The Quarterly Bulletin of the

CEAS

COUNCIL OF EUROPEAN AEROSPACE SOCIETIES

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

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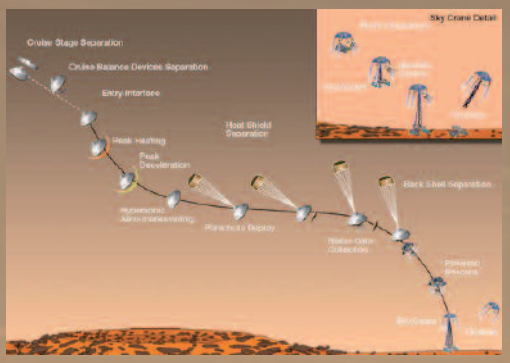

Timeline of Major Mission Events During Curiosity's Landing

Mars Rover "Curiosity" in Artist's Concept, Wide

THE THIRD QUARTER OF 2012 IN THE AEROSPACE DOMAIN WAS DOMINATED BY THE SUCCESSFUL LANDING, ON 6 AUGUST 2012 AT 05:17 UTC, OF THE NASA's ROVER « CURIOSITY » ON MARS

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 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

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

ABOUT THE SUCCESSFUL LANDING ON MARS, ON 6 AUGUST 2012, OF THE NASA's ROVER *CURIOSITY*

Jean-Pierre Sanfourche
Editor-in-Chief

The Mars Science Laboratory *Curiosity*, launched from Kennedy Space Center (Florida) on 26 November 2011, landed successfully on the Red Planet on 6 August 2012 at 05:17 UTC. The accurate landing of this car-sized rover, the most sophisticated ever built, represents quite an important technological exploit. *Curiosity* is henceforth on site to look for signs of microbial life during at least one Martian year, i.e. 23 Earth months.

It transmits to Earth directly or via three satellites in Mars orbit, and thanks to the continued rover coverage by internet, it is possible to follow day after day the progress of the mission by looking at the countless marvelous pictures and reading the explanations and comments provided by NASA's/JPL (Jet Propulsion Laboratory).

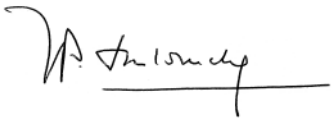
Among the videos present on www.jpl.nasa.gov/msl, two have particularly fascinated me: "Seven minutes of terror" and "NASA's Curiosity Rover has landed".

In "Seven minutes of terror", on 3 August, before the effective landing, JPL engineers described in a detailed manner the extraordinary challenge that will constitute the achievement of the very audacious EDL (Entry-Descent-Landing) sequence, a "zero margin error" operation.

And just two days after, the real exploit could be followed on the Web: "NASA's Curiosity Rover has landed", a wonderful 11-minute movie showing the scientists and engineers at the Mission Control Center of the JPL, watching this extraordinary delicate EDL sequence. It was exciting and touching to live through the alternated periods of anxiety and of relief in the room as the data received from space confirmed that the basic steps of the descent had nominally passed. Finally when a signal confirmed the rover was on the ground, when the rover's Tweeter feed announced "I AM SAFELY ON THE SURFACE OF MARS GALE CRATER I AM IN YOU", the success was greeted with a roar of approval, the numerous specialists present in the control centre punching in the air hugging each other, laughter mixing with the tears. The EDL engineers had pulled off the most daring landing ever attempted on another world, and what is also amazing and admirable is the exact similitude between the sequence described on August 3rd, "Seven minutes of terror", and the real arrival on Mars: the guided entry in the atmosphere, the large supersonic parachute descent, the powered descent and at last the sky crane lowering the rover to the soft landing.

Really this landing on Mars of a heavy payload is a great achievement of human imagination, as well as of engineering and organisational skills, opening the way for most ambitious perspectives regarding Red Planet exploration.

This major event should certainly help reinvigorate everyone's enthusiasm for space research.



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THE 20TH CEAS TRUSTEES BOARD MEETING

The 20th Trustees Board Meeting was held on Friday 15 June 2012 in Athens at the Offices of the Hellenic Technical Engineering Chamber (HTEC) Headquarters, Nikis 4, Syntagma Square.
In the evening of the day before, 14 June, the CEAS Greek friends and the HAES (Hellenic Aeronautical Engineers Society) offered a superb reception, visit and dinner.

THE ACROPOLIS MUSEUM EVENT OF 14 JUNE EVENING

On 14 June evening, the CEAS trustees in front of the Acropolis of Athens.

HAES Vice-President Tony Economopoulos gave a speech here below reproduced:

" Dear Members of the Board of Trustees of the Council of European Aerospace Societies,
Dear Members of our Society,
Dear Guests,
On behalf of the Hellenic Aeronautical Engineers Society we have the pleasure to welcome you all to tonight's event.
This dinner is in the honour of these professionals who diligently work for the promotion of common European advancement of Aerospace Science and Engineering.
The Board of Trustees meeting will take place tomorrow throughout the day in the headquarters of the Technical Chamber of Greece.
Tonight, let's enjoy ourselves, here at the Acropolis Museum not far away from the Parthenon, the temple of Goddess Athena that since the 5th century BC symbolizes wisdom and marks the beginning of western democratic civilization.
As if we all take a good look at this temple maybe it will become apparent to us that no challenge can be too great for the Human Spirit.
Now I call the president of our Society, Mr Ioannis Vakrados, for the honorary induction to our Society of Professor Franco Persiani, President of the Italian Association of Aeronautics and Astronautics and a Member of the CEAS Board of Trustees.

Thank you."

The Franco Persiani's induction followed, by HAES President Ioannis Vakrados:

" Prof. Franco Persiani's achievements in the area of Aeronautics and Astronautics have been profound and consistent over the years with realizing aerospace professional's most ambitious visions at Bologna University and in a number of important public offices in Italy. Prof. Franco Persiani personifies the qualities and attributes of an outstanding aerospace professional and a moral fellow. Thus, we are honoured to welcome Prof. Franco Persiani in our ranks. "

From left to right : Mr Nikolaos Zafeirou-Yiparakis showing the document certifying the honorary induction of Prof. Persiani to the Greek Society, Prof Franco Persiani, Dr Triantafilos Stavrinidis, HAES Past-President, and Mr Ioannis Vakrados, HAES President.

Commemorative tablet of the HAES honorary presentation to the Italian Association of Aeronautics and Astronautics.

THE TRUSTEES BOARD MEETING, 15 JUNE

WELCOME

CEAS President Pierre Bescond welcomed all the attendees and thanked the Greek friends and the HAES (Hellenic Aeronautical Engineers Society) for the superb reception, visit and dinner they offered on 14 June evening. He thanked also for their hosting of the CEAS Trustees Board Meeting.

Mr Anthony Economopoulos answered him thanking the presence of CEAS members. He made a brief introduction of the Hellenic Technical Chamber of Engineers (HTCE). Any engineer who wants to practice engineering in Greece has to get a license through an examination conducted by this institution. The HTCE counts about 124,000 members from whom 400 are aeronautical engineers from Athens University and 300 are mechanical and aeronautical engineers from Patras University.

