The Quarterly Bulletin of the

CEAS

COUNCIL OF EUROPEAN AEROSPACE SOCIETIES

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

Issue 4 - 2015
December

CEAS Award Ceremony – 9 September on board « De Majesteit »

Signing of the MoU between EREA and CEAS on 8 September : on the left Fred Abbink, on the right Joseph Kaspar, EREA chairman

CEAS2015 - TECHNICAL UNIVERSITY OF DELFT - WEEK 7-11 SEPTEMBER:

MORE THAN 500 DELEGATES,16 KEYNOTE SPEAKERS, 25 INVITED SPEAKERS, 40 SESSION CHAIRS, 75 PARTICIPANTS TO THE WORSHOPS, AND 140 HIGH STANDARD TECHNICAL PAPERS PRESENTED: THE OBJECTIVE "TO MARK A NEW STEP FORWARD IN THE RISE OF THE CEAS" HAS BEEN REACHED

WHAT IS THE CEAS ?

The Council of European Aerospace Societies (CEAS) is an International Non-Profit Association, with the aim to develop a framework within which the major Aerospace Societies in Europe can work together.
It presently comprises twelve Full Member Societies: 3AF (France), AIAE (Spain), AIDAA (Italy), DGLR (Germany), FTF (Sweden), HAES (Greece), NVvL (Netherlands), PSAA (Poland), AAAR (Romania), RAeS (United Kingdom), SVFW (Switzerland), TsAGI (Russia); one Associate Member: CzAeS (Czech republic); and four Corporate Members: ESA, EUROAVIA, LAETA (Portugal) and VKI (Belgium).
Following its establishment as a legal entity conferred under Belgium Law, this association began its operations on January 1st, 2007.
Its basic mission is to add value at a European level to the wide range of services provided by the constituent Member Societies, allowing for greater dialogue between the latter and the European institutions, governments, aerospace and defence industries and academia.
The CEAS is governed by a Board of Trustees, with representatives of each of the Member Societies.

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

WHAT DOES CEAS OFFER YOU ?

Knowledge transfer:

- A well-found structure for Technical Committees

High-Level European Conferences:

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

Publications:

- Position/Discussion papers on key issues
- CEAS Aeronautical Journal
- CEAS Space Journal
- CEAS Quarterly Bulletin
- Aerospace Events Calendar – www.aerospace-events.eu

Relationships at a European Level:

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

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

CEAS 2015: A HIGH STANDARD CONFERENCE – NOW TOWARDS CEAS 2017 IN BUCHAREST

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

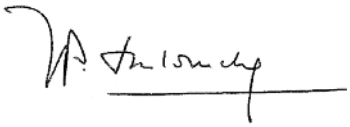
The present issue of the CEAS Quarterly Bulletin is entirely dedicated to the CEAS Air & Space Conference which was held in Delft during the week 7 – 11 September 2015.

The quality of all speeches and paper presentations was so high that it would have been justified to edit a Post Conference Proceedings Book but unfortunately, our financial resources do not allow us to realise such a publication. So, I have tried to provide here the CEAS readers with an extended summary highlighting the most important statements, facts and figures.
Concerning the plenary session keynote presentations, I have chosen to publish for each of them a brief summary illustrated and completed with some slides selected among those projected by the speakers, with however one exception, the declaration of Lt-General Sander Schnitger, Commander Royal Netherland Air Force, which has been in extenso reproduced.

As regards the papers presented within the framework of the technical sessions, I had only the possibility to make a listing of the detailed titles properly regrouped by main chapters and corresponding disciplines. Having consulted these presentations, I have to say that I am really impressed by the professionalism of their authors, convinced that they constitute an exceptional source of high standard articles to be published in the CEAS Aeronautical Journal and in the CEAS Space Journal.
An overview of the other items – education, workshops, conference panels, etc. - is also given.

Having only just achieved CEAS 2015 when we must already start the preparation of CEAS 2017!
The latter, hosted by the Aeronautics and Astronautics Association of Romania (AAAR) will take place in Bucharest, Place of Parliament, from 25 to 27 September 2017. Let us remind that a number of great aeronautics predecessors inspire Romanian aerospace engineers, among whom Henri Marie Coanda (1886 – 1972), inventor, aerodynamics pioneer (he discovered the 'Coanda effect' of fluid dynamics) and builder of an experimental aircraft described in the mid-1950s as the world's first jet. Aeronautics research establishments are located Bucharest, in particular COMOTI, the National Institute for Research & Development for Gas Turbines, whose President Director General, Dr Valentin Silivestru, is precisely in charge of CEAS 2017 preparation and organisation.

There is no doubt that he will receive from our management team the strongest assistance in order to reach and even pass beyond the success level of CEAS 2015 in TU-Delft: quite an ambitious objective!



CONTENTS

CEAS PRESIDENT'S MESSAGE

Fred Abbink, CEAS President

The most important CEAS event in the last period was, without any doubt, the 5th CEAS Air and Space Conference, with the theme "**Challenges in European Aerospace**".

It was held in the Aula Congress Centre of the Technical University of Delft from 7 to11 September.

This successful event is lenghtly described in this issue of our Quarterly Bulletin.

On Monday morning 7 September, after the official opening with a laser show and warm welcome by the Rector Magnificus of the TU-Delft prof. Karel Luyben, the CEAS presidents' lunch was held. At this lunch the CEAS plans and strategy for the next 5-10 years were discussed.

On Wednesday night 9 September the CEAS Gala dinner was held at the paddle wheel steamer "De Majesteit". During a tour through the Rotterdam harbor the CEAS Gold Award was presented to Joachim Szodruch for his lifelong efforts to increase European cooperation in the field of European cooperation in aerospace.

On Thursday 10 September at the closing ceremony, the location and organising CEAS Member Society for the CEAS 2017 Air and Space Conference were announced. The president of the CEAS 2017 Romanian Air and Space Society AAAR, prof. Valentin Silivestru, gave an overview of the venue in Bucharest.

On Friday 10 September technical visits were organised to NLR, ESA/ESTEC, Fokker Aerostructures and TU-Delft Faculty of Aerospace Engineering.

More details and a photographic impression of the conference can be found on www.ceas2015.org.

During the CEAS 2015 Air and Space Conference, on Tuesday 8 September, the CEAS Board of Trustees meeting was held.

Important agenda items were:

- the signing of the Memorandum of Understanding between the Association of European Research Establishments in Aeronautics (EREA) and CEAS;
- the selection of the CEAS Member Society AAAR to organize the 6th CEAS Air and Space Conference 2017 in Bucharest, Romania;
- the establishment of a permanent Programme Committee for the biennial CEAS Air and Space Conferences;
- the development of the cooperation process with EUCASS within the framework of the E-Caero 2 project of the European Commission:
- the intention of the Czech Association of Aerospace Engineers to join CEAS as a full member by the end of 2016;
- the date and location of the next CEAS Board of Trustees meeting: it will take place in Brussels on 9 December 2015 andn the evening of 8 December, the CEAS Board of Trustees members will have the possibility to attend the EREA annual event.

In the last period CEAS also participated in a number of other important events, more notably:

- On 20-23 July 5th International Air Transport and Operations Symposium in Delft, organised by the CEAS Aeronautics Branch Technical Committee "Integrated Air Transport Operations". On behalf of CEAS I was invited to be present;
- On 31 August-3 September, the ICAS Programme Committee Workshop was held in Krakow, Poland, with a very interesting workshop on complex systems. The ICAS Programme Committee selected the abstracts for the ICAS Congress 2016 in Daejon, Korea. A number of CEAS Board members participated in this ICAS Programme Committee meeting;
- On 22 September Leuven I had the opportunity to present "CEAS in Brief" at the EUROAVIA Annual Meeting of the EUROAVIA Congress;
- On 20-23 October the EU Aerodays – the 7th European Aeronautics Days – 'Aviation in Europe – Innovation for Growth' were held in London. The CEAS Chairman of the Programme Coordination Committee, Vice-President for External Relations Pierre Bescond was invited to deliver the CEAS presentation. Furthermore CEAS had a booth in the exhibition area and several CEAS Board members participated in this Conference;
- On 26-27 October the CEAS Chairman of the Aeronautics Branch, Christophe Hermans and I visited AAAR in Bucharest to see the venue of CEAS 2017 and to discuss with Eucass representatives the possibilities of cooperation in future Air and Space conferences, in the context of the E-Caero 2 project.

All these positive messages are overshadowed by the act of terror that brought down the Airbus A321 Russian airliner over the Sinai desert on October 31, killing all 224 people onboard. Especially after the terrorist downing of the Malaysian Airlines MH17 on July 17 last year, killing all 298 people onboard. This, combined with the latest terrorist actions in Paris, that took so many innocent lives, shows that European and global cooperation is more and more essential to cope with these very serious developments.

Finally to my great sorrow, I am unfortunately obliged to end my 'President's Message' with quite a sad news: the sudden death of prof. Franco Persiani, former President of the AIDAA and CEAS Trustee for many years. On behalf of the Board of Trustees, I address here the deep sympathy of CEAS to his family and his close relations.

Fred Abbink

CHALLENGES IN EUROPEAN AEROSPACE

CHALLENGES IN EUROPEAN AEROSPACE
5TH CEAS AIR & SPACE CONFERENCE

The 5th CEAS (Council of European Aerospace Societies) Air and Space Conference took place on 7-11 September 2015 in the Aula Conference Centre of the Delft University of Technology (TU-Delft), in Delft, The Netherlands.

It was the follow-up of the biennial conferences CEAS organises since 2007: Berlin (2007), Manchester (2009), Venice (2011) and Linköping (2013). This time the motto of the event was: '*Challenges in European Aerospace*'.

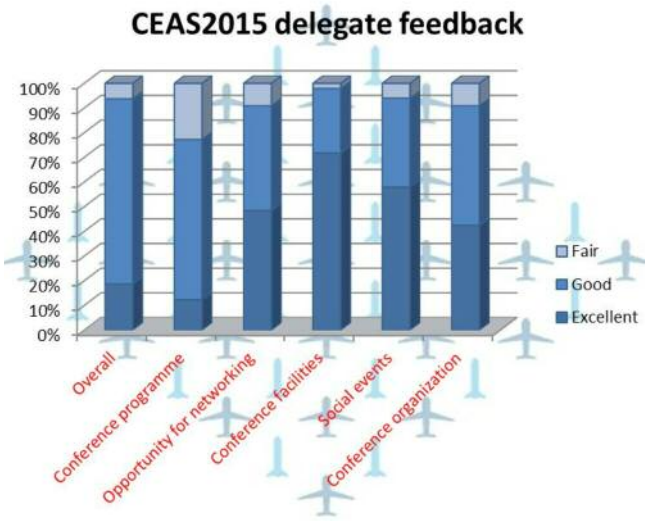
Today CEAS comprises 12 member societies, one associate member society and 4 corporate members with an outreach to roughly 35,000 European professionals in aerospace. CEAS 2015 was hosted by the Netherlands Association of Aeronautical Engineers (NVvL) with a great support from TU-Delft, the Society of Aerospace Students 'Leonado Vinci', ESA/ESTEC and the Netherlands National Aerospace laboratory NLR.

CEAS2015 highlights in brief:

- **530 delegates (90% European) attended the event on one or more days from 40 nations all over the world;**
- **240 speakers presented (16 keynote plenary sessions, 140 scientific papers, 111 of which dealt with aeronautics and 29 with space related subjects);**
- **40 session chairs;**
- **3 EU project workshops (AFLonext, IN2SAI, PulCher) and European Strategic Wind tinnels Improved Research Potential ESWIRP achievements presentations;**
- **12th European Workshop on Aircraft Design Education (EWADE) meeting;**
- **14 exhibitors participated.**

Feedback from the delegates, that completed the questionnaire, was very well appreciated and it confirmed the success of the conference. It will help understand the needs and expectations of our audience to shape future events.

Participation of all major nations involved in aerospace in the world, a wide exhibition area, special sessions on selected topics and specific actions to facilitate student's attendance made CEAS a successful event which beyond all doubt has marked a significant step forward in the rise of the Council of European Aerospace Societies.



