The Quarterly Bulletin of the
CEAS COUNCIL OF EUROPEAN AEROSPACE SOCIETIES
AAAF – AIAE – AIDAA – DGLR – FTF – NVvL – RAeS – SVFW
GENERAL • THE AERONAUTICS BRANCH • THE SPACE BRANCH
Issue 2 • June 2007

Editorial

Jean-Michel Contant

The organization started 19 years ago in Garmish-Partenkirshen between the British, French and German societies as informal periodical meetings. It evolved as a Confederation at Farnborough in 1992. Today, CEAS has abandoned its confederation status to become a strong pan-European society. The early years of CEAS are now achieved and I am proud to have been the originator of this adventure.

The new society gathering European national aerospace societies is also comprised of Branches whose membership is open to any individual member from the constituent societies wishing to join CEAS on an individual basis. The Branches will have their own entity, with a series of technical committees (29 as of today) that represent nearly 800 aerospace experts, but also a Branch newsletter and several other professional services. New publications are under preparation in the space area and announcements will be out soon. The first CEAS Air & Space conference entitled *Century Perspective* is going to be held in the prestigious city of Berlin on September 10-13. With more than 500 papers in aeronautics and space it appears to be a promising aerospace event in Europe. There is now a mutual recognition of the national fellowship programmes within Europe and the establishment of a European Fellowship programme is under discussion that should lead to a European roster of career achievements and aerospace experts.

This newly reshaped CEAS is most welcomed all over the world from aerospace industry, agencies to non-European societies. Our American colleagues of the American Institute of Aeronautics and Aeronautics have agreed on signing a memorandum of understanding with the CEAS to provide a framework for boosting transatlantic cooperation. The same interest has been received from Russia, India and China with cooperative initiatives under consideration. In the meantime CEAS is opening the door to new member society adhesions in a process to gradually enlarge CEAS in Europe that should reach over 40,000 members. This will make CEAS the largest aerospace society in the world. No doubt that each constituent society will benefit from this European dimension and from the space and aeronautics duality that most organizations do not have yet. This significant step in Europe will also constitute a strong appeal to new individual members enlarging national society memberships and to young generations that are most welcome in this new venture.

Dr Jean-Michel Contant
Vice-President, External Relations and Publications

CONTENTS

GENERAL
- Editorial P.1
- The 2nd CEAS Trustee Board Meeting P.2
- The head of PCC P.3
- CEAS Awards P.4

AERONAUTICS BRANCH
- FP7: new opportunities in Aeronautics P.5
- The EDA P.7
- LE-UAV Datalink Study New P.7

SPACE BRANCH
- PRORA-USV P.9
- COROT P.10
- Met-Op-A P.12

THE 2ND CEAS TRUSTEE BOARD MEETING

The 2nd CEAS Trustee board meeting took place in Noordwijk (NL), at ESA/ESTEC, on 7 March 2007.

Welcome

The President Sir Colin TERRY opened the meeting, welcoming all board members, thanking the host, Dr Stavrinidis for organizing the meeting and for the nice dinner, all enjoyed the evening before.

Participants

Sir Colin TERRY	CEAS President
Jean-Michel CONTANT	CEAS Vice President External Relations and publications ; AAAF Trustee
Dr Ulf OLSSON	CEAS Vice President, Awards and membership ; FTF Trustee
Dr C. STAVRINIDIS	Head of Space Branch
Dr Dieter SCHMITT	CEAS Director
Andrew LITTLE	RAeS Trustee
Dr Christophe HERMANS	NVvL Trustee
Pieter KLUIT	NVvL Trustee
Gérard FOUILLOUX	Head of PCC
Dr Joachim SZODRUCH	DGLR Trustee
Peter BRANDT	DGLR Trustee
Dr Wilhelm KORDULLA	ESA/ESTEC

Apologies for absence have been received from:

Alain GARCIA	Head of Aeronautics Branch
Mario PELLEREI	AIDAA Trustee
Michel SCHELLER	AAAF Trustee
Julián SIMÓN CALERO	CEAS Vice President, Finance; AIAE Trustee

About the Technical Committees (TCs)

General information

- Dr Dieter Schmitt had circulated before the meeting the proposed TC structure. Some members proposed to slightly revise some names in order to improve the understanding. It was also asked to have a short definition of the scope of each TC. Mr Andrew LITTLE volunteered to propose this definition of scope, following the RAeS experience.
- Two new Committees have been added : Rotorcraft and UAV.
- Anyway, the TC structure will be held flexible and when needs arise, new TCs can be created.
- Each Society should now propose their national experts to the Head of Branches, in order to nominate the chairmen and start operation of these Committees, which will really constitute the hard core of the CEAS.

The Aeronautics Branch

Dr Dieter SCHMITT reported that Alain GARCIA, Head of Aeronautics Branch, has made in an upfront meeting a proposal for the structure of the Technical Committees (TCs) and has also endorsed the Terms of Reference (ToR) for his Branch.

The Space Branch

Dr Constantinos STAVRINIDIS reported that for most of the Space Branch TCs, the members and Chairmen have been appointed. Only three TCs have still to be completed.
He also stated that CEAS should use the existing Quarterly Bulletin and magazines to announce and foster the CEAS label and report on CEAS activities.

Remark

Concerning the Terms of Reference (ToR), it is evident that after first experiences of real operation, there will always be room and time to adapt them as required.

CEAS TECHNICAL COMMITTEES STRUCTURE

Decided by CEAS Council on 7 March 2007

AERONAUTICS	GENERAL	SPACE
Aeroacoustics	Air + Space Law	Mission design + Space systems
Air Transport system	Aerospace Medicine	Aerothermodynamics
Avionics (GNC)	History	ECLS
Flight Physics/Aerodyn.	MultiDiscipl Optimiz.	Guid.-Nav-Control
Onboard Energy	Systems Engineering	Mechanisms
Passenger Systems	Environment	Propulsion
Propulsion	Education	Power
Structures & Materials		Robotics
Systems		Structures
Vehicle Design		Thermal
Rotorcraft		
UAV		

About the financial status.