AMONG THE MAIN ITEMS DEALT WITH

- The Strategy Plan is in process of completion. Mr David Marshall proposes to create a Young People Group.
- Aeronautics Branch report by Christophe Hermans: a new MOU with the AIAA concerning the Aero-Acoustics Conference will be signed soon – Russia (TsAGI) and Poland have joined the ERF (European Rotorcraft Forum) – the next CEAS EuroGNC Conference which will take place in Delft (NL) from 10 to 12 April 2013 in being actively prepared.
- Space Branch report by Constantinos Stavrinidis: a MOU formalizing the partnership between the European Space Agency (ESA) and the CEAS is being prepared – More than 500 delegates participated in the 12th European conference on Spacecraft Structures, Materials and Environmental testing, on 20-23 March 2012 at ESA/ESTEC in Noordwijk (NL), where 218 papers were presented – 0n 7-10 May in Bordeaux, 600 people attended the 3rd edition of the International Conference on Space Propulsion.
- PCC report: the CPMIS (Conference Programming Management Information System) is now operational: all CEAS Member Societies are asked to nominate the person specifically in charge of regularly updating it by introducing the new events which are planned in the coming months and years.
- The 4th CEAS European Air & Space Conference, 16-20 September 2013 in Linköping (Sweden), is under active preparation.
- It is envisaged to organise the next one - CEAS Conference 2015 – in Toulouse (France).
- A co-operation process between CEAS and EUCASS in being discussed between both parties.
- Students and Young Professionals: Thomas P. Vermin, President EUROAVIA Delft, presented the new Web platform CEAS Students in Aerospace is in course of preparation.
- Next Trustees Board Meetings: 21st TB meeting on 25 October 2012 in Bucharest (with at the same time the 8th General Assembly) – 22nd TB meeting on 7 March 2013 in Brussels – 23rd TB meeting in June 2013 in London – 24th TB meeting in September 2013 in Linköping.

By Mercedes Oliver Herrero,
CEAS Director General

ABOUT LINKÖPING CONFERENCE 2013 "INNOVATIVE EUROPE"

CALL FOR PAPERS

The CEAS European Air & Space Conference 2013 will take place in Linköping (Sweden) from 16 to 20 September 2013.

The major conference topics are:

- Innovative future Air & Space systems and technologies
- Collaborative engineering and research
- Air Traffic Management (ATM) and flight operations systems
- Research and technology for Air Power
- Education for Aeronautics and Space
- Emergent industries and markets

You are invited to submit your proposal for a presentation under these major topics.

Page responsible: magnus.sethson@liu.se

By Prof. Petter Krus
Head of conference
Linköping University
petter.krus@liu.se

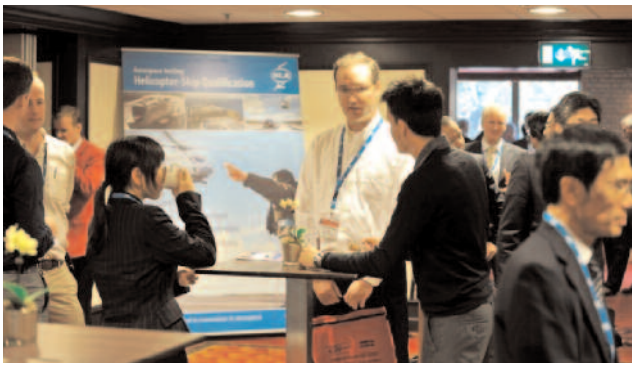
SUCCESSFUL EUROPEAN ROTORCRAFT FORUM 2012 HELD IN AMSTERDAM

By Dr Christophe Hermans, Head of CEAS Aeronautics Branch

On the 4th of September, 220 attendees were welcomed to Amsterdam by Kees Bakker, the chairman of the organizing committee and to the 38th European Rotorcraft Forum ERF. He reminded the audience to the first Forum being organized in 1975 in the UK, being a superb idea of Professor Ian Cheeseman of the University of Southampton. This became the start of a yearly event rotating over six countries (the United Kingdom, Germany, France, Italy, the Netherlands and Russia.) which today is still alive and attracts many people who work in the field of helicopters or related areas. In 2011, unfortunately professor Cheeseman passed away; however his name will remain connected to the Forum through the Cheeseman Award, which will yearly be handed out to the author(s) drafting and presenting the best paper. During the opening ceremony the chairman of CEAS, Pierre Bescond, in his welcome speech touched upon the relationship of CEAS with the European Rotorcraft Forum. The three other speakers at the ceremony addressed the helicopter from respectively a military, an industrial and a government perspective.

The European Rotorcraft Forum ERF is one of the premier events in the rotorcraft community's calendar bringing together manufacturers, research centers, academia, operators and regulatory agencies to discuss advances in research, development, design, manufacturing, testing and operation of rotorcraft. This year's ERF was organized by the Netherlands Association of Aeronautical Engineers (NVvL), one of the members of the Council of European Aeronautical Societies CEAS. It took take place in the Marriott hotel Amsterdam, the Netherlands, from September 4 to 7, 2012.

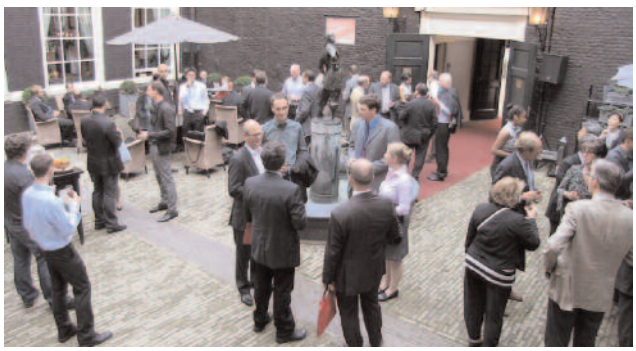
The Forums are special events for the international rotorcraft community and many might even remember past Forums as significant milestones in their careers – maybe the first public presentation for a PhD student, or a report on a multi-national collaborative research venture, the description of new technologies or operational capability for a development program or the first announcement of new draft regulations. All these and more can be found in the rich portfolio of a typical ERF. The CEAS Rotorcraft technical committee, acting as ERF International Committee, chaired by Christophe Hermans was responsible for the technical program of the Forum. It contained 110 high quality technical papers, presented during 5 parallel sessions, from 17 nations across all continents. As in previous years, the Forum sessions covered typical aspects of rotorcraft like Computation Fluid Dynamics, Flight Mechanics,



Airworthiness, Materials, Rotor Dynamics, Test & Evaluation and Operational Aspects. At the committee meeting future involvement of Poland, being one of the new CEAS members, as a potential seventh ERF nation has been addressed.

Additional to the technical content of the Forum, a welcome reception was held on Tuesday night in 'Het West-Indisch Huis' (West India House), being the former headquarters of the Dutch West India Company in Amsterdam. The traditional Forum dinner took place on Wednesday night in the unique 17th century domed 'Koepelkerk' that owes its name and fame to its beautiful copper dome, a point of orientation for every citizen of Amsterdam. During the dinner, which was graced by the band of NLR, the so-called 'hot potato' was handed over to Russia, being responsible for the organization of next year's event. This trophy, being a dragonfly sitting on a rotor blade, contains the inscriptions of places where previous ERF's were held. Dmitry Podoryashy announced that ERF 39 will be held in Moscow from September 2 – 6, 2013. All attendees and their accompanying persons were offered by the city of Amsterdam a free canal boat trip, that could be enjoyed during one of the Forum days with wonderful weather conditions

The very successful Forum ended on Friday with technical tours to Fokker Technologies (Papendrecht) and the National Aerospace Laboratory NLR (Amsterdam). At Fokker NH90 component production facilities and at NLR the airport tower and helicopter simulation facilities as well as the NLR museum were visited.



TOWARDS THE ALL-ELECTRIC AIRCRAFT: HOW DOES CLEANSKY JU ADDRESS THE CHALLENGE ?

In today's aircraft, a small proportion of the power generated by the engines is, on the one hand, mechanically diverted via the gearbox to electrical generators, central hydraulic pumps and other subsystems. On the other hand, engine high pressure bleed air is used to pneumatically power the air-conditioning system, anti-ice system, etc. As for the auxiliary power unit (APU) it provides both pneumatic power for air-conditioning and electrical power to the aircraft's avionic systems, to cabin and aircraft lighting, to the galleys, and other uses such as the entertainment systems mainly when the aircraft is on the ground. The hydraulic pumps transfer hydraulic power to the actuation systems for primary and secondary flight control, to landing gears and to a number of ancillary systems. Each system has become more and more complex over decades of developments, resulting in a non-optimal architecture (Figure 1).