WELCOME

A spectacular laser show kicked off the event in the Auditorium, presenting the CEAS countries and member societies as well as the Netherland Aerospace sector. Then CEAS President Fred Abbink welcomed the attendees. In his welcome speech, he presented the NVvL, CEAS and

From left to right: President Fred Abbink, Dr-Ing. Cornelia Hillenherms (DGLR) Prof. Dr Joachim Szodruch.

the programme of the CEAS 2015 Conference. He strongly stressed the importance of European aerospace cooperation and integration as a necessary condition to maintain European Aerospace Competitiveness.
Then Vice President of the Executive Board of TU-Delft and Rector Magnificus prof.Karel Luyben welcomed the delegates in the Large Auditorium of the TU-Delft Aula Congress Centre, reminding that The Netherlands is an important aerospace nation with a long aerospace history.
During the coffee break and lunch a combo of the Royal Netherlands Air Force band provided the music.
Two welcome receptions took place: (1) a reception in the Delft Botanic Gardens on Monday 7 September in the evening, and (2) a sumptuous Conference Dinner in the evening of Wednesday 9 September aboard the largest paddle steamer of Europe "De Majesteit", while cruising the impressive Rotterdam harbours. A band from the NLR provided the music during the boat trip.

CEAS Award 2015 for Joachim Szodruch: some excerpts from the speech pronounced by Fred Abbink

"Ladies and Gentlemen,
[...] It is a great pleasure to present the CEAS Gold Award to Prof. Joachim Szodruch. [...] Joe was nominated by the Deutsche Gesellschaft für Luft und Raumfahrt. [...]
The Statement of Justification stated in four bullets:

- Due to his ability of thinking and acting across borders – countries, subject matters, etc. – he always managed to bring together a critical mass of the "right" people from the "right" institutions to move forward together.
- He was very successful in bridging the gap between fundamental research and industrial development to yield an efficient transfer of scientific progress into product advancements by creating networks to foster cooperation. Even his career path closed the loop from science via industrial R&T to institutional research.
- He advanced technologies such as laminar flow control for aerodynamic drag reduction, always considering the impact on the overall aircraft and the air transport system.
- Joachim Szodruch has authored and co-authored more than 70 publications.

He launched one of the first large European aeronautical research projects: "ELFIN", including the flight tests on a Fokker 100 with a special laminar Glove.
He is a strong supporter, stimulator and initiator of international cooperation: I name some of them short – AT-one, EREA, ACARE, DNW and ETW. He was co-chair of ACARE, chairman of DGLR and President of CEAS.
His last achievement is the foundation of the International Federation of Aeronautical Technology (IFAR). [...]
I want to end with the citation given in the nomination:
"Joachim Szodruch has contributed in an outstanding way to the German, European and international aerospace community by motivating people and institutions to cooperate and by initiating powerful networks in an often visionary way."

Joe, my sincere congratulations!"

PLENARY SESSIONS

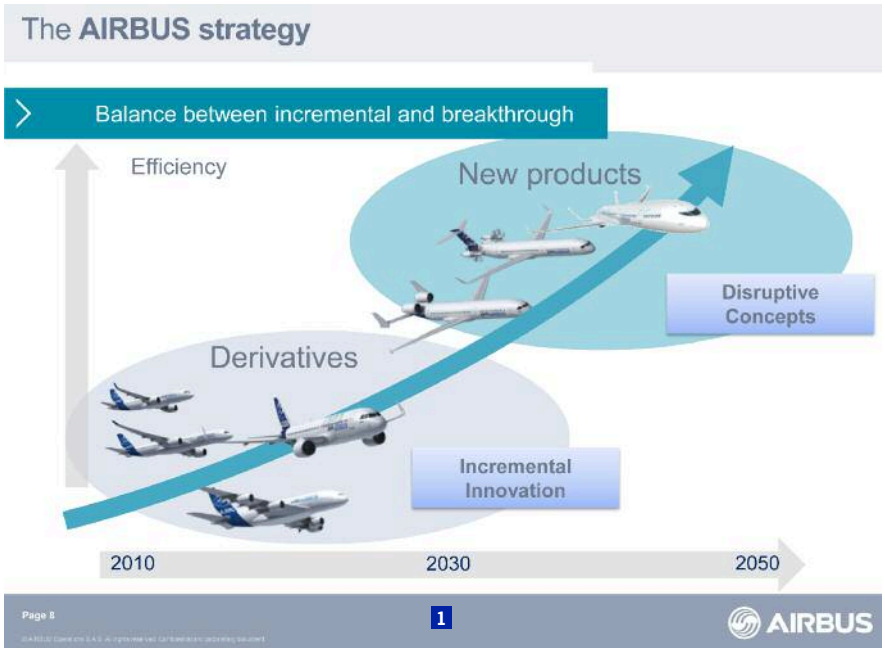
Each day there were two plenary sessions kicking off the programme for the morning and afternoon part of the day. Each plenary session had a challenging theme and was followed by a Panel Discussion.

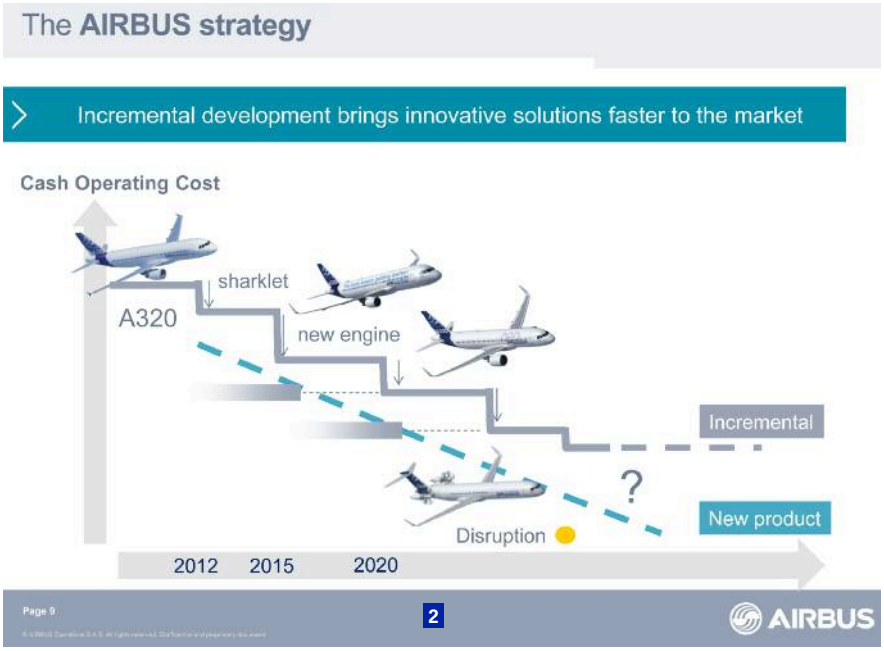
CHALLENGES FOR THE EUROPEAN AERONAUTICAL INDUSTRY

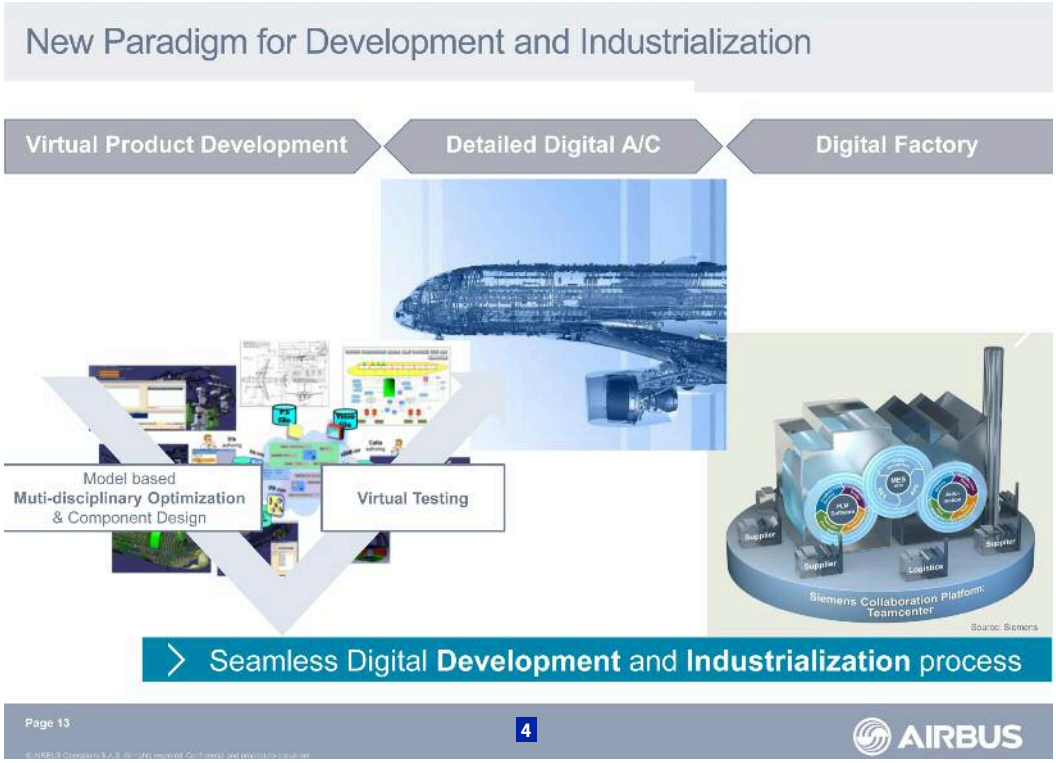
■ **Axel FLAIG**, Senior Vice President Research & Technology AIRBUS, after having said that Airbus aircraft are a familiar sight around the world (an Airbus takes off or lands every 2 seconds; 15,979 sold; 60 produced monthly; 9,282 delivered; 25,000+ daily flights), presented the market opportunities - a potential for more than 32,000 deliveries in the next 20 years due to passenger transport demand increase -, recalled the key challenges (reduce environmental impact, smart and efficient mobility, strengthen European leadership), described the new opportunities resulting from the increase of the number of 'Aviation Mega Cities' (forecast 91 Mega Cities in 2034), opening a potential new market for regional transport, and also the new opportunities based on the evolution of customer needs. Within this context what is AIRBUS strategy?

This is an optimized balance between incremental development which brings innovative solutions faster to the market and breakthroughs which lead to disruptive concepts and new products (*Figures 1, 2 and 3*).

Among breakthrough technologies, laminar flow wings, bionic structure, electrical network printing, counter rotating open rotor, ultra high by-pass ration and hybrid propulsion can be mentioned. Then Axel Flaig explained the seamless digital development and industrialisation process which will shorten development time and secure steep ramp-up of production (*Figure 4*), expressed his views on how to boost innovation and in the end of his speech insisted on the absolute necessity to strengthen European aeronautic research collaboration (collaborative projects, collaborative R&T centres).

