- 1-5 October** • **IAF** – 63<sup>rd</sup> International Astronautical Congress- IAC2012 Nostra D’oltremare Convention Center- Naples, Italy – [www.iac2012.org](http://www.iac2012.org)
- 10-12 October** • **3AF** – 11<sup>th</sup> European Forum Strategic and Economic Intelligence – From urgency to anticipation: the challenges of Economic Intelligence – Lille (France) [secr.exec@aaaf.asso.fr](mailto:secr.exec@aaaf.asso.fr) - [sophie.videment@aaaf.asso.fr](mailto:sophie.videment@aaaf.asso.fr) – [www.ies2012.com](http://www.ies2012.com)
- 11-12 October** • **INCAS, ISMMA** – Conference “Aerospacial 2012” – INCAS, n° 220, Luliu Maniu Blvd, District 6, Bucharest (Romania) – [www.incas.ro](http://www.incas.ro) – [www.aerospacial-2012.incas.ro](http://www.aerospacial-2012.incas.ro)
- 16 October** • **RAeS** – Greener by Design Annual Conference – RAeS/HQ – London (England) – [www.aerosociety.com/Events](http://www.aerosociety.com/Events)
- 23-25 October** • **FSF** – International Air Safety Seminar 2012 – Santiago (Chile) – [www.flightsafety.org/](http://www.flightsafety.org/)
- 30 October-1<sup>st</sup> November** • **SAE International** – SAE 2012 Aerospace Electronics and Avionics Systems Conference – Phoenix, Arizona (USA) – [www.sae.org/events/aerospace/](http://www.sae.org/events/aerospace/)
- 6-8 November** • Heli Show Dubai 2012 – Dubai (UAE) – Dubai Airport – [www.milavia.net/airshows/calendar](http://www.milavia.net/airshows/calendar)
- 7 November** • Europe’s Securities Priorities –CEIS – SECDEF’11 – Brussels (Belgium) – Crowne Plaza Europa – [www.securitydefenceagenda.org](http://www.securitydefenceagenda.org)
- 8-9 November** • **CSDP** – 10<sup>th</sup> Congress on European Security and Defence – The Future of European Security and Defence – Time for Change –Berlin (Germany) – Convention Center Berlin – Landsberger Allee 106 [www.euro-defence.eu](http://www.euro-defence.eu)
- 09-10 November** • **RAeS** – Autumn Flight Simulation Conference: contribution of flight simulation to aviation safety – RaeS/HQ - N° 4 Hamilton Place London W1J 7BQ, UK – [www.aerosociety.com/conference](http://www.aerosociety.com/conference)
- 10-11 November** • **EASA** – Earth Observation and Cryosphere Science Symposium – ESA/ESRIN – Frascati (Italy) [www.esa.int](http://www.esa.int)
- 20-21 November** • **3AF-SEE** – Conference “More electrical Aircraft (MEA 2012) – Bordeaux (France) [sophie.videment@aaaf.asso.fr](mailto:sophie.videment@aaaf.asso.fr) – [www.mea2012.eu/](http://www.mea2012.eu/)





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