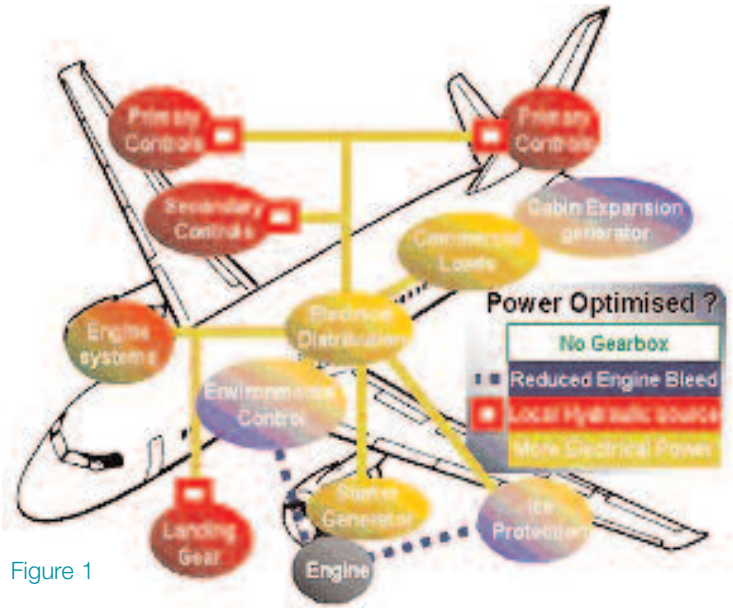


Figure 1

While there is little prospect of aircraft being propelled by electric motors any time soon, there is a move within the aeronautical industry to run all other systems on electricity. "The main purpose is to reduce the overall weight of the plane – and therefore fuel consumption." says Rainer Von-Wrede, Director of Environmental Affairs at Airbus.

HOW DOES CLEANSKY JU ADDRESS THE CHALLENGE?

The challenge consists in reducing the amount of power diverted from the engines by improving the architecture of the aircraft: optimized choice of the power off-take location, improvement of the gearbox integration (in some cases it would be possible to remove it), engine bleed air reduction, introduction of local hydraulic power sources, switch to electrically powered solutions, etc. The goal is to pass from scheme A (Figure 2 – top) to scheme B (Figure 2 – bottom)

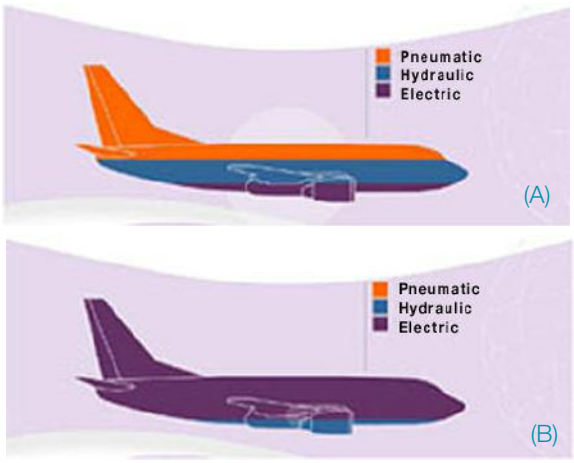


Figure 2 : Legend Pneumatic in red, hydraulic in blue, and electric (purple) power generation today (A) and in the future (B).

Current hydraulic systems generate constant power, which means that excess power is sometimes generated but not used, giving rise to a waste of fuel.

- The use of electrical power for all non-propulsion requirements will enable power to be used only when it is needed while getting rid of the hydraulics will reduce weight and pollution due to hydraulic liquid.
- The use of only one power source only (electric) instead of presently three (electric, hydraulic, pneumatic) will improve efficiency thanks to less conversion losses.
- In addition electrical systems tend to be more efficient, easier to control and better maintainable than hydraulic and pneumatic.

Clean Sky intends to demonstrate:

– Proven large-scale ground-based architectural integration of electrical generation, distribution and loads, and for thermal management;
– Proven large-scale ground-based integration of thermal management technologies;
– Flight proven electrical equipment systems, including environmental conditioning and protection;
– Flight proven technologies and sub-systems for thermal exchange and management, including liquid loops and heat exchangers;
– Flight proven technologies, architectures and concepts for power generation and distribution.

So, many technologies are developed, ranging from power generation and conversion systems to "electrical nacelle" and heat exchangers. Among these technologies, two are

top priorities: the Electrical Environmental Control System (E-ECS) and the Electrical Wing Ice Protection System (E-WIPS).

AN EXAMPLE: THE BOEING 787 "DREAMLINER"

The "Dreamliner" is the most advanced current aircraft as for the electrical systems. The transition to an electric architecture has considerably reduced the aircraft mechanical complexity because everything that was previously powered by bleed-air from the engines has been transferred to an electric architecture: engine start, APU (auxiliary power system) start, wing ice protection, cabin pressurisation, hydraulic pumps. This elimination of the pneumatic systems from the aircraft improves the efficiency of the engines but also improves reliability and cuts maintenance costs.

CHALLENGE FR THE FUTURE

Further in the future, Airbus envisages aircraft that are getting energy from a range of sources in order to reduce the amount of fuel needed, including solar power.

J.-P. S – From information provided by Clean Sky JU.

SESAR RELEASES TECHNOLOGIES READY FOR PRE-INDUSTRIALISATION

On 3 July 2012, SESAR presented the results of a first set of successful demonstration exercises, supplying the Air Traffic Management (ATM) community with new or improved technological solutions at pre-industrialisation stage, ready for deployments.

15 OPERATIONAL FOCUS AREAS

The first release of SESAR R&D results featured operational validation exercises which took place throughout Europe in 2011 and the first months of 2012. These exercises focused essentially on the development of efficient and green terminal airspace operations, four-dimensional aircraft trajectories, enhancing flight safety and collaborative ATM network management. The technological concepts assessed in this first set are clustered in 15 Operational Focus Areas (OFAs): for 10, demonstration exercises successfully demonstrated the maturity of the concept under review, and for 7 of them, the trials results are already conclusive and sufficient to support a decision for pre-industrialisation. For 8 out of the 15 OFAs, further R&D work is planned in the next phases of development: SESAR Release 2 in 2012/2013, SESAR 3 in 2013/2014.

THE 7 OFAs READY TO SUPPORT A DECISION FOR PRE-INDUSTRIALISATION:

- Optimized RNP (Required Navigation Performance) structures
- Approach Procedure with Vertical guidance (APV)
- Sector Team Operations: electronic decision aid tool kit for En-Route Air Traffic Controllers
- Enhanced STCA (Short Term Conflict Alert)
- Enhanced ACAS (airborne Collision Avoidance System)
- Integrated AMAN-DMAN (Departure MANager)
- SESAR CWP (Controller Working Position) Airport

THE 8 OFAs NECESSITATING FURTHER R&D

- Point Merge in Complex TMA (Airport Terminal Manoeuvring Area)
- i-4D (initial 4 Dimensional) Trajectory Management Framework
- AMAN and extended AMAN horizon (Arrival MANagement)
- I-4D + CTA (Controlled Time of Arrival)
- Complexity Assessment and Resolution
- Enhanced ATFCM (Air Traffic Flow Control Measure) processes
- SESAR CWP (Controller Working Position) En-Route and TMA (Terminal Manoeuvring Area)
- Remote Tower

Abstract written by J.-P.S from SESAR JU information www.sesarju.eu/

AIRBUS MILITARY A400M: SERIES RAMP-UP

By Mercedes Oliver Herrero

Ms Mercedes Oliver Herrero is Aeronautical Engineer at EADS/CASA, Director General of the CEAS and Vice-President of the AIAE.

Airbus Military started series production of its military transport aircraft A400M, also used for humanitarian and other 'civic' missions, in February 2011. After scarcely more than a decade, the aircraft sets the global standard for the 21st century within its market segment. To position such a high-tech product at the centre of attention in a competitive sector such as aeronautics is quite an achievement. But if this product has, furthermore, thanks to its capabilities and characteristics, already set the benchmark in the industry even before it has become operational, there is no doubt that Airbus Military knows what it is doing.