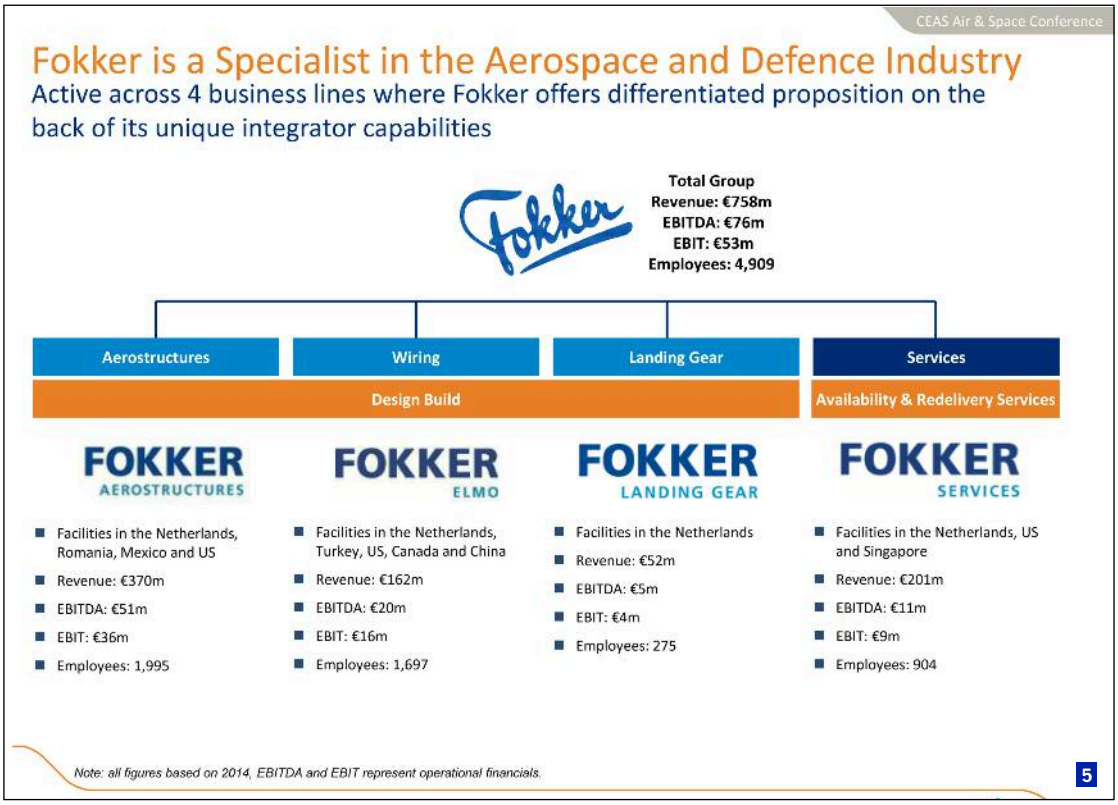


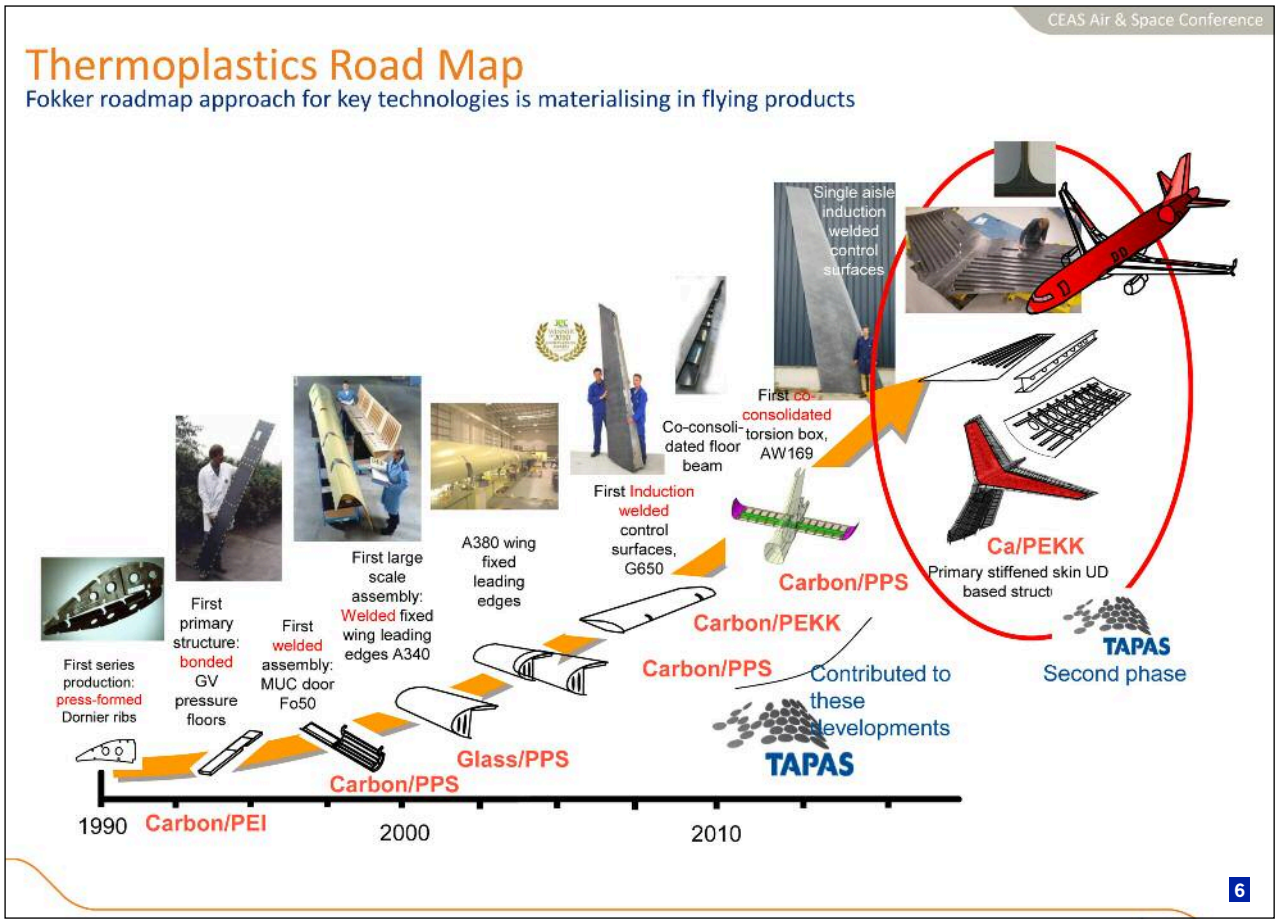




■ **Hans BÜTHKER**, Chairman & CEO Fokker Technologies, gave an overview of Fokker, specialist in the Aerospace and defence Industry and active across 4 business lines (*Figure 5*) – Aerostructures, Wiring, Landing Gear, Services -, and of GKN. Then he presented Fokker's technology portfolio management process, the development of advanced composites, the thermoplastics roadmap (*Figure 6*), the incremental products applications, the landing gear technology development, pointing out that "Specialist suppliers can drive advanced technology developments".

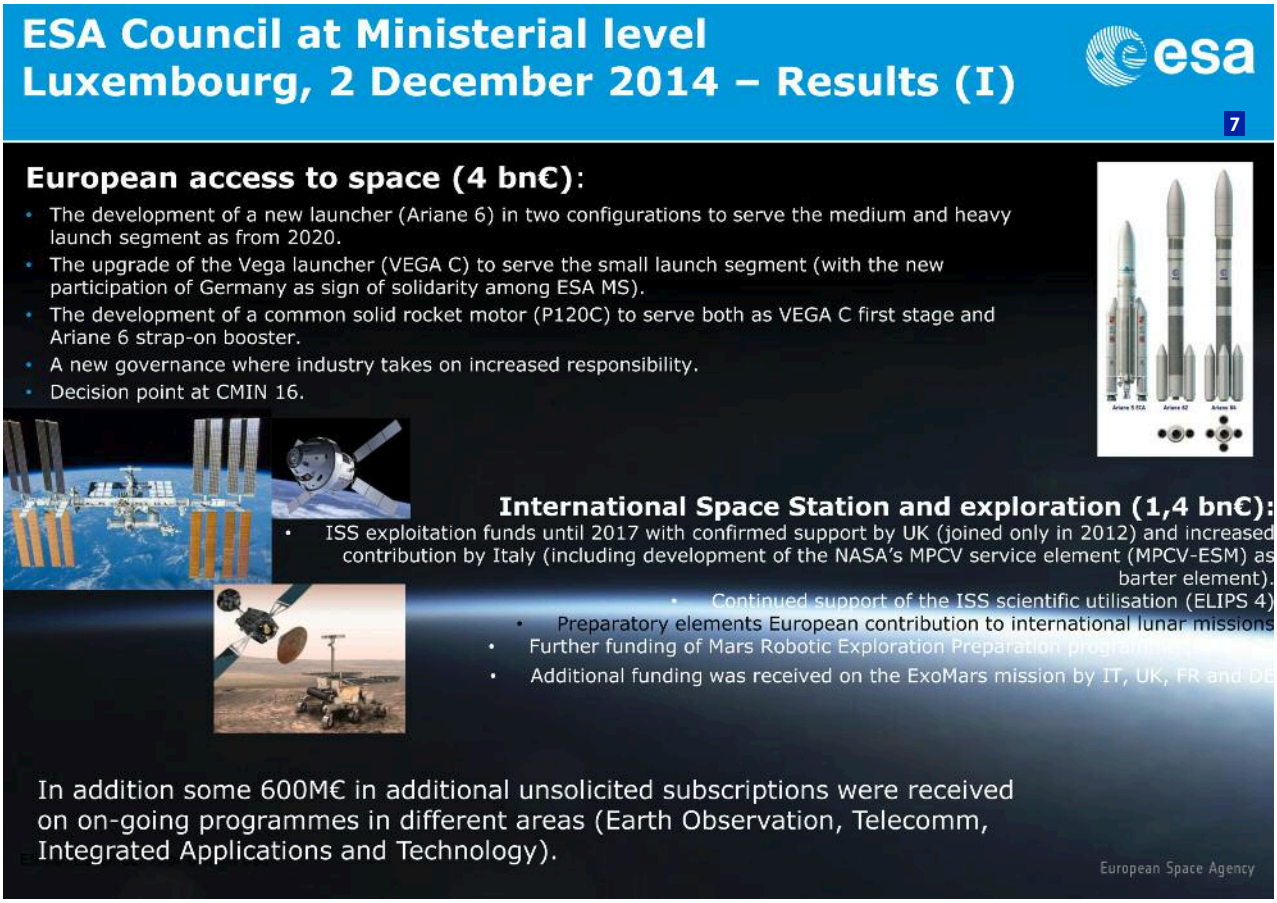
Panel discussion on Civil Aircraft Industry Challenge. Participated: Axel Flaig, Hans Büthker and Fred Abbink (moderator). Many subjects were approached, among them: how to provide the required expanding workforce for Airbus and its supply chain to handle the A320 and A350 production? What about the efficacy of alternate fuels, as H_2 and bio-fuels, and of hybrid electrical propulsion to reduce fuel cost and emissions? What is needed from the EU, National Governments, Research Establishments, Academia and Aerospace societies to maintain a competitive European aeronautical industry?





CHALLENGES FOR EUROPEAN ACCESS TO SPACE

■ **Prof Dr Kai-Uwe SCHROGL**, Head of the Department for Relations with member states, ESA, presented the subject: "ESA in between two Ministerial Councils: ESA CM2014 Luxembourg and ESA CM2016 Luzern" *(Figures 7, 8, 9).*



ESA Council at Ministerial level Luxembourg, 2 December 2014 – Results (II)

8

- On **Relations with ESA Member States,** ESA DG to make proposals to reinforce cooperation.
- On **Relations with the Scientific communities**, ESA DG to identify further cooperative endeavours with international partners to maximise exploitation of Europe's scientific heritage.
- On **Relations with Industry**, MS support the continued dialogue aimed at optimising industrial policies.
- On the **Evolution of the relationship between ESA and EU** to propose by 2016 a partnership that facilitates the European Space Policy (ESP) implementation.
- On **ESA's Relations with non-European Non-Member States** :
  - To secure the entry in force of European Cooperating States agreement with Latvia, Lithuania and Slovakia;
  - To establish formal cooperation with Bulgaria and Croatia.
- On **ESA's Relations with non-European States** to seize future cooperation opportunities with different partners.
- On **ESA Efficiency** to reinforce measures to achieve qualitative and quantitative efficiency.

ESA Unclassified – For Official Use

European Space Agency

Thematic Challenges for CM2016

9

- **Launchers:** in addition to the Ariane and Vega decision point, further decisions will be proposed at C/M16 for CSG – Europe's spaceport, for preparation of the evolution of future launchers, as well as for continuation of the Launcher Exploitation Accompaniment Programme (LEAP).
- **Human Spaceflight and Exploration**: ISS Exploitation agreed (and Utilisation/ELIPS-5) for the years 2018-2020, a decision regarding the exploitation of ISS beyond 2020 – as well as potentially other activities for securing the longer-term perspective for LEO exploitation beyond ISS (e.g. through cooperation with China). Residual funding for ExoMars 2018 mission, decisions corresponding to a post-ExoMars mission to Mars in the frame of a European Robotic Exploration Programme (EREP), and to the continuation of the Mars Robotic Exploration Preparatory Programme (MREP-3) are prepared.

- **Earth Observation:** Earth Observation Envelope Programme (EOEP-5) and a new element of Earth Watch to support the development of applications and services, together with the continuation of the current Earth Watch Global Monitoring of Essential Climate Variables (GMEVC), also known as ESA Climate Change Initiative.
- **Telecommunications and Integrated Applications:** The continuation of the elements 3-4 and 5 of the ARTES programme, and of the integrated application promotion (ARTES 20) are planned for decision. Also, decision is planned for one PPP partner programme (ARTES 33).

