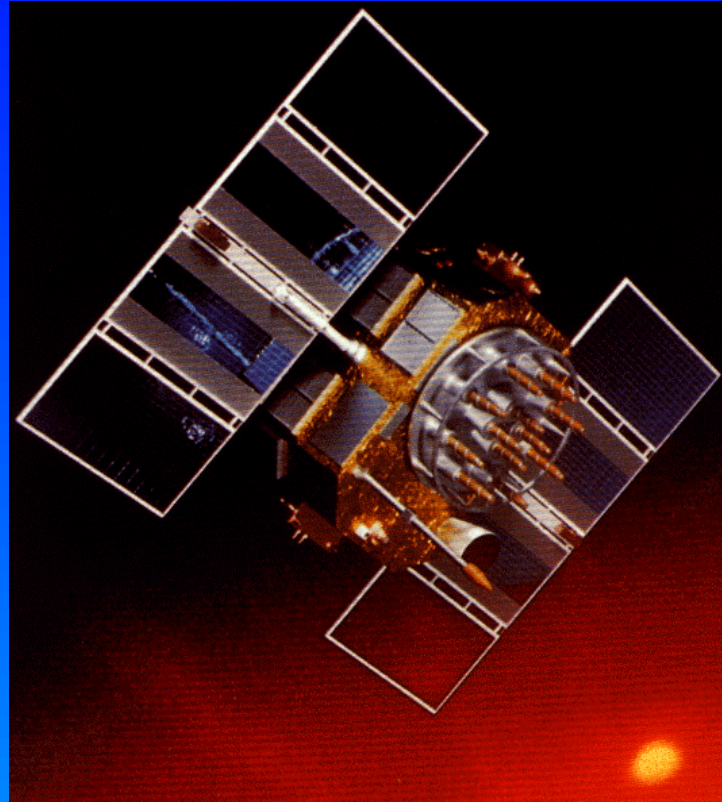


EUROCONTROL'S ACTIVITIES AND VISION ON THE USE OF GNSS IN AVIATION



Andreas Lipp
for CGSIC International Meeting
Brussels, 6/12/2002

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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)

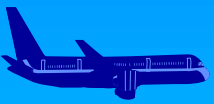
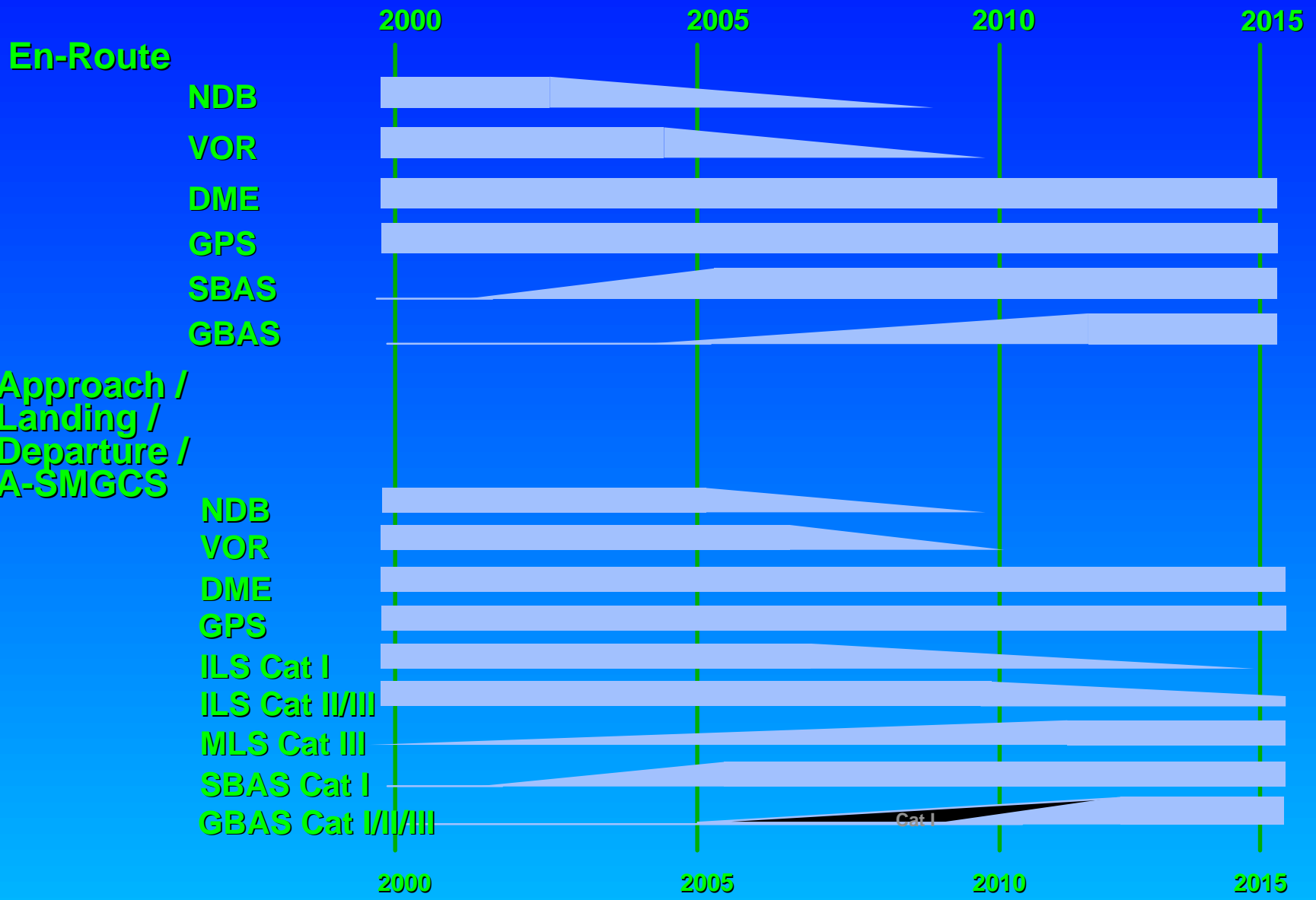