THE INTEGRATION OF THE MAJOR STRUCTURES OF THE MSN7 HAS STARTED

Ten months after A400M series production kicked off, the aircraft's final assembly line (FAL) in Seville (Spain) has begun work on the integration of the major structures of the MSN7, the first series A400M which is to be delivered to the customer in France in 2013 (Figure 1). Since the start of the final assembly of the MSN7, the production rate has been increasing and will continue to rise until it reaches the operating pace planned for the industrialisation of the programme. The FAL will assemble 2.5 aircraft per month from the end of 2015. Until then, all Airbus and Airbus Military production plants that are involved in the programme, as well as the subcontractors in the supply chain, will gradually increase their production rate in a coordinated manner. The A400M has overcome an enormous technological challenge, and the logistical challenge of manufacturing the aircraft will also be met: currently, ten thousand people throughout Europe are working on the A400M programme. This number will increase to 40,000 throughout the life of the programme.

Figure 1: Integration of the major structures of the MSN7. Credit: Airbus Military

THE FAL: A MODERN AIRCRAFT ASSEMBLY LINE

The FAL, which was set up in Seville to assemble the A400M, is one of the most modern aircraft assembly lines in the world. At the beginning of September 2012, assembly of the first three customer aircraft was already underway. The first two will go to France and the third - the

Figure 2: The MSN9 which will be delivered to Turkey, in course of integration in the FAL. Credit: Airbus Military

Figure 3: Manufacturing of the nose and of the fuselage in Bremen. Credit: Airbus Military

MSN9 – (Figure 2) to Turkey. The next ten aircraft are already at various stages of production, with long-lead items launched up to MSN23. Production of the A400M is therefore advancing according to planning, with the major sub-assembly groups for the fourth aircraft (MSN10, also for France) soon to be delivered to the FAL.

THE MAJOR SUB-ASSEMBLY GROUPS

The major sub-assembly groups for the final assembly are supplied from different parts of Europe. The outer wings and the central wing box are produced in Filton (UK) and Nantes (France), respectively, while the fuselage and the nose are manufactured in Bremen (Germany) (Figure 3) and Saint-Nazaire (France), respectively, and the vertical (VTP – vertical tail plane) and horizontal (HTP – horizontal tail plane) stabilisers are produced in Stade (Germany) and Seville (Spain), respectively. All these major components are delivered to the FAL on board the Airbus Beluga super transporter. The FAL has an unloading bay that can cope with the size of Airbus's flagship transport aircraft. Only two of the components – the central wing box and the horizontal tail plane (HTP) – will be supplied by road to the plant at San Pablo, near Seville.

THA FAL LASTS EIGHTY DAYS

The A400M assembly process at the final assembly line itself will take 88 days, including the Flight Line and the Paint workshop, the two final stages before the aircraft is handed over to the customer. The A400M (or each of its major sub-assembly groups in the stages prior to the final assembly of the structure) will spend eight working days at each of the work stations, apart from the two stations dedicated to the integration of the wing group and its equipment and the ground test centre, where the correct operation of all aircraft systems is tested. The work performed at each of these three stations requires twice as much time, i.e. 16 working days. Nevertheless, the production rate is based on the eight working days required by the other stations, so the stations that need 16 working days are doubled up to ensure that the aircraft assembly production rate is maintained.

A PRODUCTION RATE OF 2.5 AIRCRAFT PER MONTH

Although the production rate will reach its planned maximum of 2.5 aircraft per month from the end of 2015, the capacity of the modern FAL for the A400M is much higher. It was designed with a capacity to assemble up to three aircraft per month, i.e. an increase of six aircraft per year to a total of 36, with respect to the cycle of 2.5 aircraft per month or 30 aircraft per year.

AIRBUS MILITARY RECONFIRMS A400M PRODUCTION OUTPUT FOR 2013

Following the development of solutions for recent engine issue, which prevented the A400M from participating in the Farnborough Air Show flying display, Airbus Military has reconfirmed that it will deliver the first four A400M airlifters to customers in 2013 as planned.
An engine issue appeared on MSN6, the first production representative development aircraft. Being performing the 300 hour Function and Reliability (F&R) testing required to get the full Type certificate (TC), test had to be suspended after 160 hours because of the repeated detection of metallic chips in the oil systems of one of the engines, chip detection provoked by a crack of a cover plate – a mechanical piece isolating elements within the Propeller Gear Box -. EuroProp International (EPI) is solving this problem by replacing this cover plate. As soon as MSN6 is fitted with the modified engines and upon agreement with EASA, F&R testing phase will be able to restart.

The civil Type Certification (TP) and the military Initial Operating Capability (IOC) will now move to the first quarter of 2013, followed by the first delivery to the French Air Force (MSN7) in the second quarter of 2013. Despite this, the overall delivery plan of four aircraft in 2013 is maintained.

THE A400M IN A FEW WORDS

The A400M programme is a cooperative development between 7 European countries and NATO members: Belgium, Britain, France, Germany, Luxembourg, Spain and Turkey. Airbus Military's A400M airlifter is a high-speed turboprop aircraft specifically designed to meet the harmonized needs of these nations, as well as the requirements of international air forces. It combines both tactical and strategic/logistic missions.
It is a high wing and tall T. The composite materials from the carbon fiber are approximately 30% of the fuselage and the greater part of the wings. Control is essentially provided by modern electronic flight systems. The four 11,000 hp engines are the largest turboprop ever built to date. With its cargo hold specifically designed to carry the outsize equipment needed for both military and humanitarian disaster relief missions, it can bring this material quickly and directly to where it is most needed. Thanks to its most advanced technologies, it is able to fly high, fast and far, while retaining high maneuverability, low speed, and short, soft and rough airfield capabilities.

SOME KEY FIGURES

- Wingspan: 42.40 m
- Length: 45.10 m
- Height: 14.70 m
- Propulsion: 4 turboprop EPI (EuroProp International) TP 400-D6
- Total power : 4 x 11,000 hp (at sea level)
- Cargo: 17.71 m long – 4 m wide – 3.85 m high. Hold surface 92 m^2 – volume 340 m^3
- The bunker can accommodate: 116 soldiers or armed paratroopers, 66 stretchers for medical evacuation operationsoperations. And also 2 helicopters NH 90 or Tigre, 3 armored troop transport, etc. But 36.6 tons of cargo max.
- Gross Weight: 141,000 kg
- Max. Speed: Mach 0.72 (800 km/h)
- Ceiling: 11,400 m
- Range: 8,700 km (empty). Can carry 30 tons, twice, a distance ~4,500 km
- Crew: 4

THE *CURIOSITY* ROVER EXPLOIT

By J.-P. S from information data provided by NASA/JPL.

The « Curiosity » Rover is a car-sized robotic rover exploring Gale Crater on Mars as part of NASA's Mars Science Laboratory (MSL) mission. It was launched from Kennedy Space Center (Cape Canaveral) on 26 November 2011 at 15:02 UTC aboard the MSL spacecraft and successfully landed on Aeolis Palus in Gale Crater on 6 August 2012 at 05:17 UTC. The "Bradbury" (name given in honour to science fiction author Ray Bradbury) Landing Site was less than 2.4 km from the centre of the rover's touchdown target after a 563,000,000 km journey: a remarkable technological exploit! (Figures 1, 2 and 3)

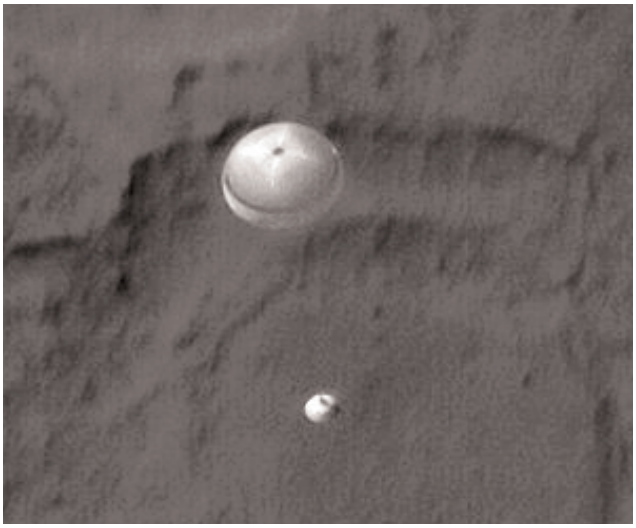


Figure 1 Curiosity rover descending under its parachute, as imaged by the High Resolution Imaging Science Experiment (HiRISE) of the Mars Reconnaissance Orbiter (MRO), 6 August 2012 at 05:17 UTC.