Dr Dieter SCHMITT had circulated a first financial status, showing a big difference between the expected revenues and the expenses to setup a minimum secretarial office. A lengthy discussion followed, where several options proposed to reduce the expenses and raise the revenues.

Jean-Michel CONTANT proposed to have a look at a mid-term view and the following preliminary agreements have been expressed:

(i) The Society which is holding the presidency will also provide the necessary secretariat support for CEAS, till financial situation is more stable.

(ii) The revenue situation should be improved by asking for a specific levy fee for all sponsored CEAS conferences.

(iii) DGLR will check, whether for the 1st CEAS Conference in Berlin, an additional CEAS fee could still be raised, keeping in mind the attractiveness of fees and the risk for DGLR.

(iv) All Societies will do a maximum to give a kind support for CEAS as much as possible in order to facilitate the start of operations.

(v) A CEAS office in Brussels and specific commitment for CEAS secretarial support will be postponed to 2008.

(vi) Additional revenues can be generated from the proposed 2008 CEAS conference in Brussels, the organisation of which will be conducted by the AAAF.

(vii) Dieter SCHMITT will prepare a proposal for the 1st call in FP7, where there are possibilities for supporting means. Andrew LITTLE, Peter BRANDT and Jean-Michel CONTANT will give support as requested for the next 2 months, to finalize the proposal.

New membership recruitment

Ulf OLSON reported that societies in **Finland**, **Greece** and **Poland** had expressed their interest to join the Council. It was decided that Dr OLSSON should invite them to present themselves at the next meeting in Paris on the 20th of June.

Dieter SCHMITT
Jean-Pierre SANFOURCHE

Gérard FOUILLOUX, THE HEAD OF PCC

Gérard Fouilloux (68) is Graduate from the Ecole Nationale Supérieure des Mines de Paris.

His professional cursus, in brief

- **Since february 2003**

JHL Conseil, Brussels and Paris. Company manager (gérant) and partner responsible for R&D and the aerospace/defence sector.

- **From 1990 to 2002**

Director of European affairs for the SNECMA group, Brussels.
– Creation of the European office in 1990.
– Responsible for all issues related to the EU and NATO, including relations with national Governments. Focus on:
– competition, with direct report to the CEO and supervision of the in-house and external counsel work done in this field;
– financing issues, in particular successive framework EU R&D programmes (from 3rd to 6th), TACIS, ECIP;
– Chair of the AECMA (now ASD) environment committee;
– Sherpa of the Star21 chairman, Mr BÉCHAT (SNECMA's CEO);
– Founding member of EDIG (European Defence Industries Group);
– Member of numerous organisations active in Brussels.

- **From 1964 to 1989**

– Manegerial positions in different companies: Retal, Sopelem, SAMM, Messier Hispano-Bugatti.

Other activities

- Honorary professor for European affairs at the Ecole Nationale Supérieure des Mines de Paris.
- Lecturer on EU affairs in numerous universities.

THE CEAS AWARDS

The CEAS Council has decided that the Award for 2007 will be presented to Professor David SOUTHWOOD. Professor SOUTHWOOD joined Imperial College in London in 1971 and eventually became head of its Blackett Laboratory. From 1997 to 2000, he was head of Earth Observation strategy at ESA where he introduced a new programme in Earth science, "The Living Planet". He has been the Director of Science at the European Space Agency since 2001, where he manages Europe's programme of scientific exploration of the solar system and beyond. He has been chairman of many space science committees in Europe and at ESA, including the Science Programme Committee (SPC) and the Space Science Advisory Committee (SSAC). He has more than 200 publications and scientific articles in solar terrestrial and planetary physics. The medal will be presented to Prof Southwood at the 1st CEAS Conference in Berlin in September this year.

The Council has also decided that the Award for 2008 will be given to Mr Jean-Paul BÉCHAT, Chairman and CEO of Snecma, for a life time of outstanding contributions to the aerospace industry. Mr Bechat joined Snecma in 1965 and has spent his entire career with the group, except for 1994-95, when he was chairman and CEO of SNPE, the French company making gun powder and rocket solid propellants. After taking over as chairman of Snecma in 1996, he multiplied the groups sales amply confirming his qualities as a visionary industrial leader. From 1997 to 2001, he was President of GIFAS, the Society of French Aerospace Companies and from 2001 to 2002 of AECMA, the European Association of Aerospace Industries (now ASD). In this position he oversaw the publication of the landmark Star 21 report about the future of the European aerospace industry.

The CEAS Technical Awards

The CEAS Council has approved the recommendation by the CEAS Aeroacoustics Specialist Committee to give the CEAS Technical Award for 2007 to Professor Ann DOWLING, Cambridge and Dr Dominique COLLIN, Snecma. Ann DOWLING is Professor of Mechanical Engineering at the University of Cambridge. She has led the Cambridge-MIT Silent Aircraft Initiative and chairs the Rolls-Royce Propulsion Systems Advisory Board. Dominique COLLIN has been the driving force behind the joint European research strategy in aeroacoustics leading to the EC Thematic Networks X-NOISE and X2-NOISE and the Technology Platform SILENCER. The Awards were presented at the AIAA-CEAS Aeroacoustics Conference in Rome 21-23 May 2007.