CONTEXT

- **ICAO Global CNS/ATM Concept**
 - ï ICAO Air Navigation Conference Fall 2003
- **ECAC ATM Strategy for 2000+**
 - ï Review foreseen in 2003
- **ECAC Navigation Strategy**
 - ï Aviation Navaid Transition Schedule
- **ECAC Satellite Navigation Strategy**
 - ï formulated in 1994



NAVIGATION STRATEGY



ECAC EUROCONTROL SATELLITE NAVIGATION STRATEGY

- EARLY BENEFITS P GNSS 1
- MULTI-MODAL
- GLOBAL FOR AVIATION
- ULTIMATELY SOLE MEANS P GNSS 2
i now SOLE SERVICE

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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

SBAS

GBAS

Galileo

Identify operational needs

Develop operational requirements & procedures

Foster development of standards

Demonstrate requirements are met

Demonstrate safety

Develop business case

STRATEGIC AXES

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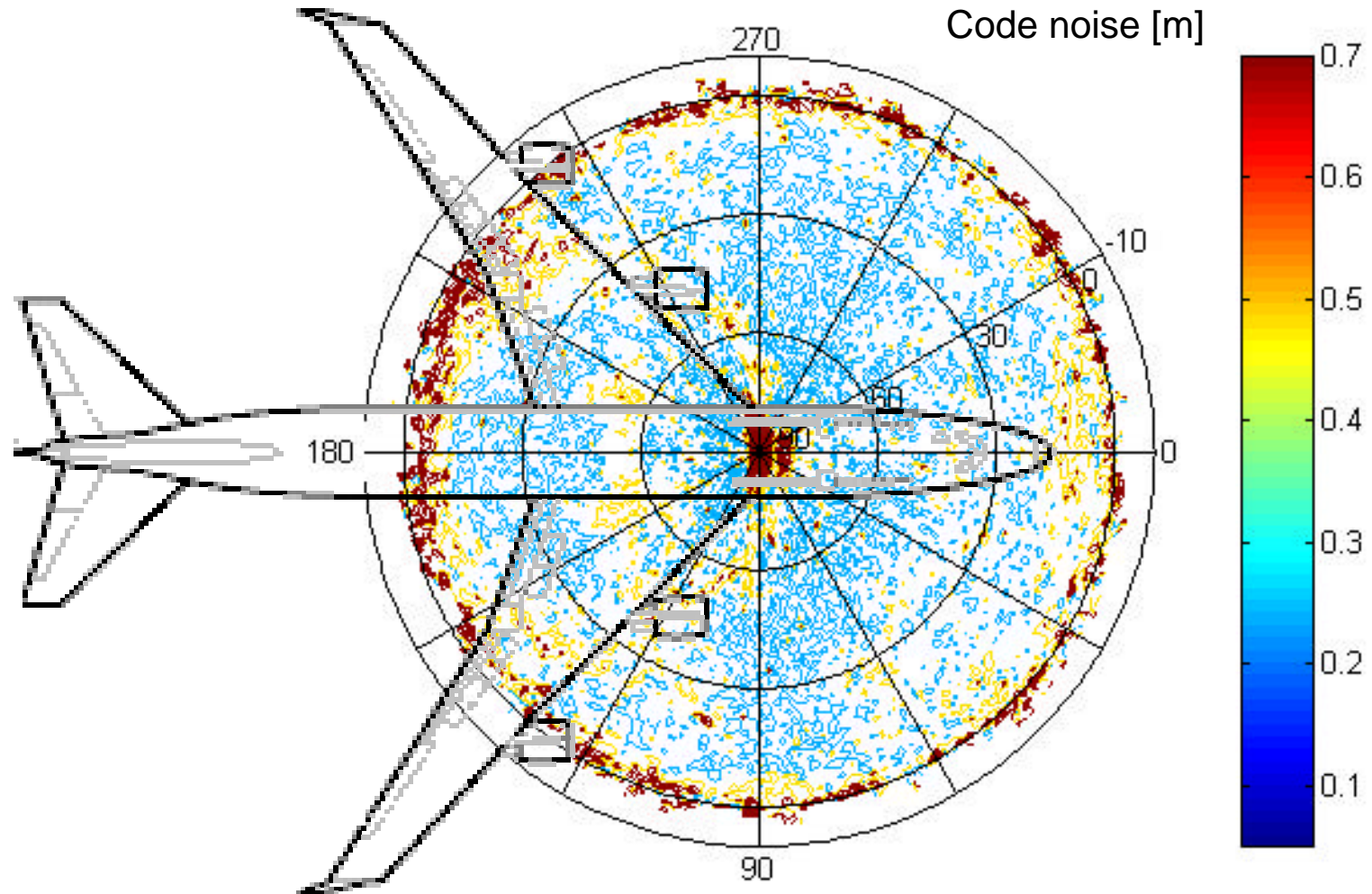


GNSS-1 - OPERATIONAL ASPECTS

- 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

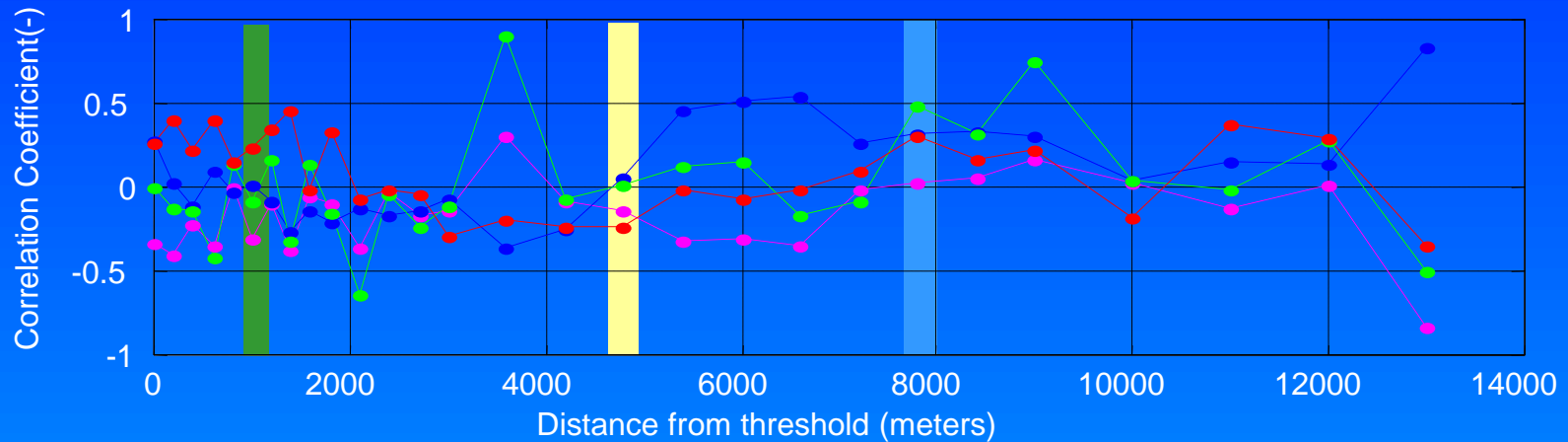
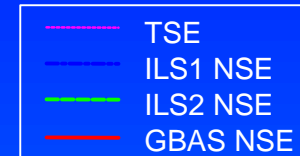