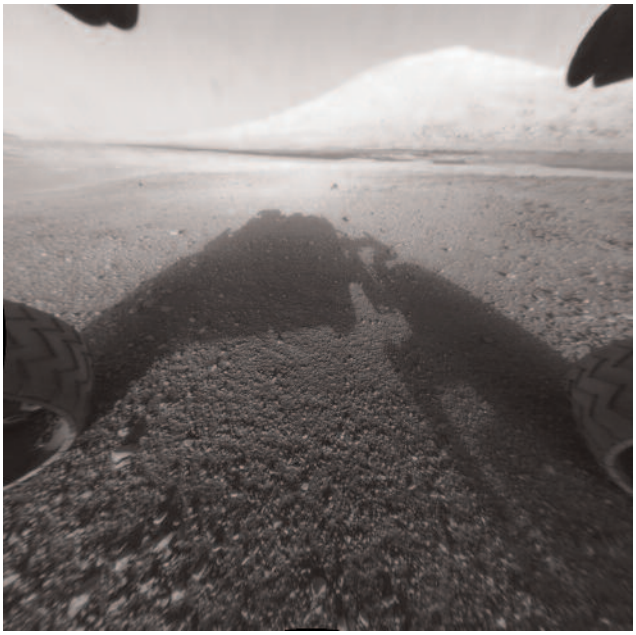


Figure 2 Curiosity rover landed on 6 August 2012 near the base of Aeolis Mons ("Mount Sharp").

THE ROVER's GOALS

As established by the NASA Mars Exploration Programme, the rover's goals essentially include: (i) investigation of the Martian climate and geology; (ii) whether Mars ever supported life, including investigation of the role of water; (iii) planetary habitability studies in preparation for future human exploration.

ROVER's FACT SHEET

- Operator: NASA, International team.
- Major contractors: Boeing, Lockheed Martin, MacDonald Dettwiler.
- Launch vehicle: Atlas V 541.
- Mission duration: 23 Earth months primary mission.
- Mass: 900 kg, i.e. 23% of the 3,893 kg Mars Science Laboratory Spacecraft, which had the sole mission of delivering the rover safely across space from Earth to a soft landing on the surface of Mars; the 900 kg include 80 kg of scientific instruments.
- Dimensions: 2.9 m long; 2.7 m wide; 2.2 m high (Figure 4).
- Power source: Radioisotope Thermoelectric Generator (RTG).
- Two onboard computers.
- Communications: Curiosity transmits to Earth directly or via 3 satellites in Mars orbit.
- Mobility: provided by six (6) 50 cm diameter wheels in a rocker-bogie suspension thanks to which it will be possible to roll over obstacles approaching 65 cm. Curiosity is expected to traverse a minimum of 19 km during its primary two-year mission; it can travel up to 90 m per hour but average speed is about 30 m/h.

- Instruments (Figure 5): 17 cameras (8 HazCams for hazard avoidance, 4 NavCams for navigation, 2 MastCams for multiple spectra and true-colour imaging, 1 Mars Hand Lens Imager – MAHLI - on the robotic arm, 1 Mars Descent imager – MARDI - and 1 Chemestry and Camera Complex – ChemCam - for chemistry); the Rover Environmental Monitoring System (REMS); the Alpha Particle X-ray spectrometer (APXS); the Sample Analysis at Mars (SAM); the radiation Assessment Detector (RAD); the Dynamic Albedo of Neutrons (DAN); the Robotic Arm (2.1 m long, 350° turning range).

THE ENTRY, DESCENT AND LANDING

The entry, descent and landing (EDL) phase began when the spacecraft reached the martian atmosphere, approximately 125 km above the surface, and ended with the rover safe and sound on the surface of Mars at 05:35 UTC on 6 August. Basically the EDL comprised four phases:

- Guided entry: the spacecraft was controlled by small rockets during descent through the atmosphere;

Figure 3 Curiosity rover's first 360° colour panorama image, 8 August 2012.

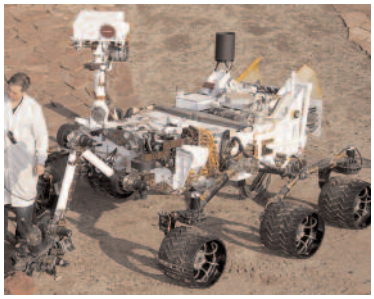


Figure 4 A view of the Mars Curiosity rover.

- Parachute descent: the spacecraft was slowed by a large parachute;
- Powered descent: rockets controlled the descent until the rover separated from its final delivery system, the sky crane;
- Sky crane: like a large crane Earth on Earth, the sky crane system lowered the rover to a "soft landing".

ABOUT THE LANDING SITE

Gale crater (Figure 7) is estimated 2 billion-year old impact crater, so it is believed that Curiosity may have the opportunity to study 2 billion years of Martian history in the sediments exposed in the mountain. Besides the landing site might be on or near an alluvial fan which is hypothesized to be the result of ground water.

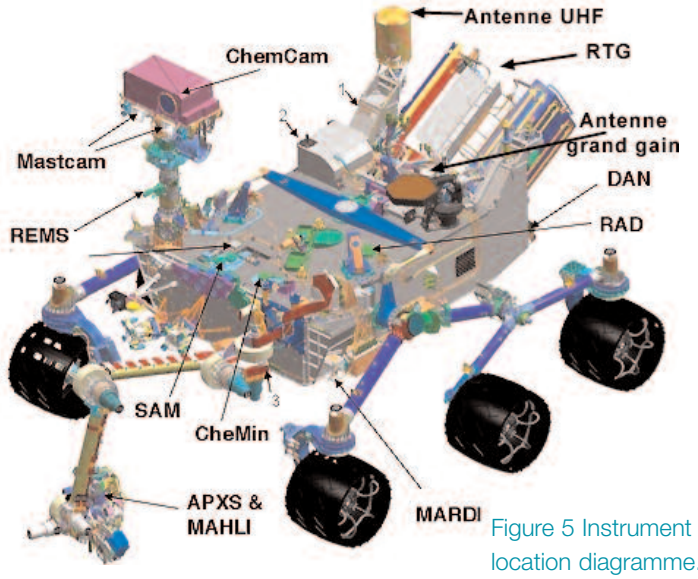


Figure 5 Instrument location diagramme.