ULF OLSSON
VP, Awards & Membership

Among the Main Coming Events

- **10-13 Sept. 2007, BERLIN, Germany, Estrel Hotel**
  First CEAS European Air & Space Congress
  www.CEAS2007.org
- 10th European Conference on Spacecraft Structures Materials & Mechnical Testing: 10–13 Sept. 2007, Berlin, in connection with the CEAS Congress.
- International Carbon Conference in Aerospace Valley – Solutions for high demanding applications, 17–19 Sept. 2007, Arcachon, France
- Space Propulsion 2008: 5th Int. Spacecraft Propulsion Conference, 2nd Int. Symposium on Propulsion for Space Transportation, 5–9 May 2008, Heraklion, Crete, Greece (www.propulsion2008.com)

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FRAMEWORK PROGRAMME 7: NEW OPPORTUNITIES IN AERONAUTICS

The Lisbon Strategy

The 7th Framework Programme commenced at the beginning of 2007 and will last for 7 years. This new programme is fully in line with the Lisbon strategy initiated in March 2000 and seeks to build the Europe of Knowledge. Compared to Framework Programme 6, there will be an average overall increase of 60% of the funds available each year for Research and Technology Development. The European Union aims to provide a major incentive to all the stakeholders involved in research and development to act in the same direction in the view to reach the goal of 3% of GDP spent in Research and Development in the European Research Area.

In order to be more efficient, the tools for Collaborative Research in Framework Programme 7 have been made simpler and more rational than their predecessors. A large amount of work was also invested in the simplification of the financial rules and of project reporting. In addition, a major new impetus will be given by the introduction of a large scale Joint Technology Initiative: Clean Sky.

Collaborative Research

Regarding Collaborative Research, the work programme is inspired from reflections from all the stakeholders in the field of aeronautics and in particular the ACARE Strategic Research Agenda (Advisory Council for Aeronautics Research in Europe: http://www.acare4europe.org/). The first priority of this work programme is the 'Greening of Air Transport'. This calls for improved knowledge in flight physics, more efficient and more environmentally friendly aero structures, cleaner and quieter engines, production, maintenance and disposal techniques that respect the environment.

As a second priority 'Increasing Time Efficiency' looks, for example, for improved systems and equipment with shorter and less frequent maintenance.

"Customer Satisfaction and Safety" targets research towards a more comfortable cabin environment as well as aircraft operations and airports which take into account passenger friendliness. Improved aircraft and operational safety will result from focused research work on aero structures, systems and equipments, avionics, maintenance, airports, human factors, etc.

Research contributing to the reduction of aircraft development costs and aircraft and Air Transport System operational costs will contribute to "Improved Cost Efficiency".

A better 'Protection of Aircraft and Passengers' should also be investigated with the contribution of aero structures, equipments, avionics and airports for a more secure air transport system.

We must also prepare the long term evolution of aeronautics and this is addressed in 'Pioneering the Air Transport of the Future'. Here, innovative and breakthrough technologies for lift, propulsion, aircraft interior space, etc., are needed. Novel vehicles, guidance and control systems and new airport concepts must be envisaged and assessed.

Overall, of the order of 1 billion € will be dedicated to these risk-sharing activities over 7 years. The proposed research topics are complementary with those developed by SESAR (The Single European Sky initiative, http://www.eurocontrol.int/sesar) in the field of Air Traffic Management and Galileo (http://ec.europa.eu/dgs/energy_transport/galileo) in the field of Space. The connections with surface transport have also been considered, particularly concerning intermodality. Of course, the Collaborative Research work programme will be in full synergy with the Clean Sky Joint Technology Initiative. The first call for proposals closed on the 3rd of May 2007 with an available budget of 217 M€. The Commission prepares actively the evaluation of proposals which will be carried out by independent experts. The opening of the second call for proposals is scheduled for the end of 2007 and will be published at http://cordis.europa.eu/fp7 under "Find a call: AAT: Aeronautics and Air Transport".

Clean Sky

The second important initiative for "Aeronautics" in FP7 is the "Clean Sky", a public/private Joint Technology Initiative. With 800 M€ of European Commission funds complemented with 800 M€ from industry and research centres (i.e. a total funding of 1.6 billion €), Clean Sky will have a highly integrated approach on European aeronautics research.

Because some promising technologies can be used for large and regional airplanes as well as for helicopters, transverse platforms will serve the purpose of the three above mentioned types of vehicle.

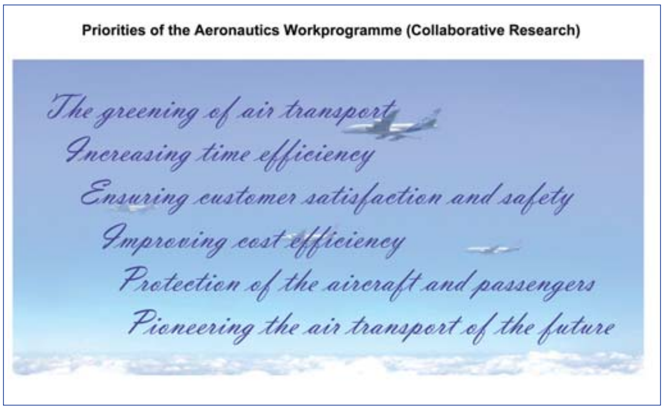
The engine transverse platform ("Sustainable and Green Engines") will select the most promising architectures and technologies in the aim of decreasing emissions, noise, and weight and satisfy the increasing demand of electrical power for the aircraft.

The second transverse platform will develop "Systems for Green Operations" revisiting systems architecture to include more electrical components, managing the power and heat onboard of the aircraft but also optimizing trajectory, mission and ground operations.

The first vehicle platform will develop a "Smart Fixed Wing Aircraft" which integrates flow and load control technologies in an active wing concept design.

The second platform, "Green Regional Aircraft" will mostly focus on low noise and low weight configurations.
The 'Green Rotorcraft' platform will also tackle noise issues and greener operations.

