EUROCONTROL’S ACTIVITIES AND VISION ON THE USE OF GNSS IN AVIATION

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Overview

- Context of GNSS Introduction
- EUROCONTROL GNSS Activities
  - EATMP GNSS Programme
- Examples of Current Activities
  - Operational and Validation Aspects
  - Safety Aspects
  - Cost Benefit Aspects
- The Future
  - Galileo
  - Long Term Goals (GNSS 2)
ICAO Global CNS/ATM Concept
   ICAO Air Navigation Conference Fall 2003
ECAC ATM Strategy for 2000+
   Review foreseen in 2003
ECAC Navigation Strategy
   Aviation Navaid Transition Schedule
ECAC Satellite Navigation Strategy
   formulated in 1994
ECAC EUROCONTROL
SATELLITE NAVIGATION STRATEGY

- EARLY BENEFITS ⇒ GNSS 1
- MULTI-MODAL
- GLOBAL FOR AVIATION
- ULTIMATELY SOLE MEANS ⇒ GNSS 2
  now SOLE SERVICE
EUROCONTROL in GNSS

**GNSS Programme within EATMP**
- ETG Responsibilities (ESA, EC, EUROCONTROL)
  - civil aviation user requirements
  - ensure operational acceptance
  - support safety regulation
- Cooperation with (examples)
  - NAV Programme: Standards, Operations
  - Airports Unit: GNSS in A-SMGCS
  - Safety Unit: Safety Assessment, ESARR
  - COM Domain: Spectrum Issues

**Legal services**
- Legal and institutional aspects, particularly liability

**CRCO**
- possible methodologies for cost allocation
EUROCONTROL EATMP GNSS PROGRAMME

STRATEGIC AXES

- Identify operational needs
- Develop operational requirements & procedures
- Foster development of standards
- Demonstrate requirements are met
- Demonstrate safety
- Develop business case

SBAS
GBAS
Galileo
Identification of needs and development of requirements

Development and validation of ICAO SARP’s

Development of operational procedures

Harmonised operational test and val. plans

Development of data recording/analysis tools
  - MARS (Modular Analysis and Research System)
  - PEGASUS (Prototype EGNOS Analysis System using SAPPHIRE)
  - SAPPHIRE (Satellite and Aircraft Data base Project for System Integrity Research)

Interoperability aspects
PANS-OPS Development Support

- Guidance Information Correlation

- Effects of Parallel Runway Operation

  Unavailability Impact on Safety of Operation and Assessment Method
Noise Reduction with GNSS Approaches
SBAS Trials at Nice Airport

Current ILS Approach

Proposed GNSS App.

Experimental use only

Noise Effects
Parameter Influence Visualisation

Example: SBAS Ionospheric Corrections
Static GNSS Integrity Evaluation

![Vertical Performance ESTB over 42855 epochs](image)

- System Unavailable Alarm Epochs: 87
- MI Epochs: 0
- HM Epochs: 0
- APV-1 99.799990%

Number of Points per Pixel:
- $10^0$ to $10^2$
GNSS-1 - SAFETY REGULATION ASPECTS

- **SBAS**
  - EGNOS Safety Case
  - Formal relationship to SRC
  - Transfer to Service Provider

- **GBAS**
  - Common European Approach
  - EATMP Safety Assessment Methodology
  - Application of ESARR Requirements
  - Link to JAA, SRC, EUROCAE
GBAS SAFETY ASSESSMENT

- Application of the Safety Plan to airports: June 02
- Pre-Concept FHA: June 02
- Detailed Post-Concept FHA: 1st Quarter 2003
- PSSA: 2nd Quarter 2003
- SSA & outline of the Safety Case: late 2004
- EUROCONTROL in close consultation with ATSPs, airlines, National Regulatory bodies, JAA, SRC
APPLICATION TO TRIAL AIRPORTS

GBAS SP APPLIED TO
- Regional airport
  - Bremen
- Malaga
- Toulouse
- Zurich
- Linate (Milan)
COST-BENEFIT ASPECTS

“EGNOS multi-modal costs and benefits - A study of the aviation case in ECAC”

- Potential operational benefits identified
- Funding of transition period
- Need to identify other revenue streams
  - multi-modal in Europe
  - services outside Europe
- Fair distribution of costs over all users
Agreement on the development of a European satellite navigation system
Development phase launched March 28, 2002
Independent but interoperable with GPS
Civil system under civil control
Decision for Deployment phase to be made in 2003
Support ICAO RNP Concept

Required Navigation Capability

- GNSS
- Terrestrial Infrastructure
- Airborne Systems
- Combination of the above

For the foreseeable future, a rationalised terrestrial infrastructure must be retained
If world-wide GNSS is the most cost beneficial solution and is supported by a successful safety analysis, it should become the « sole service » navigation system, for provision of positioning and timing data, for all phases of flight.

↓

GNSS 2

Sole System: only system used aboard
Sole service: only system provided externally
Strategic Aims of Sole Service Concept

- Feasibility of safety
- Performance down to CAT III Operations
  - regional and local specific requirements
  - global interoperability and complementarity
- World-wide resolution of institutional issues
  - safety, certification, standards, liability
- Fair Allocation of Costs
  - between civil aviation and other user categories
  - between States
  - between phases of flight
- Transition Planning
  - commitment to decommission terrestrial aids
  - commitment to global equipage
  - establishment of implementation plan
<table>
<thead>
<tr>
<th>EUROCONTROL C.O.M. 1994 &amp; 1998</th>
<th>Common Civil Aviation Community Position ACG 06/01 ⇒ PC</th>
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</thead>
<tbody>
<tr>
<td>* EARLY BENEFITS FROM EXISTING SYSTEMS  ↓  GNSS1</td>
<td>* Aviation to be treated in a fair and non-discriminatory manner in the provision of a multi-modal service</td>
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<tr>
<td>* MULTI-MODAL</td>
<td>* Creation of a world-wide seamless system</td>
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<td>* GLOBAL FOR AVIATION</td>
<td>* Sole-service navigation system for provision of positioning and timing data for all phases of flight</td>
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<td>* ULTIMATELY SOLE MEANS FOR ALL PHASES OF FLIGHT  ↓  GNSS2</td>
<td>SAFELY and COST BENEFICIAL</td>
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