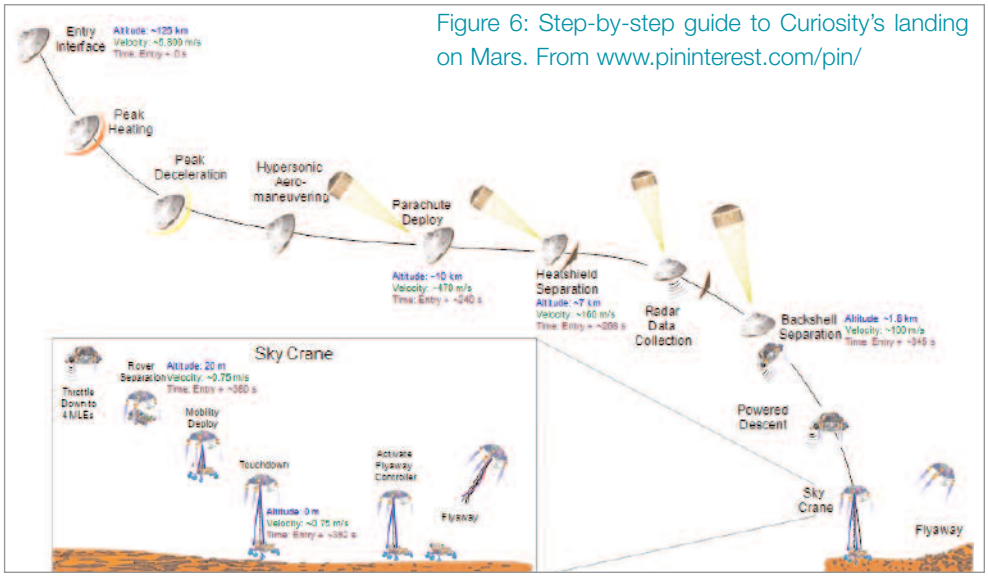


Figure 6: Step-by-step guide to Curiosity's landing on Mars. From www.pininterest.com/pin/

NASA Administrator Charles Bolden declared: "Curiosity, the most sophisticated rover ever built, is now on the surface of the Red Planet, where it will seek to answer age-old questions about whether life ever existed on Mars ... or if the planet can support life in the future."

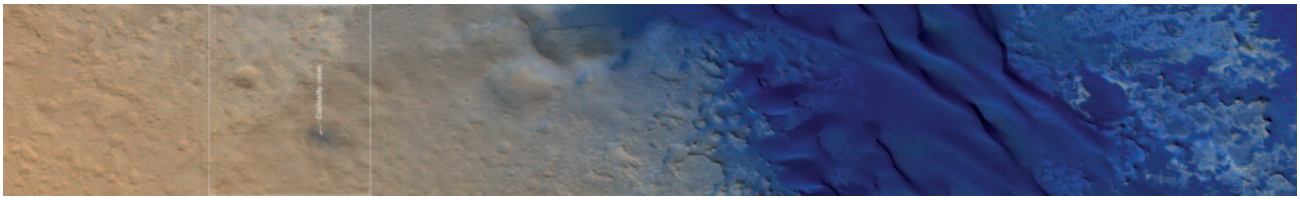


Figure 7 Curiosity rover and surrounding area viewed by HiRISE (MRO) on 14 August 2012. North is left.

SPOT 6 : A NEW PERSPECTIVE FOR EARTH OBSERVATION

Launched with success on 9 September 2012 by an Indian rocket PSLV, the SPOT 6 satellite observes the Earth with a resolution of 1.5 m. It is flying through the Earth's poles at an altitude of 694 km. It marks the continuation of the family of remote sensing satellites French civil Earth observation developed by the French Space Agency (CNES): 1st generation with SPOT 1,2,3 (respectively launched in 1986, 1990 and 1993), 2nd generation SPOT 4 (launched in 1998) and 3rd generation SPOT 5 (launched in 2002). SPOT 6 represent a new evolution with 1.5 m resolution to be compared with the 2.5 m of SPOT 5.

A SUCCESSFUL LAUNCH

India, Satish Dhawan Space Centre, a PSLV (Polar Satellite Launch Vehicle) launcher lift-off on 9 September at 09:53 local time with the mission to place three satellites in polar orbit: a Japanese one, an Indian experiment and SPOT 6, 720 kg weigh.

SPOT 6 IN A FEW WORDS

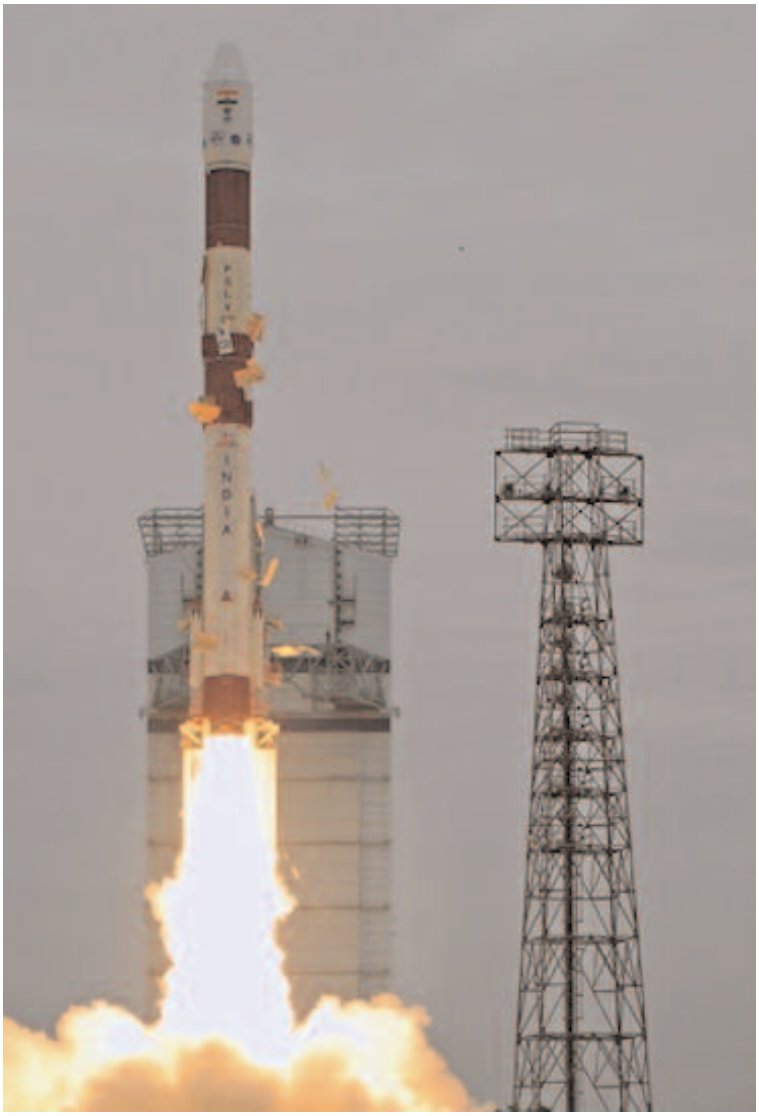
- Satellite developed by EADS/Astrium.
- Mass: 720 kg, to be compared with the 1 ton of SPOT 5.
- SPOT 6 is designed to operate during 10 years.
- SPOT 6 will work with Pleiades 1A satellite of CNES launched with a Soyuz at Guiana Space Centre in December 2011 and following the same orbit at 694 km altitude.
- There will be complementary observations between SPOT 6 – 1.5 m resolution to 60 km wide – and Pleiades 1 A – 0.5 m resolution to 20 km wide -.
- Five spectral bands covering the visible domain and the near infrared (760-890 microns).
- Agility: the satellite does not just look right under itself; it can move to perform shots with angles up to 45° from its normal line of sight.
- Multiple applications.
- A high number of customers: many States, Non-Governmental Organisations, private companies, etc.

AND VERY SOON SPOT 7

The following satellite of the family is SPOT 7, planned for early 2014. In fact SPOT 6 and SPOT 7, together with Pleiades 1A and Pleiades 1B, will form a constellation of Earth Observation, designed to ensure the continued availability of high-resolution data and wide field until 2023. The realization of this constellation was decided in 2009 by EADS/Astrium. SPOT Image, a subsidiary of Astrium brings the total investment and owns the whole system: the satellites and the ground segment comprising 43 receiving stations on five continents.