All these platforms will prove the appropriateness of their choices with ground or flying demonstrators. To complement, an 'Eco-Design' platform will look into material life cycle. Finally, the overall effectiveness of this initiative will be assessed by a "Technology Evaluator" operating at project level.
The stakeholders are now expecting the approval from the European Council in the second half of 2007 in the view to start activities early in 2008. More information is provided at http://www.asd-europe.org.



Building the Europe of Knowledge

With regard to the Europe of Knowledge which Framework Programme 7 aims to develop, associations such as CEAS have certainly an important role to play. Together with other initiatives, we hope that they will assist the Commission in improving the visibility of European research and in harmonizing further of the dissemination of knowledge in Europe in the field of Aeronautics.

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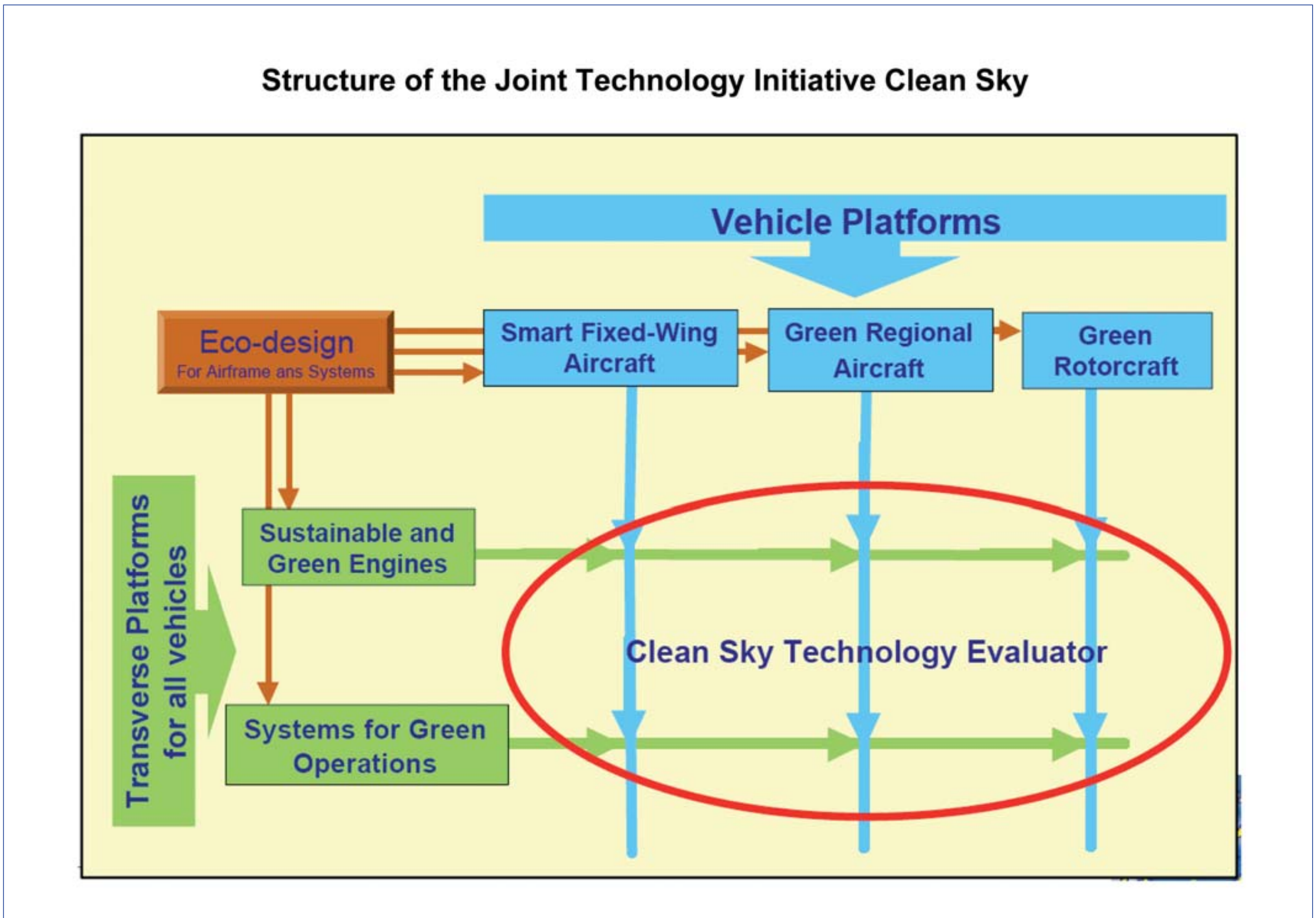

THE EUROPEAN DEFENCE AGENCY

Background

The European Defence Agency was established under a Joint Action of the Council of Ministers on 12 July, 2004, *"to support the Member States and the Council in their effort to improve European defence capabilities in the field of crisis management and to sustain the European Security and Defence Policy as it stands now and develops in the future"*.

Functions and tasks

The European Defence Agency, within the overall mission set out in the Joint Action, is ascribed four functions, covering:

- developing defence capabilities;
- promoting Defence Research and Technology (R&T);
- promoting armaments cooperation;
- creating a competitive European Defence Equipment Market and strengthening the European Defence, Technological and Industrial Base.

Structure

The EDA is an Agency of the European Union. The EU High Representative, Javier Solana, is Head of the Agency and Chairman of the Steering Board, its decision-making body composed of Defence Ministers of the 26 participating Member States (all EU Member States, except Denmark) and the European Commission. In addition, the System Steering Board meets regularly at sub-ministerial levels, such as National Armaments Directors of Capability Directors.

The Steering Board acts under the Council's Authority and within the framework of guidelines issued by the Council.