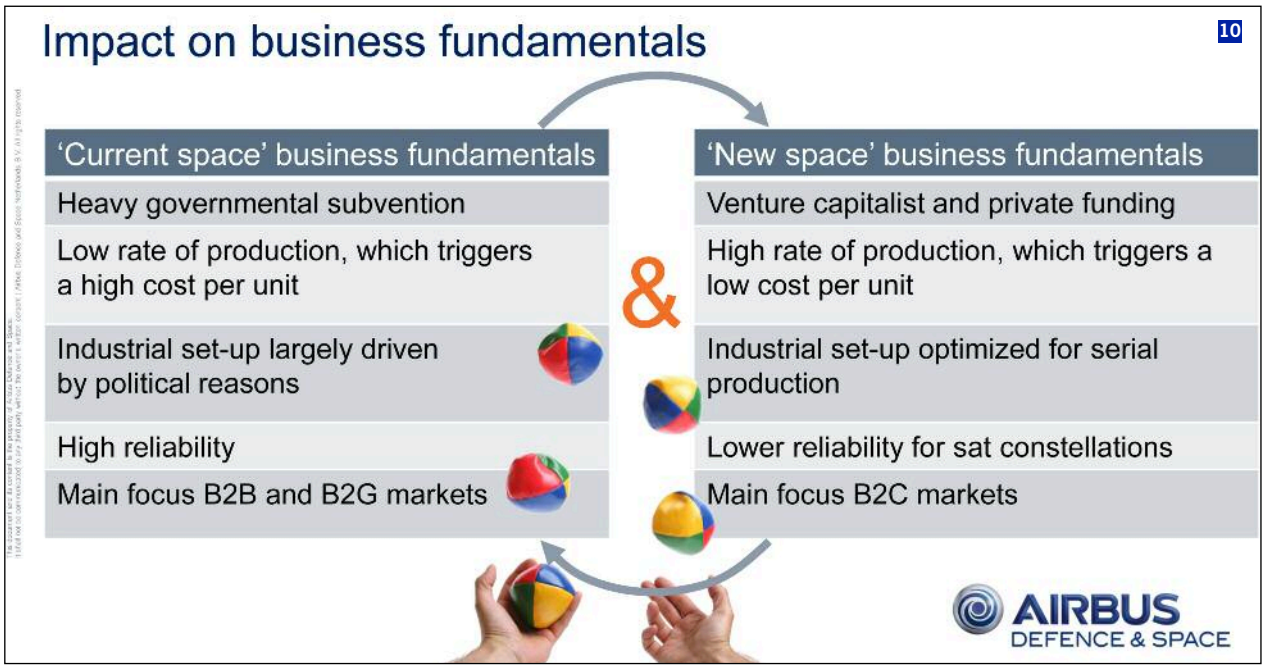
Decisions are also planned on the continuation of the **Space Situational Awareness** (SSA) Programme and the **General Support Technology Programme** (GSTP). Within the **Clean Space initiative**, the e-Deorbit mission of Active Debris Removal is planned to be proposed in 2016 for implementation before 2020.

European Space Agency

As a follow up of CM2014 the following matters, among others, will be tabled at ESA CM2016: the launcher decision point, the European participation to ISS and other exploration international endeavours, a proposal on a partnership with the EU. Additionally CM2016 is expected to take decisions on programmes across several ESA activities and in particular on the mandatory part of ESA's budget (science and general activities).

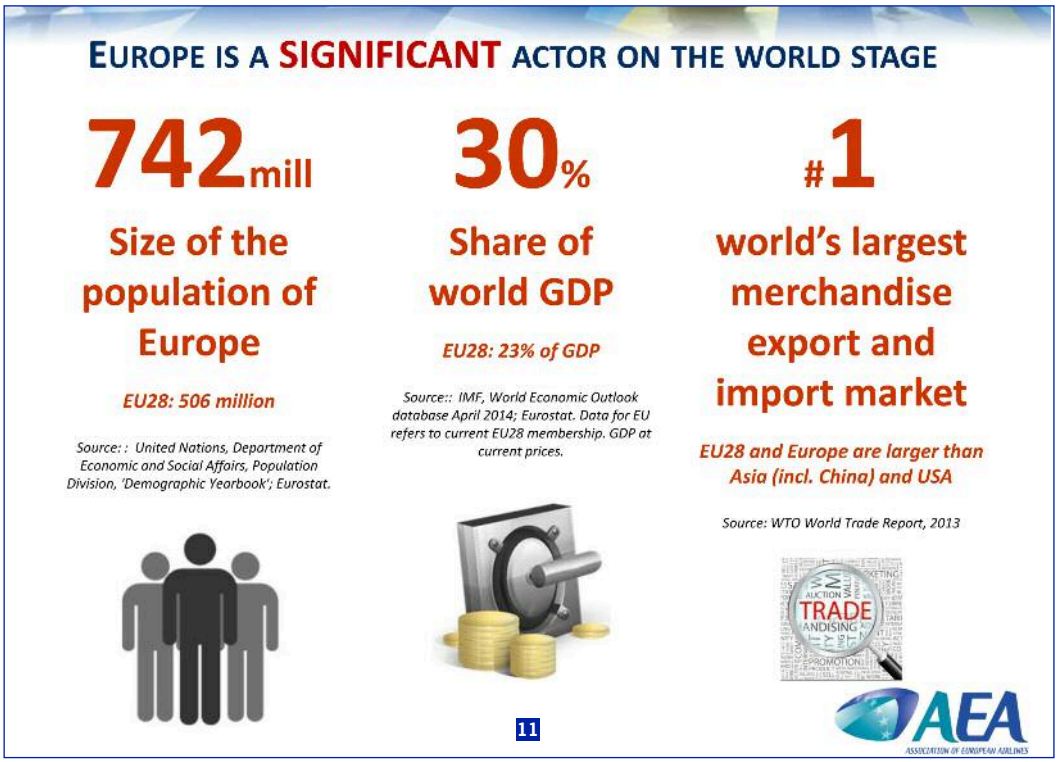
■ **Arnaud de JONG**, CEO Airbus Defence and Space Netherlands, presented "A Dutch perspective on new horizons and frontiers". He showed the difference between 'Current space' business fundamentals and 'New space' business fundamentals.
Then he described Airbus Defence and space Netherlands activities: Solar Arrays, Launcher Structures, Instrument systems. He developed the theme: "Access to space: an example of innovation". *(Figure 10)*

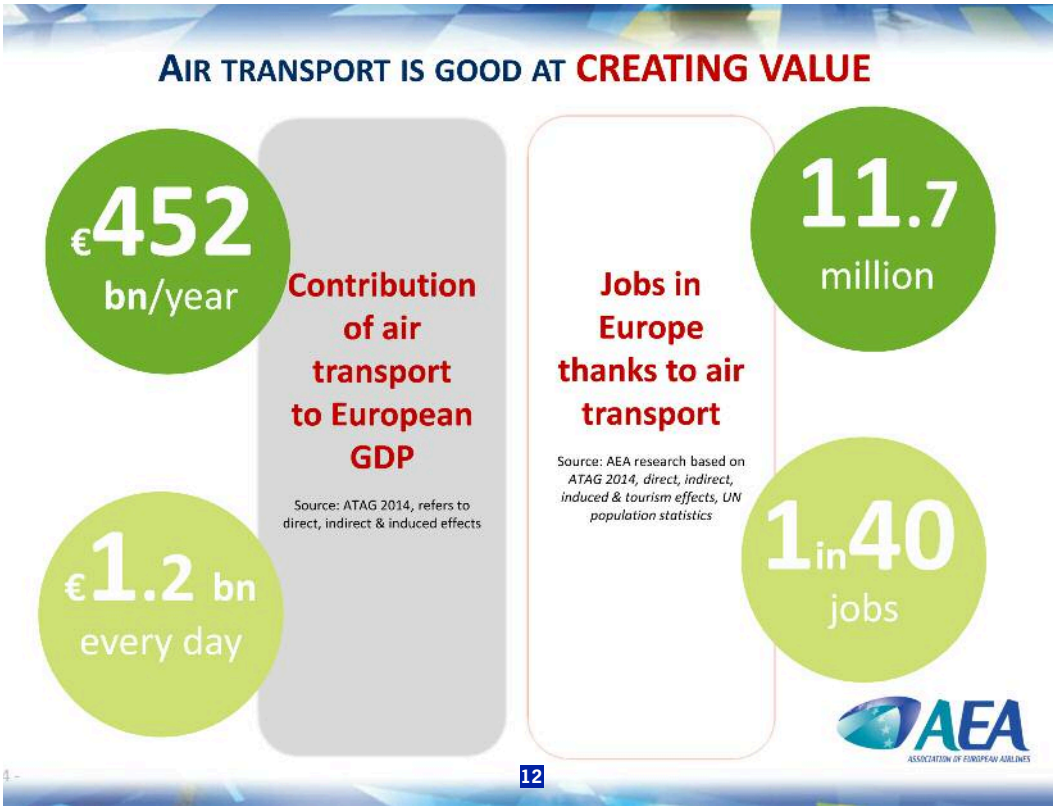
Panel discussion on European Space Challenge. Participated: Jan Woerner (ESA DG), Arnaud de Jong (Dutch Space) and Constantinos Stavrinidis (ESTEC/CEAS), moderator. Among the numerous questions dealt with: lower cost launchers, the SWOT (Strengths, Weaknesses, threats and Opportunities) of the European Space Sector towards their future international competitiveness, the level of European Military Space, manned space vs unmanned space.

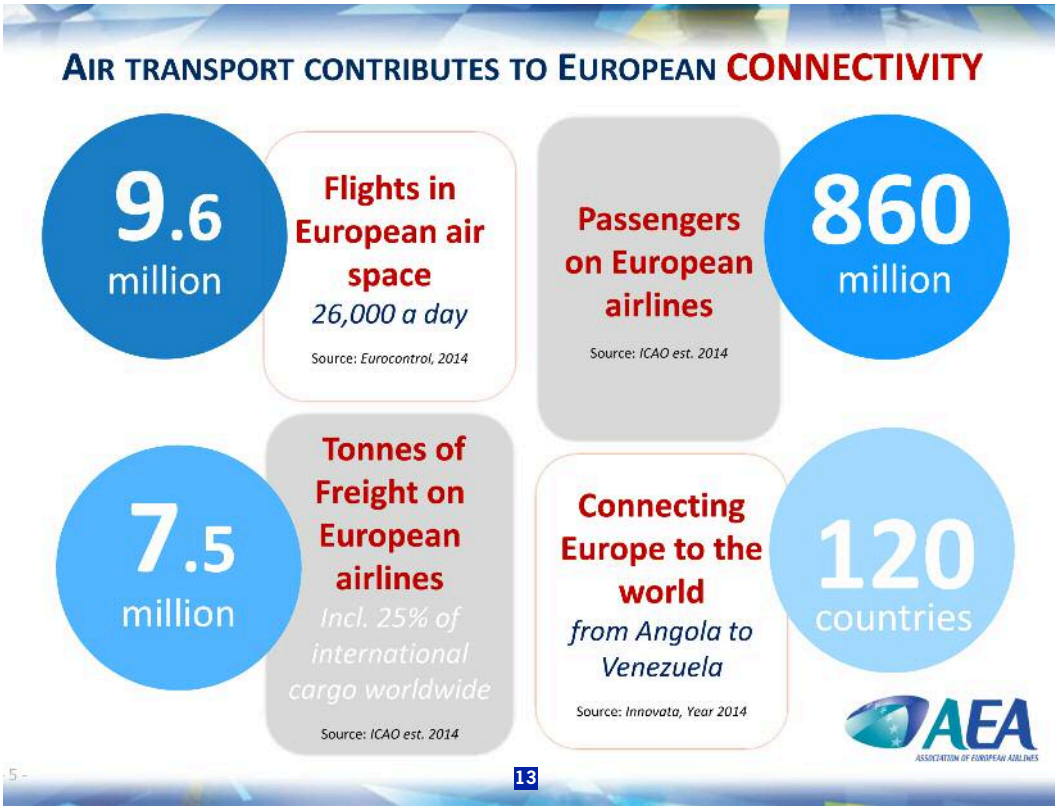


CHALLENGES TO THE EUROPEAN AIRLINES

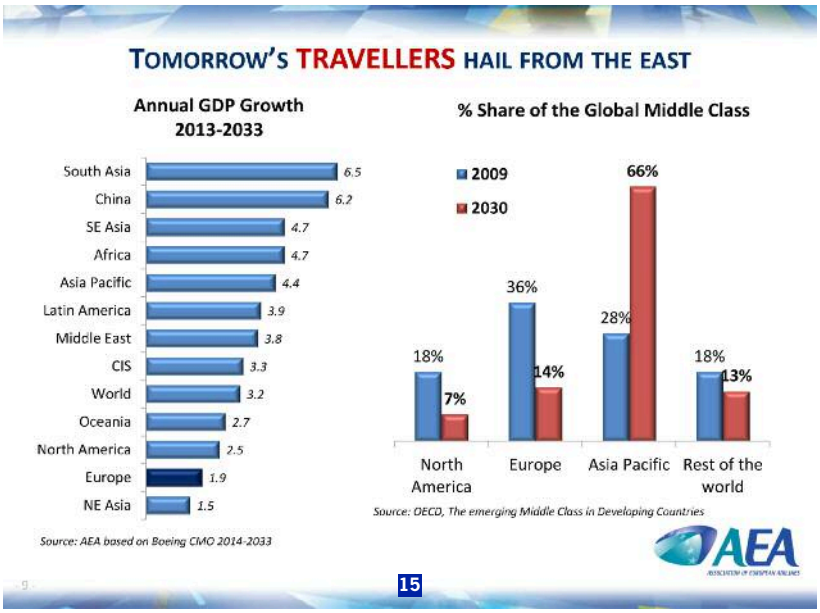
■ **Athar Husain KHAN**, CEO Association of European Airlines, after having presented a complete view on Air Transport in Europe (high contribution of air transport to European GDP, high contribution to European connectivity, investments and innovation), explained that the centre of gravity is shifting to the East ("faster rate of change in global economic balance in history"), presented the EU Carriers' share of international markets (on routes to/from