■

From www.enjoyspace.com/



India, Satish Dhawan Space Centre: PSLV launcher lifts-off on 9 September 2012, 9:53 local time, with onboard the SPOT 6 satellite. PSLV is a 4-stage launcher developed by India for placing devices on a polar orbit.
Credit: ISRO

MISSION ACCOMPLISHED FOR ATV EDOARDO AMALDI

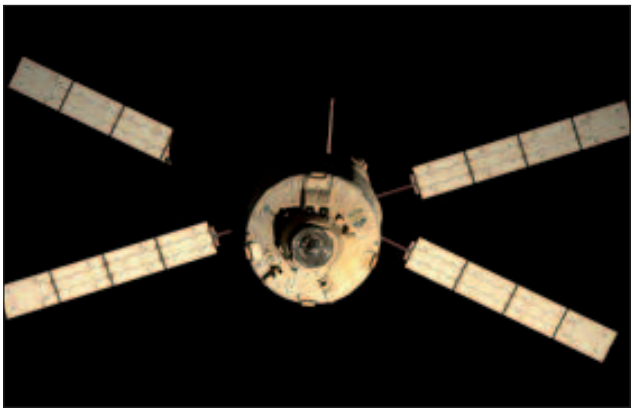
ESA's third ATV (Automated Transfer Vehicle) cargo ferry "Edoardo Amaldi" completed on 3 October 2012 the final part of its highly successful six-month servicing mission to the International Space Station (ISS) by reentering the atmosphere and burning up as planned over an uninhabited area of the southern Pacific ocean. ATV-3 was lofted to orbit on 23 March 2012 by an Ariane 5 launcher and docked with the ISS five days later.

ATVs perform all manoeuvres, including docking autonomously, under close surveillance the Toulouse (France) Control Centre.
So far, ATVs and Russian vehicles Progress and Soyuz are the only vehicles to dock with the ISS automously, with built-in redundancy.
While docked, the ATV-3 performed 9 reboosts to keep the ISS in orbit, countering the effects of the atmospheric drag. On 22 August, ATV-3's 8th reboost lasted for 40 minutes, i.e. about half an orbit, and raised the ISS to new heights: 405 x 427 km above Earth.
During the 6 months that ATV-3 spent at the ISS, it provided 48 m^3 of extra space for the astronauts. Before its departure, the crew loaded its pressurized module with waste material. The European ferry undocked on 28 September and after a free flight, it manoeuvred into a safe reentry trajectory. Edoardo Amaldi and its waste burnt up in the upper atmosphere at 01:30 GMT.

NEXT ATVs

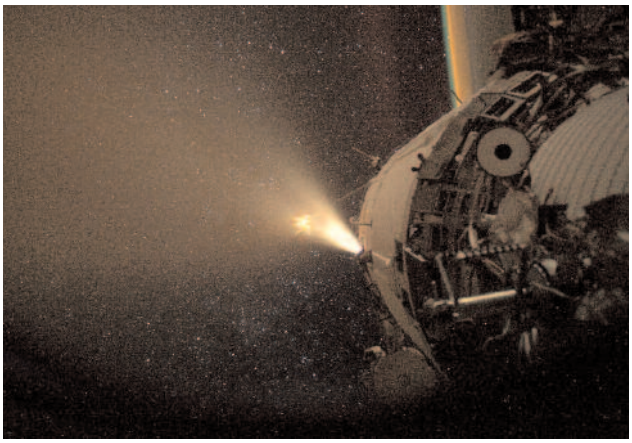
- ATV-4 Albert Einstein is scheduled to be launched in April 2013.
- ATV-5 Georges Lemaître is scheduled to be launched in April 2014.

SOME ILLUSTRATIONS



ESA's Automated Transfer Vehicle Edoardo Amaldi leaving the International Space Station after delivering 6596 kg of fuel, air, oxygen, scientific equipment, spare parts and crew supplies.The two spacecraft undocked at 23:43 CEST (01:43 GMT) on 28 September 2012.
Credits: NASA

ESA astronaut André Kuipers unloading priority cargo from ATV-3. ATV Edoardo Amaldi docked with the Interntional Space Station on 29 March 2012 during André's six-month PromISSe mission. The cargo ship delivered 6596 kg of fuel, air, oxygen, scientific equipment, spare parts and crew supplies. André was loadmaster for ATV-3. Credits: ESA/NASA



ATV Edoardo Amaldi and the International Space Station firing their thrusters to boost the orbital outpost's orbit.
This shot was captured by ESA astronaut André Kuipers during his PromISSe mission. Credits: ESA/NASA

ATV Albert Einstein arriving by boat at Europe's Spaceport, in Kourou, French Guiana on 19 September 2012.
It is scheduled for launch to the International Space Station in April 2013.
Credits: ESA/CNES/Arianespace/Optique Video du CSG

ESA's third Automated Transfer Vehicle Edoardo Amaldi and the International Space Station orbiting Earth. This picture was taken in Chibo, Japan on 2 October 2012 at around 4:30 JST (23:00 GMT) and shows the orbits of both the International Space Station (brighter dotted line) and ATV-3. Edoardo Amaldi undocked from the Space Station on 28 September and completed the final part of its six-month servicing mission to the Station by reentering the atmosphere on 3 October and burning up as planned over an uninhabited area of the southern Pacific ocean.
Credits: Yujiro Suzuki

DEPLOYMENT OF GALILEO CONSTELLATION CONTINUES

On 12 October 2012, the third and fourth satellites of Galileo were lofted into orbit from Guiana Space Centre. They join the first pair of satellites launched last year to complete the In-Orbit Validation (IOV) phase of the programme.

THE LAUNCH

The Soyuz ST-B launcher, operated by Arianespace, lifted-off on 12 October at 18:15 GMT from CSG.
All the stages of Soyuz performed as planned and the Fregat-MT upper stage released the two satellites into their targeted orbit at close to 23,200 km altitude, 3 hours 45 minutes after liftoff.
The satellites are built by a consortium led by EADS/Astrium as prime contractor, with Thales Alenia Space for assembly, integration and testing.
The operations are managed by SpaceOpal, a joint company of the DLR (German Aerospace Centre) and Italy's Telespazio, the early operations of the satellites being controlled by a joint ESA-CNES team in Toulouse.
After initial tests, they will be handed over to the Galileo Control Centres in Oberpfaffenhofen (Germany) and Fucino (Italy) for testing before they are commissioned for the Service Validation Phase.

FROM IOV TO FOC

With 4 identical satellites in orbit (which are the same as the forthcoming operational satellites), ESA can now complete the testing phase and demonstrate the performance of the Galileo positioning system fully before the deployment of the remaining operational satellites:

- By late 2014, 18 satellites are scheduled to have been launched, by which time early services to Europeans can begin;
- In 2018 Galileo's Full Operational Capability (FOC) will be reached with 30 satellites (including the present 4 IOV satellites which constitute the nucleus of the constellation).

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FOURTH QUARTER 2012

01-05 October	• **IAF** – 63rd International Astronautical Congress- IAC2012 Nostra D'oltremare Convention Center- Naples, Italy – www.iac2012.org
09-11 October	• **RAeS** – 3rd Aircraft Structural design Conference – Delft University (NL) – www.aerosociety.com/Events
10-11 October	• **EASA** – Safety Oversight: Managing Safety in a Performance-based Regulatory Environment – EASA Cologne (Germany) – www.easa.europa/events/events.php
10-12 October	• **3AF** – 11th European Forum Strategic and Economic Intelligence – From urgency to anticipation: the challenges of Economic Intelligence – Lille (France) - secr.exec@aaaf.asso.fr - sophie.videment@aaaf.asso.fr – www.ies2012.com
11-12 October	• **ASD** – Annual ASD Convention and Technology Forum – Lisbon (Portugal) – www.asd-europe.org
11-12 October	• **INCAS, ISMMA** – Conference "Aerospatial 2012" – INCAS, n° 220, Luliu Maniu Blvd, District 6, Bucharest (Romania) – www.incas.ro – www.aerospatial-2012.incas.ro
14-18 October	• **AIAA** – 2012 AIAA/IEEE Digital Avionics System Conference – Williamburg, VA (USA) www.dasconline.com/
16 October	• **RAeS** – Greener by Design Annual Conference – RAeS/HQ – London (England) – www.aerosociety.com/Events
23-25 October	• **FSF** – International Air Safety Seminar 2012 – Santiago (Chile) – www.flightsafety.org/
24-25 October	• **RAeS** – Greener by Design Annual Conference – RAeS/HQ – London (England) www.aerosociety.com/Events
29 October-02 nov.	• **CANSO** – Global ATM Safety Conference – Cape Town (South Africa) www.canso.org/safetyconference2012
30 October	• **RAeS** – Conference on Airworthiness, Innovation, Regulation and the Aircraft Engineer – RAeS/HQ London (UK) – www.aerosociety.com/Events
30 October-1st November	• **SAE International** – SAE 2012 Aerospace Electronics and Avionics Systems Conference – Phoenix, Arizona (USA) – www.sae.org/events/aerospace/
31 October-02 Nov.	• **EASN/VZLU** – General Assembly EASN and 2nd Flight Physics and Propulsion Workshop – Prague (Czech Republic) - Barcelo Praha Hotel – www.EASN.net
06-08 November	• **– IATA** – Aviation Fuel Forum – Bangkok (Thailand) – www.iata.org/events/
06-08 November	• **Heli Show Dubai 2012** – Dubai (UAE) – Dubai Airport – www.milavia.net/airshows/calendar
07 November	• Europe's Securities Priorities – **CEIS – SECDEF'11** – Brussels (Belgium) – Crowne Plaza Europa – www.securitydefenceagenda.org
08-09 November	• **CSDP** – 10th 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
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