Contact details and EDA Management details

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Among the recent EDA funded studies relating to Research and Technology

- **26/03/2007** Technology Demonstration Study – LE-UAV Datalink Study New. The Study on Digital Line-of-Sight (LOS) and Beyond-Line-of-Sight (BLOS) Data Links for Long-Endurance Unmanned Aerial Vehicles (LE-UAVs) was the first EDA-funded R&T study contracted by the European Defence Agency to address one of its "flagship" priorities.

The Study scope

The main scope of the study was to define a framework architecture for digital LOS and BLOS data links to integrate the LE-UAV and its on-board subsystems with the existing and future ISTAR networks. The study was initiated in December 2005 and, after 14 months, the final results were delivered in February 2007.

During the programme, in addition to essential guidance from EDA, also participating Member States made use of the opportunity to direct the focus of the study thus ensuring the best usability of the results in ongoing and future activities.

The focus taken

The overall scope of LE-UAV operations covers a broad range of military tasks. The enclosed figure illustrates the importance of LE-UAVs in the creation of superior situational awareness in a warfare theatre. Potential military-governmental co-operation can be supported, for example through large area, sea and border surveillance. The cusses of missions conducted using LE-UAVs are extremely dependent on the availability of robust, high performance communication data links.

The Consortium identified flexibility, security and networking as the most important capabilities for the LE-UAV communications still requiring further research and development. These issues were emphasized during all the phases of the study. It was also essential to assure the aspect of multi-source procurement and European self-sustainability of the long-term solutions.

The Consortium

Consortium leader Patria and co-contractor Insta are internationally acting defence, companies with a background of over 20 years in development, production, integration and testing of tactical data links and network centric applications. The companies are also the main contributors in the "FinUVS" technology program focusing on UAV-related research and development for the Finnish Defence Forces.

The subcontrators, University of Oulu and VTT, have internationally acknowledged expertise in research and simulations related to wireless communications, waveform development, SATCOM and optical links.

Essential results of the study

LE-UAV communication architecture

A multilink framework architecture proposed by the Consortium is considered optimal for fulfilling the diverse requirements for LE-UAV communications. As depicted in the figure below, the architecture consists of several data link system types with different functions and characteristics. Consequently, these systems are able to complement each others capabilities and can be used as a back-up for each other.

Recommended solutions

The near-term solution for the LE-UAV data link system planned to enter operational use in 5 years' time must be based mainly on existing standards and solutions. Baseline capabilities are achieved by integrating available state of the art systems and technologies. However, such a near-term solution still has some performance gaps. Within a period of 10 year, the solution will most likely consist of a mixture of current and emerging technologies, standards and systems.

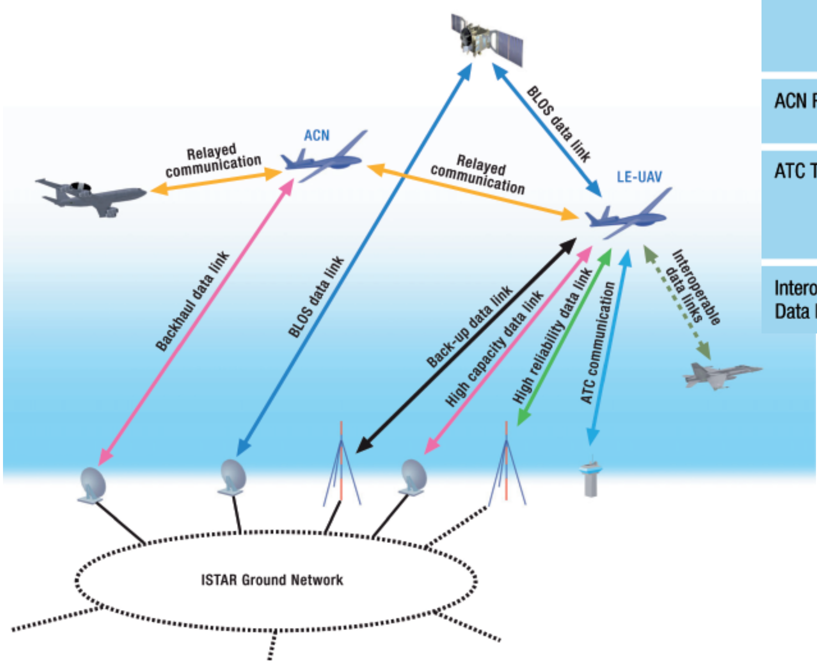
The mid-term solution will provide increased functionality and performance filling the gaps in interoperability, European self-sustainability, throughput and EW-protection. The utilization of SDR technology will provide additional flexibility and interoperability.

The long-term solution, addressing the timeframe of 20 years and further, is based on emerging technologies, standards and systems, as well as technologies still under research.

Proposed way forward

- Definition of common rules and standard interfaces for the LE-UAV multilink communication architecture
- Selection of LOS and BLOS data link technologies that will form the basis for open standardization of LE-UAV data link systems.

System type	Purpose
High Reliability Data Link (HRDL)	Primarily responsible for C2 data, status data and ATC voice transfer Moderate throughput, high availability and integrity requirements
High Capacity Data Link (HCDL)	Primarily responsible for sensor transfer High throughput requirements for the downlink
BLOS Data Link	Responsible for data exchange via a relaying platform such as a satellite, a high altitude platform (HAP) or a LE-UAV ACN
Back-up Data Link	Responsible for C2 and status data transfer in emergency situations Low throughput, very high availability and integrity requirements
Backhaul Data Link	Responsible for data exchange between a LE-UAV ACN and the ground Very high throughput requirements
ACN Relay Payload	Responsible for relaying real-time data and voice communications between different ISTAR assets
ATC Transceiver	Responsible for communication between a LE-UAV and a local ATC system (or other aircrafts) Governed by international regulations and legislation
Interoperable Data Link	May be needed to fulfil certain interoperability requirements example direct Link 16 connectivity



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CEAS
The Quarterly Bulletin of the
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THE SPACE BRANCH

NEWS FROM THE CEAS SPACE BRANCH (EUROPEAN SPACE SOCIETY, ESS)

PRORA-USV: The First Dropped Transonic Flight Test

The USV First Flight: The first Dropped Transonic Flight Test (DTFT-1) of USV (Unmanned Space Vehicles), performed with Castor, the first of the two flying laboratories developed within the USV Programme by CIRA (Italian Aerospace Research Center), was performed on 24th February 2007, from Tortolì Airport in Sardinia.