EU), the need to adapt the business model, how competition and fuel costs dictate cost cutting, the creation by market dominance and inefficiencies of inequalities in the aviation value chain, and concluded by the political and regulatory challenges, in particular the regulatory cost saving future potential and the 4 driving principles: (i) take a Holistic Approach; (ii) create Smart Regulations; (iii) reduce Burdens; (iv) act upon Level Playing Field. *(Figures 11, 12, 13, 14, 15, 16)*



■ **Peter HARTMAN**, Vice Chairman Air France KLM and Chairman ACARE General Assembly, enumerated the traditional challenges with continuous impact and limited effect on competitive position – oil price evolution, geopolitical instability, events with impact - and then pointed out the real challenges: the unexpected quick growth of Gulf's carriers' long haul business, the low cost carriers changing the European aviation landscape, the fact that European regulations distort international fair competition and that uniform enforcement is lagging at EU level. He concluded by indicating the way forward: collaboration and cooperation, better adapted regulations and introduction of industry solution for societal challenges.
(Figure 17, 18, 19)

Panel discussion. Participated: Peter Hartman (Air France KLM), Athar Husain Khan (IATA) and Prof. Ricky Curran (TU-Delft/CEAS). Among the questions debated: increasing airlines economy of scale, SESAR implementation, cockpit crew reduction, RPAVs for fret transport, European airport infrastructure developments, wide-body short-range airliner, new cargo aircraft, air-to-air refuelling, SWOT of European airlines, needs from the EU, National governments, Research Establishments, academia and aerospace societies as regards airlines.

Real challenges (1)

ACARE

Unexpected quick growth of Gulf carriers' long haul business

AC fleet	2005	2010	2014	'05 - '14 growth
Emirates	85	142	231	+ 170%
Etihad	12	57	110	+817%
Qatar	50 (2006)	n/a	162	+224%
Turkish	83	153	241	+190%

Real challenges (3)

European regulations distort international fair competition
Uniform enforcement is lagging at EU level

Regulation	EU airlines	Non European airlines
Passenger rights	Reg. 261/2004 (EU **Flight delay compensation**) Reg. 1107/2004 (EU Rights of people with reduced mobility in air transport)	No similar legislation in Gulf
Environmental regulation	Reg. 2008/101/EC (EU Emission Trading System - **ETS**) Reg. 1907/2006/EC (Registration, Evaluation, Authorisation and Restriction of Chemicals - **REACH**)	No similar legislation
Ground handling	Reg. 96/67/EC (EU access to the ground handling market at Community airports)	State monopoly (Gulf) or no similar legislation
State involvement and aid	Art. 107, sec. 2 TFEU treaty (**Aid granted by States**)	No similar legislation for Gulf

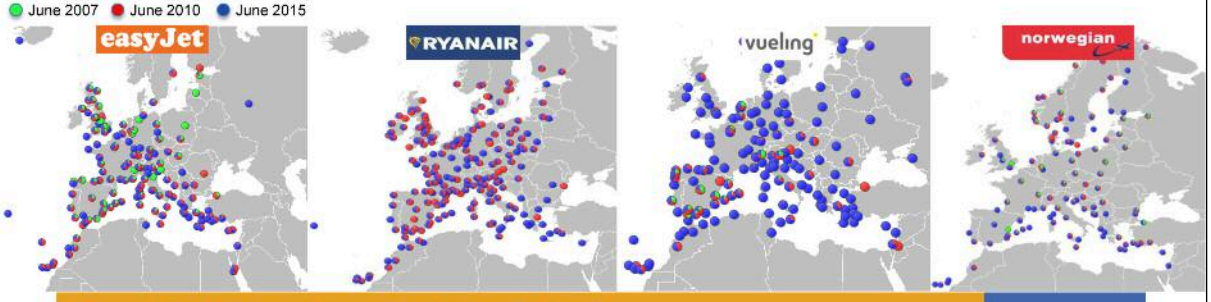
Real challenges (2)

ACARE

Low cost carriers change the European aviation landscape

	Flights			Stations		
	June '07	June '10	June '15	June '07	June '10	June '15
Easy Jet	5.388	7.922	10.252	68	114	134
Ryanair		9.891	12.638		151	183
Vueling	974	1.999	4.341	20	51	153
Norwegian	1.167	2.236	3.467	53	83	120

+160% +250% +175% +240%



CHALLENGES IN REALISING A SINGLE EUROPEAN SKY

■ **Florian GUILLERMET**, Director SESAR JU, and Paul Riemens, CEO LVNL, have focused their presentation on the theme 'From innovation to solution, the role of technology'. They explained the changes in ATM and their benefits in terms of safety, capacity and flight efficiency. The evolution will be based on automation and services.
The European ATM Master Plan 2015 was presented, highlighting the Future SESAR solutions, technical and operational, a SESAR Deployment Manager being put into position to ensure a high level of coordination, standardisation and integration.
(Figure 20)

Panel discussion. Participated: Florian Guillermet (SESAR JU), Paul Riemens (CANSO) and Marja Eijkman (NLR). Several questions were discussed among which: European ANSPs (Air Navigation Service Providers), how to expedite Single European Sky and FABEC (Functional Airspace Blocks), towards a unified worldwide ATM system (European SES + NextGen) , more autonomous flight vs fully controlled by ATCos, introduction of RPAS in airspace together with piloted aircraft.

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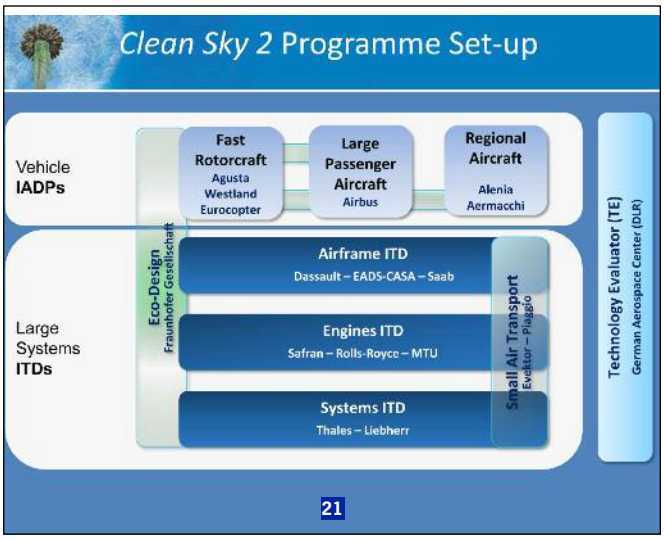
CHALLENGES TO EUROPEAN AEROSPACE RESEARCH AND INFRASTRUCTURE

■ **Eric DAUTRIAT**, Executive Director CleanSky, **Rolf HENKE**, Member DLR Executive Board and **Michel PETERS**, CEO NLR presented a status report of Clean Sky. Clean Sky 2, covering the period of time 2014-2020 (2024?), will include up to 1,000 participants, to be compared to the 600 of Clean Sky 1 started in 2008 within Framework Programme 7 (FP7). The CS1 results were presented and details were given concerning the new set of challenges to be taken up by CS2.

Then the speakers put emphasis on the evolution of the innovation pipeline (Academia > Research Establishments > Industry) and on the necessity of a rationalisation, at EU level, involving Research Establishments and other Infrastructures: EU + National States. They finished their presentation by expressing what CS2 intends to demonstrate by 2017 and they showed the EU Research SWOT (Strengths-Weaknesses / Opportunities-Threats) from a Clean Sky Point of View.
(Figures 21, 22)



■ **Rolf HENKE**, DLR Executive Board Member, DGLR President and ACARE WG 5 Co-Chair, summarised as follows the ambition of EU regarding Research Infrastructure: He pointed out that education and training for controllers, pilots and engineers are incorporated into the SRIA (Strategic Research & Innovation Agenda) and said that to guarantee success, research and validation initiatives are integrated with education. (*Figure 23)*

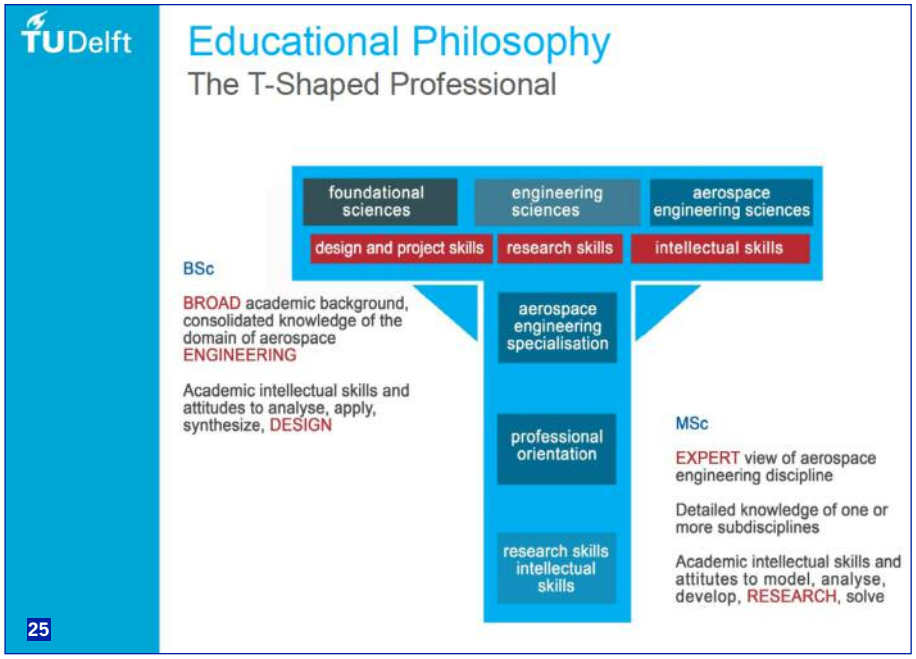
The roadmaps of SRIA allow the prioritisation of research. They result in a network of physical and virtual testing and certification infrastructure to ensure that competent workforce, reliable and interoperable facilities as well as standardised processes and data exchange actually enable maximum time-cost-quality benefits. Rolf Henke described a new approach, defined by ACARE WG 5, supported by EREA concerning the infrastructure's evolution and concluded his speech by a "food for thought"; a European Aviation Agency ensuring Research Integration at 20xx time horizon.