13-16 November • **ESA** – Earth Observation and Cryosphere Science Symposium – ESA/ESRIN – Frascati (Italy) – www.esa.int/esaCP/index_Calendar.html

13-18 November • **Air Show China 2012** – Zhihai, Guangdong (China) – www.milavia.net/airshows/calendar/

19-30 November • **ICAO** – 12th Air Navigation Conference – ICAO – Montréal (Canada) – www.icao.int

20-21 November • **3AF-SEE** – Conference "More electrical Aircraft (MEA 2012) – Bordeaux (France) sophie.videment@aaaf.asso.fr – www.mea2012.eu/

21 November • **RAeS** – Progress Towards Open Rotor propulsion Technology Conference – London (UK) – RAeS/HQ – www.aerosociety.com/Events/

26-27 November • **SEE, Aerospace Valley** – Towards Even More Electrical Aircraft – Bordeaux (France) – www.aerospace-valley.com

27-28 November • **Behördern Spiegel** – Berlin Security Conference (BSC): 11th congress on European Security and Defence – Berlin (Germany) – Andel's Hotel & Convention Center – www.euro-defence.eu

28-29 November • **RAeS** – Flight Simulation Research Conference – RAeS/HQ – London (England) – www.aerosociety.com/Events

11-13 December • **Middle East Business Aviation** – MEBA 2012 – Dubai (UAE) – www.milavia.net/airshows/calendar

YEAR 2013

07-10 January • **AIAA** – 51st AIAA Aerospace Sciences Meeting – Grapevine (Dallas/Ft. Worth Region), Texas – www.aiaa.org/

12-14 February • **World ATM** – World ATM Congress 2013 – Madrid (Spain) – IFEMA Feria de Madrid – www.sesarju.eu/news-press/events

12-14 February • **ATC Network** - ATC Global 2013 Exhibition and Conference – Amsterdam RAI – Amsterdam (NL) – www.atcglobalhub.com/ev... hazel.miller@ubm.com

26 February – 3 March • **Australian International Air Show "Aviation 2013"** – Aviation Airport Geelong, Victoria (Australia) – www.milavia.net/airshows/calendar/

19-20 March • **RAeS –** 2nd Aircraft Commander in the 21st Century Conference – London (UK) – RAeS/HQ www.aerosociety.com/Events/

19-21 March • **Asian Aerospace 2013** – Asia World Expo – Hong Kong (China) – www.milavia.net/airshows/calendar/

21 March • **RAeS –** Conference: Optimising Airport Capacity – London (UK) – RAeS/HQ – www.aeosociety.com/Events/

25-28 March • **AIAA** – 22nd AIAA Aerodynamic Decelerator Systems (ADS) Technology Conference including AIAA Balloon Systems and Lighter-Than-The-Air Systems Technology Conferences – www.aiaa.org/events/

10-12 April • **CEAS –** CEAS EuroGNC 2013 Conference on Guidance, Navigation and Control (GNC) –Delft (NL) – delft University of Technology – www.lr.tudelft.nl/EuroGNC2013 EuroGNC2013@tudelft.nl

24-27 April • **Air Show -Aero Friedrichshafen** – Friedrichshafen (Germany) – www.milavia.net/airshows/calendar

14-16 May • **EBAA/NBAA** – Annual European Business Aviation Convention & Exhibition 2013 – Genève (Switzerland) – Palexpo – www.eventseye.com/fairs/f-ebace

27-29 May • **AIAA/CEAS** – 19th AIAA/CEAS Aeroacoustics Conference – International Forum for the field of Aeroacoustics – Berlin (Germany) – www.aeroacoustics2013.dglr.de

27-29 May • **Russia** – 20th St Petersburg International Conference on Integrated Navigation Systems – St Petersburg (Russia) – www.elektropribor.spb.ru

08-10 June • **ACI Europe/ACI world** – Airport Exchange: Annual Congress and Exhibition 2013 – Istanbul (Turkey) – Istanbul Congress Centre – www.aci-europe-events.com/

9-13 June • **ESA** – 21th ESA Symposium on European rockets and Balloon Programme – thun (Switzerland) – www.congrexprojects.com/list-of-events

12-13 June • **RAeS** – Mission Training and Flight Simulation Conference – London (UK) – RAeS/HQ – www.aerosociety.com/Events/

17-23 June • **GIFAS** – 50th International Paris Air Show 2013 – Le Bourget – www.paris-air-show.com

24-27 June • **RAeS/CEAS/AIAA** – International Forum of Aeroelasticity & Structural Dynamics 2013 – Bristol (UK) – www.aerosociety.com/Events/

12-14 August • **AIAA – AIAA AVIATION 2013 FORUM** – Los Angeles, CAL – Hyatt Regency Hotel – www.aiaa.org/events/

19-22 August • **AIAA** – AIAA GN&C Conference – Boston, Massachusetts – www.aiaa.org/events/

16-20 September • **CEAS/FTF** – **4th CEAS European Air & Space Conference – Linköping (Sweden)**

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Welcome to CEAS2013, 'Innovative Europe'

The CEAS European Air & Space Conference 2013 will take place in Linköping (Sweden), from 16 to 20 September 2013. Linköping is considered the aeronautics capital of Sweden, home of most important Swedish aviation industry and birthplace of Swedish aviation. This event will constitute a forum aimed at exchanging information in the wide field of aerospace, and also a unique forum and meeting place for socializing and networking among colleagues and friends from aerospace industry, institutions, academia and associations.

CEAS2013 will be a joint event between the fourth CEAS Conference (after Berlin 2007, Manchester 2009 and Venice 2011) and the eight Congress on aeronautics and astronautics arranged each third year by Flygtekniska Föreningen (FTF), the Swedish Society of Aeronautics and Astronautics. Organised by the FTF and Linköping University, it will address all disciplines of aeronautics and aeronautical systems, including design, development and operations.

Welcome to Linköping and CEAS2013!

23-27 September • **IAF** – 64th International Aeronautical Congress – Beijing (China) – www.iafastro.com/

24-26 September • **SAE International** – SAE 2013 Aero Tech Congress & Exhibition – Montréal (Canada) – Palais des Congrès – www.sae.org/events/atc/

22-27 October • **South Korea** – Seoul International Aerospace & Defence Exhibition 2013 – Seoul Airport – www.milavia.net/airshows/

11-15 November • **COSPAR** – 1st COSPAR Symposium – Bangkok (Thailand) – Central Plaza Ladprao www.cospar2013.gistda.or.th/

17-21 November • **UAE** – Dubai Airshow 2013 – Dubai (UAE) - Airport Expo – www.milavia.net.airshows/calendar/