At 8:30 a.m. the 340000 cubic meters helium stratospheric balloon lifted off from the East coast of Sardinia, bringing the Flying Test Bed #1 (FTB-1) up to the altitude of 20.1 km before release within the isolated sea polygon controlled by Italian Air Force Fire Test Range in Salto di Quirra (PISQ). The mission ended at 10:30 a.m. with the splash-down of the components of the system vehicle-gondola-balloon.

The mission itself was very good, with a nose-up manoeuvre under highly unsteady transonic conditions, reaching a maximum Mach number as high as 1.07. Nominal flight conditions were achieved up to the beginning of the vehicle recovery final phase, when the opening sequence of the three-stage parachute system should have guaranteed the recovery of the FTB-1.

Unfortunately, a failure in the first stage parachute caused a too high velocity splash down with the consequence that the vehicle was broken in three major parts, two of which were recovered.

The main mission target and achieved data were as follows:

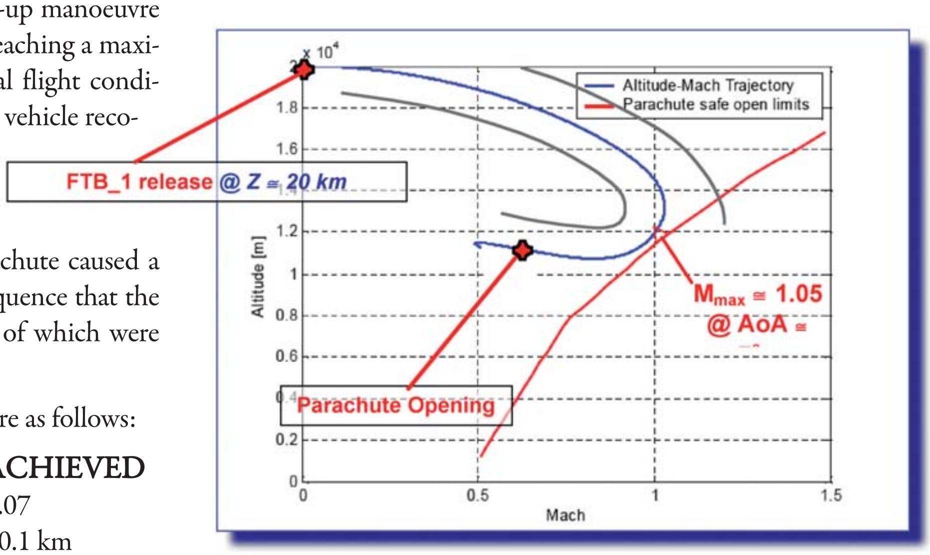
PARAMETER	TARGET	ACHIEVED
• Max Mach:	1 – 1.1	1.07
• Release Altitude:	19-21 km	20.1 km
• Attitude:	$\alpha > 4°$	$\alpha \approx 7.5°$
• Aerodynamic Efficiency:	L/D > 2.5	L/D > 2.5

Some 2 million measurements were taken related to flight data, housekeeping, as well as 500 aerodynamic and structural experimental sensors, while flying in the Mach number range between 0.6 and 1.07.

Many national and international institutions and industries contributed to the mission preparation and execution, under the supervision and technical guidance of CIRA: Italian Space Agency, Italian Air Force, Italian Navy, Italian Civil Aviation Authority, Italian Company for Air Navigation Services, Port Authorities, European Space Agency, Techno System Dev., Vitrociset, Carlo Gavazzi Space, Space Software Italia, Alcatel Alenia Space Italy, and ISL-Altran Group. It is worth underlying that SMEs from the Campania region played an important role as most of the vehicle manufacturing was performed by them.

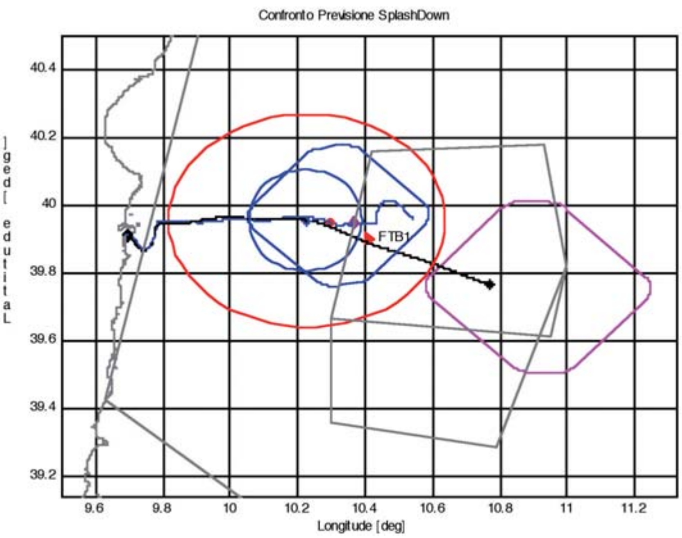
DTFT-1 will be followed by at least three other experimental missions of similar type, looking at higher maximum Mach numbers (up to 1.8) and more complex flight manoeuvres thanks to a wide range of release altitudes (from 10 km up to 35 km).