Panel discussion. Participated: Eric Dautriat (Clean Sky), Rolf Henke (DLR), Michel Peters (NLR) and Christophe Hermans (DNW/CEAS). Among the themes debated: Europe needs larger technology development programmes than the individual governments can afford; presently Clean Sky takes this role, is it sufficient? – How to further optimise the coherence between the technology development programmes of the EU Member States and the large EU programmes? – At a very limited level the EU has stimulated cooperation between the strategic large wind-tunnels (DNW, ETW and ONERA S1, it is necessary to increase this cooperation in the same manner as in the USA where NASA and DOD jointly invest in and manage all US wind-tunnels in an optimal way.

CHALLENGES TO EUROPEAN AEROSPACE EDUCATION

■ **Hester BIJL**, Dean TU-Delft Aerospace Faculty, has presented Aerospace Engineering at TU-Delft: Education: 1,500 BSc students, 35% international and 1,000 MSc-students, 70% international – Research: wide range of AE disciplines Graduate School with 200 PhD-students – Top laboratories for education and research – Innovation through start-ups, students and partnerships with industry. The Educational Philosophy, based upon the T-Shaped Professional concept was described in detail as well as the five areas of specialisation: Aerodynamics & Wind Energy – Flight Performance & propulsion – Control & Operations – Space Flight – Materials & Structures. (*Figures 24, 25*)

■ **Frithjof WEBER**, Head of Competence, Knowledge and Learning, AIRBUS Group, explained how the Competence Strategy is updated every year, anticipating the needs (typical short, mid and long term competence needs), and how action plans are being implemented systematically: business strategy > competence strategy > development actions. The highly necessary access to multidisciplinary engineering competences was underlined. (*Figure 26*)



■ **Franco BERNELLI**, Politecnico di Milano, Aerospace Science and Technologies, expressed his views about the future needs and trends as regard the education of the future aerospace engineers, based upon his experience.

■ **The PEGASUS**, organisation was presented as well as the PERSEUS project whose objective is the definition of a clear methodology for the evaluation of aerospace/aeronautics/air transport related higher education programmes ("improving skills and knowledge base in European aviation"). In Europe over 200 University degrees related to Aerospace/Aeronautics/Air Transport exist, offered by over 100 Universities, but only 25 Universities meet on a regular basis to discuss and exchange information. External programme evaluation is not mandatory in all countries and no subject-specific criteria exist in any country. (*Figure 27)*

Panel discussion. Participated: Hester Bijl (ACARE WG 5), Fridhjof Weber (Airbus), Franco Bernelli (Politenico Milano) and Joris Melkert (TU-Delft/CEAS). Among the main subjects: Are changes in the curricula of the aerospace engineer being foreseen to take into account the future electrical systems? – The EU and the National Governments should help more and more the Aerospace Universities to cooperate together and with the national Aerospace Research Establishments.

CHALLENGES TO THE EUROPEAN AIR POWER IN ASYMETRIC CONFLICTS

■ **Lt-gen Sander SCHNITGER**, Commander Royal Netherlands Air Force, delivered a speech which allowed him to deliver his views on the challenges for European Air Power.

" Ladies and Gentlemen,
I would like to start with thanking the organization of the CEAS for giving me the opportunity to share my views on the challenges for European Airpower.
To cut a long story short: Airpower will face / is facing a predominantly a-symmetric threat, current conflicts are almost always by definition a-symmetric conflicts.
Why? Because experience supported by some research shows that increasingly, conflicts and capabilities adapt and evolve at a very high rate and change quickly between symmetric, a-symmetric and hybrid nature and its associated tactics and procedures. So called 'symmetric opponents', usually state actors, more and more plan or at least end up using hybrid tactics that include cyber, information, stratcom, non-lethal and non-kinetic operations in a search for an advantage in the battlefield at all levels.
A quick conclusion is then that no matter what kind of opponent you / we will face,

- wide range of options,
- a wide range of targets,
- a wide range of threats and
- a wide range of challenges

that will have to be met, faced and prevailed upon by quickly adapting, quickly shifting focus across dimensions like air, space, cyber, information etc. By the way, the point in time where we have to face these challenges in earnest is behind us. The conflicts in the Middle East with recruitment of 3rd genimmigrants in EU through social media and in Ukraine with the advent of plausible deniable 'little green men' is proof of that. I'm afraid we have also proven that the West has a hard time adapting to these threats.
Let me elaborate a bit:
Europe is surrounded by a what Jonathan Holslag calls 'a ring of fire'.
This ring seriously threatens our privileged way of life. (Or is it that our privileged way of life is the real threat ?). Certain is that the threats we face in Europe are at least triggered by this very situation, and facilitated by the freedom we have gained and our open society. The 'Ring of fire' can best be illustrated by a few examples:

– Close to us in the Middle East horrendous wars amongst religious groups, tribes, families and criminal organizations are being fought. Leading to masses of victims and displaced persons. As a result, large numbers of refugees are escaping the horrible and inhumanely situation at home and try to find shelter in Europe. The images of the harsh and risky travel of these people have invaded our homes and again we have been very slow to react.
– Islam-terrorism threatens Europe from western and northern Africa. The risk of attacks in Europa is steadily on the rise, increasing our defensive posture and thus at least subjectively limiting our personal freedom.

Mr Snowdon I think, has proven that there are more than just subjective limits on our freedom than meets the eye.
Think of the increasing safety measures on airfields and international trains. Thousands of soldiers in the streets guarding schools and synagogs. And the risk just grew bigger with trained soldiers joining terrorist groups as ISIS, providing them with inside knowledge. Even from the core of my humble air force.

– While just to the east of EU and NATO territory a newly invigorated Russia is clawing back its position of power as it existed before the collapse of the Berlin Wall. And mr. Putin has astutely and successfully linked the ME and EU situation together by deploying troops into Syria.

– On top of this all, we are also faced with the effects of an economic downturn that seems very hard to escape from.
– All this is happening while the United States is actively pursuing a pivot to Asia, expecting Europe to fend for itself now when it comes to defending its territory. In all fairness: they have not forgotten us.

So, what does this mean for us? The easy part: If people do not believe in a secure future, societies will simply slide down into a quagmire of restrictions of the free word, violations of human rights, violation of personal privacy, economic recession, corruption, and crime. This must be prevented. That is why armed forces, police, intelligence services are deployed to bring security. So, today´s security environment calls for strong armed forces because without security there can be no economic growth, and in the end no democracy and rule of law.

We have known for 75 years that a strong Air Force is a prerequisite for that. Employment of airpower is crucial to all forms of effective military action. The Air Force provides air support to troops on land and at sea. That is why my F-16s have been in operations continuously during the past 21 years.

That is why my transport aircraft, helicopters and, most importantly, the men and women of the Air Force, have been on missions across the globe continuously since the end of the cold war.

So, a global playing field, more insecure environment, asymmetric and hybrid threats even without a state of war, the need to be stronger and much more agile, and above all: defence needs to be low cost and infallible.

It will probably not have escaped your attention that we are living in a time where technology is evolving almost at lightning speed. The pace is so high we call it 'exponential' and we expect a technological 'singularity'. The point were we can no longer look deep enough into the future to predict what is coming next.

One thing is certain: technology will continue to revolutionize our lives and the world we live in at an ever increasing pace, at least until the next major game changer. Our world will become fare more complex and at the same time transparent.

A recurring theme in all developments that are relevant to the future of the air force is already this increasing complexity of it all. 20 years to develop a weapon system? Weapon systems, legislation, processes, technology, interoperability of data flows, everything is becoming more and more complex. A high-tech organization such as the Netherlands Air Force, operating in the air and space domain, is keenly aware of this, perhaps even more so than any other organization. The number of weapon systems and weapons platforms equipped with advanced networked technology is increasing rapidly. For example, all-weather and stand-off capabilities have been enhanced considerably; a low observable (stealth) capability will be entering the service of the Defence organization soon, while there is a prolific increase in the diversity of unmanned systems and the options for their deployment.

Furthermore, the war of 2040, 2030, 2020, next year and today is no longer about bombs or bullets, it is about information. And the information driven operations of today only provide us with a glimpse of what is coming. In 2025 everything is a sensor. With all these sensors, we are also looking at ever more data becoming available while the operational tempo increases further. This leads to a growing complexity in modern warfare.

The combination of ´more information and less time´ makes it increasingly difficult for commanders to make decisions. The military campaigns of the past few decades show a shift towards smaller, rapidly deployable units. There are still pockets of resistance but they will wipe themselves out over time. There is a shift to a 'wider and thinner' operational environment paired with the capability to focus sensors and weapons quickly and with devastating effects. The use of the air and space domain has a large role in that process because more and more operations today are driven by Situational Understanding, the highest degree of Situational Awareness.

The third dimension offers unique advantages for obtaining situational understanding through awareness, for transport and for attack as well as protection. Given the developments in the communications and information technology, sensors, unmanned systems and the use of space, the importance of airpower will only increase further in the coming decades. Our assets are flexible and can be deployed in a wide range of scenarios. Scalability and escalation dominance are important and decisive attributes.

Apart from that, we are also able to guarantee freedom of action and security of operations before military intervention is launched. Because, in the future, the starting point in military campaigns will be, more than ever before, the securing of information-dominance in order to support security across the entire spectrum of operations, including but not limited to the classic military campaign.

The actual deployment of military assets will only be resorted to on the basis of correct and timely information. That´s why Airpower is the weapon of choice.

Because of the constant changes and their unpredictability, we have to focus our efforts on continuous innovation. These are turbulent times and my air force is in a continuous state of flux. New weapon systems, new tasks, continuous deployments, shrinking budgets and a continuously downsizing organization force us to adapt and change. The world around is also in a state of flux, as a result of technological, economic, ecological, societal and other developments, which seem to take place at an ever increasing pace.

So, in order to remain effective, relevant and affordable in the future, the air force must adapt to these changes continually and become innovation leaders rather than followers. Because of this high pace of change, the traditional processes and concepts of operation of the air force, and the armed forces as a whole, are no longer adequate. By and large these concepts stem from pre-napoleonic times.

Perhaps even more important than technological innovation are social and cultural innovation: both the organisation and the individual will have to change in order to survive.
And that is exactly where our biggest challenge lies, because even though with a high-tech organisation such as the Air Force you might first of all think of technological developments, our largest gains in the coming decade will be achieved in the area of social innovation. The crux of this process will be innovation of our rules based system, and those very rules, both written and unwritten, that our organisation is based on. It is about the way we interact with each other as individuals.
We will have to change from a predominantly rigid and static organisation into an agile, adaptive 'system' that can hold its own in our rapidly and continually changing interconnected environment. The increasing complexity and changes in the labour market in particular call for a high degree of flexibility on the part of the organisation.
We will have to move forward quickly in the areas of Space, High-tech, Cyber and Big Data. We, as Air Force, can-not go there alone – neither can the Armed Forces as a whole. And we don´t want to go there alone either.
We have been working more and more with partnerships. In this process, the relationships have shifted away from one based on old school customer-supplier models and transformed into strategic partnerships with industry and knowledge institutes. The triple helix! We are still a long way away from perfecting that, but we are moving forward. We need each other to move forward, now more than ever before. We need this to remain future-proof and affordable, to be leaders rather than followers. We simply cannot just sit on our hands in a world that is developing and changing at a dazzling speed, a world where security and freedom cannot be taken for granted. Not acting is no option. Forging partnerships, sharing knowledge, driving innovation, these are the prerequisites for success and security in the future!
We are dealing with adversaries who have a wide range of options available for making our lives difficult. And who are able to change their options, make use of the latest technologies and can develop quicker than we can. From paralyzing cyber-attacks and destabilizing use of social media to the build-up of conventional armed forces and gruesome terrorist attacks. As our Chief of Defence put it so aptly: ˝These days, the impact of spreading disinformation through Twitter or Facebook has become just as dangerous as brandishing a Kalashnikov.˝

In order to develop new concepts, to counter hybrid warfare and be able to apply new technology swiftly and effectively, innovation now is more important than ever before. Still John Boyd's law applies here. We have to be able to move inside the decision loop of the enemies. We have to know what he will do before he knows it himself!
Defence forces, let alone the Air Force and military assets in themselves are not the answers to the complex challenges we are facing. Just a quick recap of some challenges:
– Increasing diversity of threats,
- Exponential technological developments
- Big Data,
- Increasing complexity,
- Situational Understanding
- Social, Cultural and Technological Innovation
We will have to open our doors even further to cooperation with European Air Forces, industry, other government departments and non-governmental organisations. We have to do this in order to explore new avenues and technologies together. It is a shared concern, and we need each other to work on shared solutions. Together we must take care of the security ecosystem.
We are ready to tackle this challenge together with our partners, both within and outside the Defence organisation, nationally as well as internationally.
I would now like to hand the floor to Air Commodore Pete Round who will delve deeper into the challenges posed by exponential technology to European Military partnerships.

