ANASTASIA

Airborne New and Advanced Satellite techniques and Technologies
in A System Integrated Approach

Presentation at Aeronautics Days 2006, Vienna 19-21 June

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ANASTASIA

- European Commission Project, 6th framework programme

- Integrated project, aeronautical and space priority
  - 20 ME Euro
  - 30 partners
  - Starting date: 1st of April 2005
  - Duration: 4 years

- Goal: To define the Future satellite based CNS Avionics beyond 2010
Partners

- 31 Partners: 13 countries, Large Industrials, SME, universities, Research centers

- Core Team: THALES-AVIONICS, AIRBUS, DASSAULT-Aviation, DLR

- Coordinator: THALES-AVIONICS

Expertise

- Airframers: Airbus (F and G), Dassault Aviation (F)
- Satellite: Inmarsat(UK), Astrium(F)
- Research centres: DLR(G), NLR(NL), EADS research centers(F, G), Thales research center(UK), Joanneum(A)
- Universities: INSA/ENAC(F), Tech univ Braunschweig(G), Vigo univ(SP), UCL(UK), Imperial college(UK), University of Surrey(UK)
- Suppliers: Skysoft(P), Data respons(N), Gatehouse(DK), Geozup(R), Triagnosys(G), Rhea systems(B), WIS(UK), Sirehna(F), EADS(F,G), Astrium(F), Selex(I), THALES Avionics(F, UK), ERA technology, ASCOM (CH)
RATIONALE

Rationale/Input:

- New needs: The foreseen increase of the traffic will request to improve operational capacity and safety of the air transport system

- New space based technologies: Satcom, satellite navigation

Output:

- To propose new CNS satellite based systems and architectures to fit with these new needs, on the basis of the evaluation of these new technologies
The ANASTASIA objectives

- ANASTASIA aims to carry out research, evaluation and cost benefit analysis to define future satellite based CNS avionics beyond 2010

- **Navigation**
  - Investigate Multiconstellation, multifrequency satellite positioning
    - Antenna design
    - Advanced signal processing
    - Receiver integration
    - Hybridisation techniques with low cost inertial sensors

- **Communication**
  - To establish the requirements for an affordable aeronautical Satcom system for ATM
  - To design, implement and demonstrate a preliminary such Satcom system
  - Prototype Higher bandwidth services and Systems for future a/c Communication requirement

- **Consolidate future needs of Surveillance with the requirements and key technologies from COM & NAV**
Project Implementation

- Consolidate Nav, Com & Surveillance Requirements
- Identify Technologies and Architectures
- Select Most Promising Architecture
- Develop Prototype Systems
- Improve
- Prototype
- Flight Trials
- Demonstrate
- Report and Disseminate
### SCHEDULE

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**SP1 Management**

**SP2 NEEDS and aircraft requirements**
- WP2.1, 2.2, 2.3 initial a/c requirements nav and com
- WP2.2; WP2.3 synthesis
- WP2.2; WP2.3 final requirements

**SP3 & 4 Navigation & Communication**
- WP3.1 & WP4.1 analysis of expectations
- WP3.2 & WP4.2 advanced studies
- WP3.3/WP3.4 & WP4.3/WP4.4 Key techn design and devpt

**SP5 Operational Evaluation**
- WP5.1 Characterisation of test environment
- WP5.2 Operational validation test definition
- WP5.3 Test platform preparation
- WP5.4 Flight tests

**SP6 Exploitation, Dissemination**

- Initial Requirements
- System requirements (installation constraints, expected performances...)
- Final requirements
- Tests needs definition
- Nav and com mockups
- Results of flight tests
ANASTASIA WBS – SP level

ANASTASIA Project

SP1 Management and technical coordination
THAV

SP2 Needs and Aircraft requirements
AIRBUS-F

SP3 Navigation
Space Based Technologies
THAV

SP4 Communication
Space Based Technologies
THAUK

SP5 Operational characterisation and Evaluation
DLR

SP6 Dissemination
DASSAULT
SP 2 Objectives

To identify the requirements for the new satellite based CN(S) functions for both business jets and commercial aircraft

- “Top – Down” analysis of the future needs foreseeable in 2020, and their associated performances
- “Top – Down” analysis of the airborne functional requirements foreseeable in 2020, for both navigation and communication
- “Bottom-up” assessment of the airborne opportunities introduced by foreseeable technological evolutions (identified in SP 3 and 4)
SP3 Objectives

Investigate and evaluate the techniques and technologies that will be the keys to the success of future space-based navigation systems:

• Multi-constellation, multi-frequency GNSS receivers (GPS/Galileo) for real world-wide autonomous robust navigation

• Signal processing techniques and antenna design for high robustness to critical Radio Frequency Interference and multipaths environments

• High accuracy and integrity techniques for up to Cat 3 landing and gate-to-gate operations (SMGCS)

• Technological design of low cost navigation systems components:
  • Technological design of new receiver and antennas
  • Technological design of MEMS based lower cost hybridised systems
SP 4 Objectives

1. To design, implement and demonstrate a prototype of an affordable aeronautical SATCOM system that will meet evolving European ATM requirements such as using satellites to complement the congested VHF spectrum.
   - It shall be based on current or planned space segment and shall have maximum synergy with existing and planned non-ATM aeronautical SATCOM systems

2. To carry out research into higher bandwidth services, systems and airborne equipment to meet future SATCOM requirements in ATM such as delivering weather maps and electronic flight bag data.
   - This work will concentrate on synergies with revenue-generating passenger use, and antenna issues (dual band conformal antenna)
SP 5 Objectives

- To assess the performances of key satellite Navigation and Communication technologies in actual environment
  - Characterization and modelling of the environment
  - Flight trials
  - Data analysis
SP 6 Objectives

- Contribution to standards and dissemination of the results
  - Use of the ANASTASIA results in a way which will allow future regulations to take into account the future generation of satellite based NAV and COM receivers
  - ANASTASIA results will be presented to ICAO, RTCA, EUROCAE, ARINC,..
  - Dissemination of the results through patents, papers, conferences.
Where we are (T0+12):

- **SP2 : Needs**
  - Jan 10-11: User forum at Toulouse
  - T0+12 D2.1 «Future CNS requirements for use of space based Com and Nav subsystems on civil aviation »

- **SP3 : Navigation**
  - T0 + 8 D3.1 «Analysis of existing techniques for space base navigation»
  - T0+12 D3.2.1.1 «Interference and multipath mitigation study report»

- **SP4 communication**
  - T0+12 D4.1 «Analysis of requirements and technologies »
  - T0+12 D4.3.1 «Aircraft terminal technology assessment report »

- **SP5 Operational characterisation and evaluation**
  - T0+16 D5.1 «Characterisation of critical environment»

- **SP6 Dissemination**
  - Leaflet
  - www.anastasia-fp6.org
  - A number of papers and presentations
More information?

Web site: WWW.Anastasia-FP6.org

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ANASTASIA PROJECT
Airborne New Advanced Satellite techniques and Technologies in a System Integrated Approach

New Aeronautical Communication for ATC-AOC-AAC
INMARSAT 4

GPS
New Satellite Navigation Systems

New On-board Technologies

The New on board Satellite based Navigation, Communication Systems and Technologies

EUROPEAN COMMISSION PROJECT
6th FRAMEWORK PROGRAMME (2002-2006)