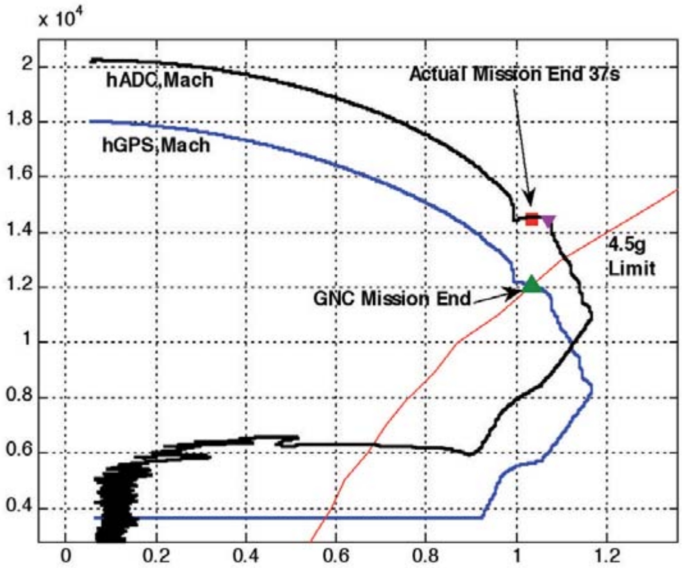
The DTFT-1 Mission: The DTFT-1 designed mission scenario is illustrated in the following figure. The nominal flight path (blue line) was defined in order to keep the vehicle always within the parachute 4.5 g safe opening limits (red line). Given the target to reach transonic flight conditions, it was chosen to release FTB-1 from Carrier (balloon system) at 20 km altitude, having to accept the probability to cross the parachute safe opening limit because of variations in the flight path due to dispersions (see gray lines).



The Carrier trajectory during the ascent phase and up to the FTB-1 release point was perfectly nominal, as well as those of the parachuted gondola and broken balloon after the release and up to the splash down. The following figure shows those actual trajectories as per the available telemetry data that appear to be very near the projected ones.

Expected and actual trajectories of the system components before and after the release, and up to the splash down. (Black line: Expected trajectory in case of timer imposed flight end; blue line: Actual Carrier trajectory up to the gondola splash down; red circle dot: Actual FTB-1 release point; violet squared dot: Broken balloon splash down point; red triangle dot: FTB-1 splash down point; blue broken curve: Expected FTB-1 release area; red curve: Expected FTB-1 splash down area; violet curve: FTB-1 + gondola splash down area following the release caused by the timer imposed flight end.)





The essential FTB-1 flight phases, after release from the balloon, were free fall, acceleration, transonic manoeuvre and deceleration, where the last phase failed to occur.

The following graph shows the actual trajectory. The GNOB (Guidance Navigation On-board Computer) was based on GPS data and ended the mission at the crossing of the parachute safe opening limit (red line). It must be said that an error has been identified during the post-flight analysis on the GPS-based measurement of altitude. The actual altitude as measured by the Aero Data Computer (hADC) is 2000 m higher than the hGPS, with the consequence that the actual trajectory is the black one.

In terms of mission data acquisition assessment, the actual status is summarized in the following table. It can be easily seen that a very large part of flight data were acquired and transmitted to ground via both direct and satellite (Artemis of ESA) telemetry channels. The analysis of the flight data is on-going.

DTFT-1 Mission Data Acquisition Assessment

Flight Component	Phase	Data Available
CARRIER	up to splash down	100%
FTB-1 via Artemis	up to RESY opening	? 90% (a 10 Hz)
PEX (500 sens + flight)	up to splash down	100% (a 100 Hz)
1st on board video	up to splash down	100% (6 fps)
2nd on board video		0%
Trajectories from radar (PISQ)	up to splash down	100%

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COROT

The COROT satellite has been successfully launched on 2006, December the 27th , by the new 2.1b version of the Soyuz launcher. After a smooth and successful in-flight tests, the scientific mission started at the beginning of March 2007.

What is COROT ?

The COROT mission is part of the Small Mission Initiative of the French Space Agency CNES, and has two scientific objectives, both requiring long uninterrupted observations with very high photometric accuracy : stellar seismology, and search for exo planets.

Concerning the stellar seismology, a star is a mass of hot gas, subject to forces of gravity, pressure and Coriolis inertia when it rotates. These forces play like the spring forces of an oscillator with eigenmodes. The stationary waves associated with these hydrodynamic processes make the surface distort and are the source of photon flux oscillations, whose amplitude is expected to be about a few 10-6 (ppm). The high precision photometry of COROT makes possible the measurement of these oscillations, in the frequency domain.

Concerning the planet hunting, the COROT planet-finding program aims at detecting the presence of extrasolar planets when they transit in front of their parent star. The detection is based of the analysis of the photometry signal in the time domain.

This mission uses the so-called PROTEUS Satellite bus. With the latter, only low earth orbits are accessible. In order to observe the same direction of the sky for a long period of time (several months), not being blinded by the Sun or occulted by the Earth, the satellite must have a polar inertial orbit and a line of sight roughly perpendicular to the orbit plane. The spacecraft is orbiting around the sun and then should slew through 180 degrees two times a year, at equinoxes.

The Partners

COROT is a French national-lead programme which introduces a new type of collaboration with ESA. National space agencies usually contribute to ESA programmes by supplying science instruments or equipment. For COROT, the roles have been reversed. CNES is the prime contractor for the mission, the payload development is driven by an integrated team with people from CNES and CNRS laboratories (LESIA in Meudon, IAS in Orsay and LAM in Marseille) and including European partners (Austria, Belgium, ESA and Germany). Alcatel Alenia Space is responsible for the platform and the integration of the satellite. As for the satellite, the Ground Segment is developed within the same frame of cooperation between CNES, CNRS laboratory (OMP in Toulouse) and international partners (Brasil and Spain). The satellite mission and control centers are located at the Toulouse Space Center. Communication with the satellite is provided by means of the CNES 2GHz network, an antenna in Alcantara (Brasil) and an antenna in Vienna (Austria). The data is then distributed to the mission's scientists.