Thank you for attention. ”

■ **Air Commodore Peter ROUND**, Director Capability EDA (European Defence Agency), described the EDA's AAR (Air-to-Air Refuelling) initiative going from Pillar 1 – Short Term Gap Filling – to Pillar 2 – Optimisation of assets & Organisations – Pillar " – A400M – and Pillar 4 – Strategic Tanker Capability – and then the 'Persistent Surveillance Long Term Analysis (SULTAN) study. *(Figure 28)*

Panel discussion. anticipated: LtGen Alexander Schnitger (RNLAF), Air CDRE Petre Round (EDA) and George Bridel (ALR, Swizerland/CEAS) panel moderator. Among other basic questions, the following ones were largely debated: What steps to be made towards a joint common European Air Force part, in combination with national owned fighter aircraft and military RPASs and with joint training and shared/pooled test ranges – The necessity of integration of the European military aircraft industry – The role foreseen in the future for EDA and OCCAR.

TECHNICAL SESSIONS

About 140 technical papers were presented by aerospace scientists and engineers from 25 different nations around the world, who shared and disseminated the latest scientific knowledge and research in several areas.

■ **AERONAUTICAL SCIENCES: Aerodynamics/CFD:** An automated CFD analysis workflow in overall aircraft design applications - Unsteady surface pressures measured at a pitching lambda wing subjected to vortex dominated flow including transonic effects – Experimental investigation of small scale homogeneous isotropic turbulence in S1MA wind tunnel of ONERA – Fuselage aerodynamic drag prediction method by CFD – Mach number control improvement in ONERA large sonic wind tunnel S1MA – Aerodynamic modelling of an active flow control system for flapless flight control in the preliminary design stages – Progress in inverted joined wing scaled demonstrator programme – On the minimisation of cruise drag due to pitch trim – Validation and assessment of turbulence model impact for fluid-structure coupled computations of the NASA common research model (CRM) – Aerodynamic validation of a parametric airfoil description – APIAN-INF: a low-speed aerodynamic and aero acoustic investigation of pylon, pusher propeller interaction effects – CFD analysis of a blowing pylon system for the APIAN propeller in pusher configuration – Using wing modal deformation for improvement of CFD results of ESWIRP project – Aerodynamic design and shape optimisation of transonic joined-wing civil transport – Characteristics of locked and free-wheeling ducted fan based on wind tunnel tests and CFD analyses – The influence of the drag dynamic stall in the vertical axis wind turbine starting efficiency – Future wing hybrid laminar flow control suction system design and analysis – **Aero-elasticity:** Multidisciplinary design optimisation of flight control system parameters in consideration of aero elasticity – Automatic generation of aero elastic simulation models combined with a knowledge mass prediction – Aero elastic concepts in civil aircraft wings design – Mechanics: Methodology for the validation of loads in rational turning analysis – **Aircraft noise & acoustics:** Assessment of aircraft noise sources variability using an acoustic camera – Auralization of novel aircraft configurations (to limit noise on the ground) – On thermo-acoustic acoustic-vortex-entropy waves and flow stability – Rotorcraft noise and emissions reduction process for Clean Sky, the measurement success – Noise predictions of hypersonic air transport vehicle concept during the landing and take-off cycle – **Materials & Structures:** Crash concept for composite transport aircraft using tensile and compressive absorption mechanisms – Composite laminate simulation using an enhanced peridynamics lamina formulation – Multi scale virtual testing: the roadmap to the efficient design of composites for damage tolerance - The GARTEUR project on damage growth in aerospace composite structures – Damage identification in composite panels using acousto-ultrasonic waves – Citric acid aerospace stainless steel passivation: a green approach – Morphed vertical tailplane assessment for certification requirements – Automation in aerospace composites: state at NLR and future developments – **Engines and propulsion integration:** Propeller and inflow vortex interaction: vortex response and impact on the propeller performance – Assessment of pulsed-jet actuators to increase maximum lift of a mid-range aircraft – CFD analysis of a blowing pylon system for the APIAN propeller in pusher configuration – Computation of thermodynamic cycle for novel detonation aircraft engine – Analysis of the flow in a propulsion nozzle subjected to a fluid injection – Active flow control applied at the engine-wing junction – **Thermal:** Cooling channel flow characterisation using particle image velocimetry (PIV) and laser induced fluorescence (LIF) – **Landing gears:** Landing gear conceptual design and structural optimisation of a large blended wing body aircraft – Challenges in introduction and certification of thick-walled composite components in landing gears – **Health management:** Impacts of a prognostics and health management system (PHM) on aircraft fleet operating cost during conceptual design phase – Conception of service offers: from strategy to technology and the other way around. The case of Health and Usage monitoring systems (HUMs) in the management of missiles stockpiles – **Electrical wiring:** A methodology to enable automatic 3D routing of aircraft electrical wiring interconnection systems – **Electromechanical actuation systems:** preliminary design rules, the effects of saturation and compliance - **MRO:** Accelerating MRO procedures for composite materials using innovative detection techniques – **Aircraft design and configurations:** Design and analysis o the control and stability of a blended wing body aircraft – Analysis of aircraft configurations including propagated uncertainties - Auralization of novel aircraft configurations – A multidisciplinary design optimisation advisory system for aircraft design – Conceptual method for the wing weight estimation of strut braced wing aircraft – Comparison of the potential environmental impact improvements of future aircraft concepts using Life Cycle Assessment (LCA) – Progress in inverted joined wing scaled demonstrator programme - FEM analyses of joined wing aircraft configuration – Integrated multidisciplinary engineering solutions at Fokker Aerostructures – Feasibility study for a tailless aircraft with post stall manoeuvring

capability – The constructal principle and character law, hyperbolic, of natural design, a new paradigm of aerospace systems – Development of a certification module tailored to aircraft multi disciplinary optimisation – The importance of non-linearities in aircraft preliminary design – Statistical time and market predictive engineering design (STAMPED) techniques for preliminary aircraft sizing – Aircraft preliminary design: the windowless concept - **Product development:** A methodological approach for the product development process optimisation of aircraft components – **Manufacturing:** Development of laser beam welding concepts for fuselage panels – Additive manufacturing – design and optimisation methodologies for additive layer manufacturing (ALM) considering uncertainties – **Ground testing:** Ground test vibrations as non-conservative mean of compliance for vibration airworthiness requirements of aircraft mechanical system design - **Flight test:** Aerial delivery dynamic model validation by flight test – **TEMO:** Research and development of time and energy managed operations.

■ **WIND TUNNELS: ESWRIP** (European strategic wind tunnels improved research potential) programme overview – Wind tunnel high speed powered tests of the ERICA tilt rotor model in S1MA (NICETRIP project) - Mach number control improvement in ONERA 'S1MA' large sonic wind tunnel - Wind tunnel model support and wall interference corrections in DNW-HST ensuring high data quality standards - Wind tunnel test for breakthrough laminar aircraft demonstrator Europe at DNW-LLF - Investigations of ETW slotted wall interference using the NASA Common Research Model (CRM) - DNW innovations in wind tunnel testing – New moving belt system for large low speed facility - Analysis of the NASA common research model (CRM) tested in the European Transonic Wind Tunnel (ETW) data and comparison with NASA test data.

■ **FUTURE MILITARY AIRCRAFT:** flight-physical aspects and methods of future military aircraft designs.

■ **AIR TRANSPORT:** certification and airworthiness, **Airports:** Developing generic flight schedules for airport clusters - Clusterisation of airport cities and cluster dynamics for an air passenger demand network topology forecast based on socio-economic development scenario. **ATM/ATC:** Decision-making inconsistencies in ATC, an empirical investigation into reasons for rejecting decision support automation aviation environmental impacts - An ecological flow-based decision support tool for future 4D-trajectory management by air traffic control - Solution space-based complexity metric for ATC – Implementation of GNSS-based RNAV-flight procedures - Model-based system assessment and trajectory optimisation on aircraft level - Flight management system improvement: optimised steps in cruise, quantification of potential benefits for business aviation users – Air traffic flow optimisation with trajectory uncertainty.
Emissions reduction: Carbon dioxide emissions from air traffic internal to industrialised states and between them – Understanding fleet impacts of formation flight – An ecological flow-based decision support tool for future 4D-trajectory management by ATC – Environmental prospects in aviation: a study from the Air & Space Academy – Experimental investigations based on a demonstrator unit to analyse the combustion process of a nitrous oxide/ethane premixed green bipropellant – Aviation: environmental threats simplified methodology of NOx and CO emissions estimation – Comparison of the potential environmental impact improvements of future aircraft concepts using Life Cycle Assessment (LCA).
Clean Sky: Clean Sky Technology Evaluator, air transport system assessment– Noise assessment and experience at airport level – Rotorcraft noise and emissions reduction process for Clean Sky, the measurement of success – Integration of mission trajectory management functions into Clean Sky Technology evaluation process - People planet profit (PPP) – the making of the Clean Sky 2 – The Clean Sky experience: a cluster core partner's perspective.

■ **COLLABORATION IN AERONAUTICS RESEARCH IN EUROPE:** EREA (association of European Research Establishments in Aeronautics) - GARTEUR (Group for Aeronautical Research and Technology in Europe).

■ **INTERNATIONAL COOPERATION:** the IFAR (International Forum for Aviation Research).

■ **RPAS** (Remote Piloted Aerial Systems): comparative studies of European RPAS regulations - RPAS systems overview and configuration tool - Numerical and experimental investigations on subsonic air intakes with serpentine ducts for UAV configuration - Design of UAVs for photogrammetric mission in Antarctic area - Methods of flight-path planning for UAV photogrammetric missions with consideration of aircraft dynamic properties - Decision making for unmanned flight in icing conditions - UAV noise prediction, autonomous planning and re-planning of a single unmanned aerial vehicle: strategies and simulations A new computational framework for UAV quadrotor noise prediction – Design, implementation and evaluation of a RPAS system to support Well Clear (ICAO's Annex 2).

■ **SPACE:** Interactive 3D visualisation to support concurrent engineering in the early mission design phase - Autonomous robotic system for active debris removal: requirements - State-of-the-art and concept architecture of the rendezvous and capture (RVC) control architecture and system - Time-efficient and accurate performance prediction and analysis method for planetary flight vehicles design - Combined launch systems: a new concept to reduce the launch costs for micro (cube) satellites and debris hunting probes - 'Cubesats' – green micro-resistojet research

at TU Delft: the new frontiers of 'cubesat' propulsion - Envisat removal by robotic and net capture means: results of the Airbus DS led e.Deorbit phase A ESA study - Space capsule using energy of gravitational field for flight control - Special equipment which uses concentrated solar light for Earth protection against asteroids-advanced design and technology - COBRA: a proposed technique to control the motion of a non-cooperative satellite by means of the interaction between the thrusters exhaust gases from the chaser and the target satellite – Introducing eco-design to ESA: an overview of the activities towards a coherent eco-design approach - Eco-Space Project – environmental impact of new technologies – eco design for space and aerospace: what happens when we make eco design relevant for demanding applications? Pulcher-pulsed chemical rocket with green high performance propellants - Integrated sustainability in the design of space activities: development of eco-design tools for space projects - Future green bipropellant thrusters – Propulsive performance of a c3h4/h2o2 rocket prototype for future green bipropellant thrusters - ANDROID small active debris removal mission - ESA's e.Deorbit mission and its roadmap to active debris removal - How many satellites need de-orbit technologies?, architectural design and testing of a de-orbiting subsystem - Future scenarios for passive de-orbit devices - All moving tail plate interaction on an aerodynamic characteristic of the rocket plane in tailless configuration (for suborbital space tourism flights) - Impact of rocket launches on chemical and aerosol composition of the atmosphere - Analysis of electrical propulsion for de-orbiting of Sun-synchronous satellites - Green solid propulsion for launchers - Additive manufacturing for space applications - Characterisation of material demisability for spacecraft components - Clean Space: introducing eco-design to ESA – an overview of the activities towards a coherent eco-design approach - ESA green propulsion progress - Findings and conclusions from the AtILA project conducted by ESA's Cleanspace office aimed to better understand the environmental and atmospheric issues linked to its space activities - Developing a standardised methodology for space-specific life-cycle assessment - Airbus DS global approach to space debris mitigation - Cleansat: the Clean Space's response to the space debris situation - Simulating and testing throw-nets for space debris removal - EU environmental regulation and the space sector: an overview – EU environmental regulation and the space sector – A potential framework for the safe and permanent passivation of a LEO battery bus power system.

■ **FUTURE:** Economical assessment of commercial high-speed transport - Autonomous flying: a must for the future – Future sky – Jumbo City Flyer.

■ **THINKING OUT OF THE BOX:** Unwrapping the 'Flying Car', how to combine personal transport in the air and on the road – European personal aero-transportation: using of the double-flutter flight principle for manufacturing of personal flying-cars by European aircraft and car manufacturers.

■ **EDUCATION:** 21st century skills for the Aerospace Industry Workforce and their translation to the classroom - Giving space to space: bachelor education ins space engineering at TU Delft - A multidisciplinary approach and practical view in aeronautical engineering education – Effects of training strategies on acquiring and retaining manual control skills.

Here below are some words to present the objective of this paper, by Ilias Lappas (South Wales University) and K.I.K. Kourousis, (University of Limerick):

"[...] An industrial-age curriculum will not fully equip students for living and working in an information-age society. To succeed in this knowledge-base economy, everyone must learn to collaborate and connect digitally – both in their local communities and around the globe. Translating these 21st century skills to the classroom will shape the economic and social development of countries and communities for years to come. However, one of the most striking findings of the survey is that the education providers are the only who, in general (74%) believe that their graduates are adequately prepared for entry level positions in their chosen field of study, in contrast with 35% of the employers and 38% of the youth themselves. [...] New skills have to be identified for the future workforce of the aviation industry, which have then to be translated to the classroom.

The objective of the paper is precisely to propose a generic skill set and the respective changes at the existing curricula, to raise the awareness for this challenging issue and to call for a European-wide action based on close collaboration between industry and academia.

A synopsis of the current challenges faced in the educational field is outlined, followed by a mapping of the future of both education and air platforms, is an attempt to set the basis of the needed skills framework. Research undertaken by the Assessment and Teaching Of 21st Century Skills Project is used a baseline for the definition of the future 'critical' skill-set, which is considered well aligned with the future needs of the aerospace industry. In fine a translation of this 'critical' skill-set to the classroom is proposed, based in redesigning learning approaches and activities, together with expected benefits.

CONFERENCE PANELS

Conference panels were held on different subjects: Space sustainability, the IXV project of ESA (Intermediate eXperimental Vehicle) and the Future Combat Air System for Europe.

The Future Combat Air System Demonstration Programme (FCAS DP) which is being conducted in cooperation between UK and France has been presented in detail and followed by a panel discussion of European experts.

WORKSHOPS

■ **EWADE** European Workshop on Aircraft Design Education

The first edition of EWADE took place in Madrid in 1994, with Prof. E. Torenbeek, from TU Delft, as one of the founding fathers.

Since then, EWADE has formed a forum for staff active in aircraft design education at European (but not only) universities. These are EWADE's main objectives:

- To enable active collaboration between European lecturers concerned with Aircraft Design.
- To discuss Aircraft design problems as regards research and education.
- To enhance close cooperation with the aerospace industry for the two aspects mentioned above.

In 2003 EWADE has become the Educational Section of the CEAS Technical Committee Aircraft Design.

The 12th EWADE edition has taken place on 10 September within the CEAS2015 Conference Programme hosted by Dr G. La Rocca from TU Delft.

http://ewade.aircraftdesign.org/

■ **AFLONEXT:** On 10 September the EU-funded project Active Flow, Loads & Noise control on next generation wing 'AFLoNext 2nd generation active wing' organised a workshop as a partner in the CEAS2015 Conference. AFLONext is a 4-year integrated project with the objective of proving and maturing highly promising flow control technologies for novel aircraft configurations – www.aflonext.eu

■ **IN2SAI:** the increasing young women's participation in Science Studies and in the Aeronautic Industry IN2SAI project intends to increase the participation of women in higher education studies in scientific fields – especially those relevant for aeronautics – and to contribute to their integration into the aeronautics industry. On 9 September, IN2SAI held a panel session, interactive discussions and the final project conference.

■ **PulCheR** (pulsed Chemical Rocket with Green High Performance Propellants) is a 3-year research project co-funded by the EU, mainly aimed at demonstrating the feasibility of a pulsed propulsion system in which the propellants are fed in the combustion chamber at low pressure and the thrust is generated by means of high frequency pulses. The current status of the project, its main achievements and the still open challenges were discussed on 7 September. http://www.alta-space.com/pulcher/

PROJECT

■ **ESWIRP:** European Strategic Wind tunnels improved research Potential ESWIRP achievements were presented on 8 September. This EU-ESWIRP project is funded by the FP7 to support the integration of and access to research infrastructure of pan-European interest. It has enhanced the interoperability of DNW-LLF, ETW, and ONERA S1MA. A central element of the project, besides networking and joint research activities, is the transnational access (TNA), which has been provided to 4 consortia with a total of more than 100 scientists from 17 different nations.

http://www.eswirp.eu/

TECHNICAL VISITS

On 11 September CEAS was pleased to offer 4 technical tours to places of interest: to ESA/ESTEC in Noordwijk, the National Aerospace Laboratory of Netherlands NLR in Amsterdam, TU-Delft Faculty of Aerospace Engineering and Fokker Aerostructures in Papendrecht.

EXHIBITION

A variety of companies, institutions and organisations presented themselves at the spacious Foyer, where lunches were served and networking opportunities could be seized. Amongst which were: CEAS, ESA, Fokker Technologies, DLR, NLR, Compoworld, PAL-V, DNW, TU-Delft, VSV Leonardo da Vinci, EUROAVIA, Springer, Aerodays.

CONSULT THE CPMIS : CEAS CONFERENCE PROGRAMMING MANAGEMENT INFORMATION SYSTEM

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

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

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

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

AUTOMATIC INSERTION OF NEW EVENTS BY THE ORGANISERS THEMSELVES:

- Go to http://www.aerospace-events.eu
- Click on the "introduction" text
- Redirected on the New Event Form, you have to click on this form and to enter your event related information, validate, click on Save and send.

Point of Contact:

postmaster@aerospace-events.eu is the general address for any question and requests;

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

YEAR 2015 – DECEMBER

01 December • **RAeS** – Human Spaceflight Conference – London (UK) – RAeS/HQ – www.aerosociety.com/Events/

01-03 December • **SESAR JU** – SESAR Innovation Days – Bologna (Italy) – University Bologna www.sesarinnovationdays.eu/

02-03 December • **EASA** – Ninth EASA Rotorcraft Symposium 2015 – Cologne (Germany) – Hilton www.easa.europa.eu/

02-04 December • **ACI World /ICAO** – ACI Conference on Investing in Airports – Economic Oversight and regulation – New Delhi (India) – The Oberoi, New Delhi – www.aci.aero/Events

08-10 December • **ACI Europe** – Airport Exchange – Istanbul (Turkey) – www.aci-europe-events.com

15-16 December • **ESA** – Moon 2020-2030 – A New Era of Coordinated Human and Robotic Exploration – Noordwijk (NL)- ESTEC – www.esa.int

YEAR 2016 – JANUARY TO MID-MAY

04-08 January • **AIAA** – AIAA SciTech 2016 – San Diego, CA (USA) – Manchester Grand Hyatt http://www.aiaa-sci-tech.org/

14-15 January • **EDA** – First Plenary Session – Consultation Forum for Sustainable energy in the Defence & Security Sector - Brussels (Belgium) – www.eda.europa.eu/info-hub/Events

27-29 January • **3AF/SEE/SIA** – ERTS2 2016 (ERTS Embedded Real Time Software Systems) – Toulouse (France) – Centre de Congrès Pierre Baudis - www.erts2016.org

02-04 February • **3AF** – OPTRO 2016 – Paris 16e (France) – OECD Conference Centre – http://www.optro2016.com

14-18 February • **AAS/AIAA** – Space Flight Mechanics Meeting – Napa, CA (USA) – Embassy Suite Napa Valley – http://www.space-flight.org/

23-24 February • **RAeS** – 2016 RAeS Air Transport Conference – 4 hours door-to-door within Europe by 2050 – London (UK) - RAeS/HQ – www.aerosociety.com/Events/

01-03 March • **ESA** – European Space Components Conference ESCCON 2016 – Noordwijk (NL) – ESTEC – www.esa.int

05-12 March • **IEEE** – 2016 IEEE Aerospace Conference – Big Sky, MT (USA) – Yellow Stone Conference Center – http://www.aeroconf.org

08 March • **RAeS** – Aerospace Medicine Symposium 2016 – London (UK) - RAeS/HQ – www.aerosociety.com/Events/

08-10 March • **CANSO /ATCA** – World ATM Congress 2016 – Madrid (Spain) – IFEMA Feria – www.worldatmcongress.org/2016

14-17 March • **ESA** – 6th International Conference on Astrodynamics Tools and Techniques ICATT – Darmstadt (Germany) – ESA/ESOC – www.esa.int

14-18 March • **ESA** – From Giotto to Rosetta – Noordwijk (NL) – ESREC – www.esa.int

15-17 March • **ESA** – Big Data from Space BIDS – Santa Cruz de Tenerife (Spain) – Auditorio de Tenerife – www.esa.int

15-17 March • **IATA** – 10th World Cargo Symposium – WCS – Berlin (Germany) – Berlin Hotel Continental – www.iata.org/events/

18 March • **RAeS** – Financing the Business of Aerospace – Conference – London (UK) – RAeS/HQ – www.aerosociety.com/Events/

04-06 April • **3AF** – 51st Applied Aerodynamics International Conference – Strasbourg (France) – European Doctoral College, University of Strasbourg - 46, bd de la Victoire - www.3AF-aerodynamics2016.com

04-08 April • **ESA** – Spacecraft Changing Technology Conference – Noordwijk (NL) – ESTEC – www.esa.int

12-14 April • **SAE International** – SAE 2016 World Congress & Exhibition- Powering possibilities – Detroit, Michigan (USA) – Cobo Center – https://www.sae.org/congress/

12-14 April • **3AF** – AEGATS'16 : Advanced Aircraft Efficiency in a Global Air Transport System – Paris 12e (France) – Les Salons de l'Aveyron – http://www.aegats.com

12-15 April • **ESA** – Water in the Universe from Clouds to Oceans – Noordwijk (NL) – ESTEC – www.esa.int

19-21 April • **ICNS/IEEE/AIAA** – 16th Integrated Communications and Surveillance Conference – Herndon, VA (USA) – Westin Washington Dulles Airport Hotel – http://i-cns.org

20-23 April • **AERO Friedrichshaffen** – The Global Air Show for General Aviation – www.aero-expo.com

1 May • **ERCOFTAC** – Lattice-Boltzmann-Methods (LBM) for Industrial Applications – Paris (France) – www.ercoftac.org/events/

02-06 May • **3AF/ESA/CNES** – Space Propulsion 2016 – Rome (Italy) – Conference Centre, Via Col. T. Massia – http://www.propusion2016.com

09 May • **RAeS** – Conference: Aircrew Mental Health and Well Being 2015 to 2040 – London (UK) – RAeS/HQ – www.aerosociety.com/Events/

09-13 May • **ESA** – Living Planet Symposium – Prague (Czech Republic) – Prague Congress Centre – www.esa.int

15-18 May • **IATA** – SpaceOps 2016 – Daejeon (Korea) – Daejeon Conference Center – http://www.spaceops2016.org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2017
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Henri Coanda
Our great predecessors inspire us in our job.
Hermann Oberth
Aurel Vlaicu
Traian Vuia


CONFERENCE VENUE
Palace of Parliament, in the Bucharest city centre
Space Available
10 000 sqm (conference and exhibition area)
8 meeting halls from 50 to 1200 seats
cloak-room
lobbies and galleries
parking lot
2 main entrances
elevators
first aid station
Technical Facilities
installed and mobile simultaneous translation system
video projector
international telephone, fax
Event Management
conference & congress organization
exhibition organization
Catering
standing buffets
dinners
cocktails
buffets
coffee breaks


OFICIAL DINNER VENUE
The National Military Centre