Technical Challenges

There are a number of technical challenges to be met on board this satellite, as the signal to be measured is weak (variations of approximately one millionth in seismology). These challenges particularly include:

- **The pointing stability**

For the stellar seismology measurements, because of the non-uniformity of the pixel-to-pixel response, the pointing jitter produces noise. In order to keep this noise lower than the photon noise, a stability of 0.25 pixel is. That means a stability of 0.5 arc-second. This level of accuracy is achieved by using the instrument in the control loop.

- **The protection against the straylight**

The requirement to be almost completely protected against the light reflected by the Earth lead to design a telescope with an off-axis un-focused parabolic (2 mirrors) system completed with a baffle which has a rejection factor never achieved before (10^{-13} at 20 degrees).

- **The thermal stability**

The quantum efficiency and the dark current are function of temperature. In order to fight against the periodic noise (orbital period) induced by fluctuations of temperature, the CCD must be at -40°C with a stability better than 0.05°C over 1 hour. In order to reach this performance, a passive modular concept has been used, with separate and isolated “cells”:

Management Challenges

The counterpart of international cooperation is a complex management of the project with a high number of interfaces. There are plenty of factors of complexity :

- The responsibility of CNES at all levels from the procurement of parts up to the whole system integration and gooing through equipment, subsystems, the instrument and the ground and space segments.
- The different nature of relationship between actors. Agreements with international partners, Convention with the french laboratories (CNRS) and the Contract with manufacturers. The project has to manage 6 International Agreements, 3 Conventions and more than 100 contracts.
- The difference of cultures and experience which leads to always privilege the content to the form.

It is to be noticed that once the programme has been stabilized by the fall of 2003, the development of the flight hardware and the whole system has been done in less than three years.

Concerning the technical management, the number of interfaces has imposed to the project a strong system engineering and management in order to keep everything consistent.

Results

The date processing is being actively performed in many centres and the scientific community is delighted with the first results, wich are very promising. It appears that the PROTEUS platform and instrument performances are often better than specified.

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MET OP

MetOp, Europe's first polar-orbiting satellite dedicated to operational meteorology, was launched on 19 October 2006 from Baikonur Cosmodrome, in Kazakhstan, by a Russian Soyuz 2/Fregat rocket operated by Starsem.

- MetOp-A is the first in a series of three satellites, developed as part of a joint undertaking between ESA and the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT), whereby MetOp forms the space segment of EUMETSAT's Polar System (EPS). MetOp represents the European contribution to a new cooperative venture with the United States providing data to monitor climate and improve weather forecasting.
  To fulfil its ambitious mission, MetOp-A incorporates a comprehensive remote-sensing payload consisting of a set of new-generation European instruments, plus a set of 'heritage' instruments provided by the United States similar to those flown on current NOAA satellites.

Payload instruments

- The Infrared Atmospheric Sounding Interferometer (IASI), developed by the French space agency CNES. Its soundings will be complemented by measurements from the US heritage instruments AVHRR (Advanced Very High Resolution Radiometer), HIRS (High Resolution Infrared Radiation Sounder) and AMSU (advanced Microwave Sounding Unit) and from the Microwave Humidity Sounder (MHS), a five-channel microwave radiometer developed by EUMETSAT.
- The improved Global Ozone Monitoring Experiment (GOME-2), a scanning spectrometer designed to probe the atmosphere for profiles of ozone concentrations as well as other trace gases.
- Another instrument with a strong ERS programme legacy is the Advanced Scatterometer (ASCAT).
- A new instrument developed in the frame of MetOp is the GNSS Receiver for Atmospheric Sounding (GRAS).
- The NOAA-supplied instruments include: the third-generation (AVHRR-3); two 15-channel (AMSU/A); and the fourth-generation HIRS, a 20-channel equivalent of the IASI interferometer.
- In addition, MetOp-A carries an advanced Argos data collection system supplied by CNES.

The Soyuz 2 launcher, on its first operational mission, lifted off with the 4093kg spacecraft encapsulated in a new 4.1m diameter payload fairing. Some 69 minutes after launch, the Fregat upper stage released the first MetOp satellite into a 'sun-synchronous' circular orbit at an altitude of 837km over the Kerguelen archipelago in the South Indian Ocean. This orbit will enable MetOp-A to circle the globe from pole to pole while always crossing the equator at the same local time, i.e. 9:30 am.

This was the start of the early operations phase, under ESA/ESOC control, and included the execution of the automatic deployment sequence of the satellite's solar array and release of the reaction wheels; the attitude acquisition and the payload antenna deployments. Satellite manoeuvres were also performed to allow the final operational orbit to be reached. Activities were completed, without incident, by 22 October 2006, when control of the satellite was passed to EUMETSAT.

The satellite In-Orbit Verification (SIOV) phase had then started, with the successive switch-on and check-out of the payload instruments. A delay is required at the start of this process to allow the cooled instruments (IASI, AVHRR, HIRS and GOME) to decontaminate their sensitive optical and thermal surfaces.

By the end of last year, all instruments had been switched on and "first light" data was available. No major anomalies were encountered for the instruments, and the performances were as expected. The phase has been successfully concluded on 29 March 2007 after which EUMETSAT, with the support of ESA, has started the Commissioning phase, aimed at calibration/validation activities, for the overall system. This should be completed mid May 2007, and routine operations will then be started.

In the mean time the MetOp-B and MetOp-C spacecraft have largely completed their integration and are placed into storage, waiting for the restart in 2009 for the next launch (MetOp-B), foreseen in 2011. MetOp-C is slated for launch in 2015.

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