SARPS Validation Example Aircraft Multipath Allocation



PANS-OPS Development Support

● Guidance Information Correlation

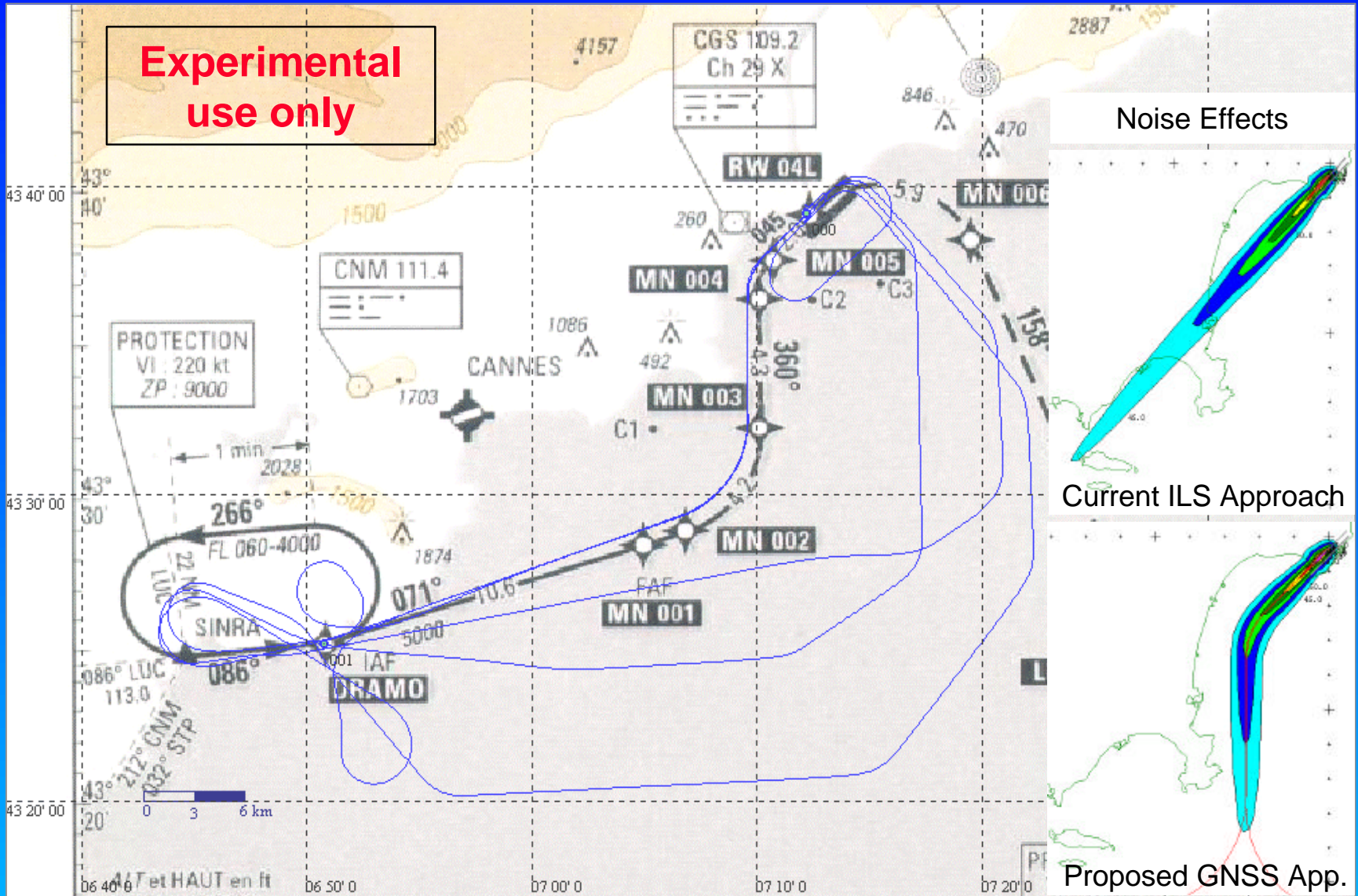


● Effects of Parallel Runway Operation i Unavailability Impact on Safety of Operation and Assessment Method



Noise Reduction with GNSS Approaches SBAS Trials at Nice Airport

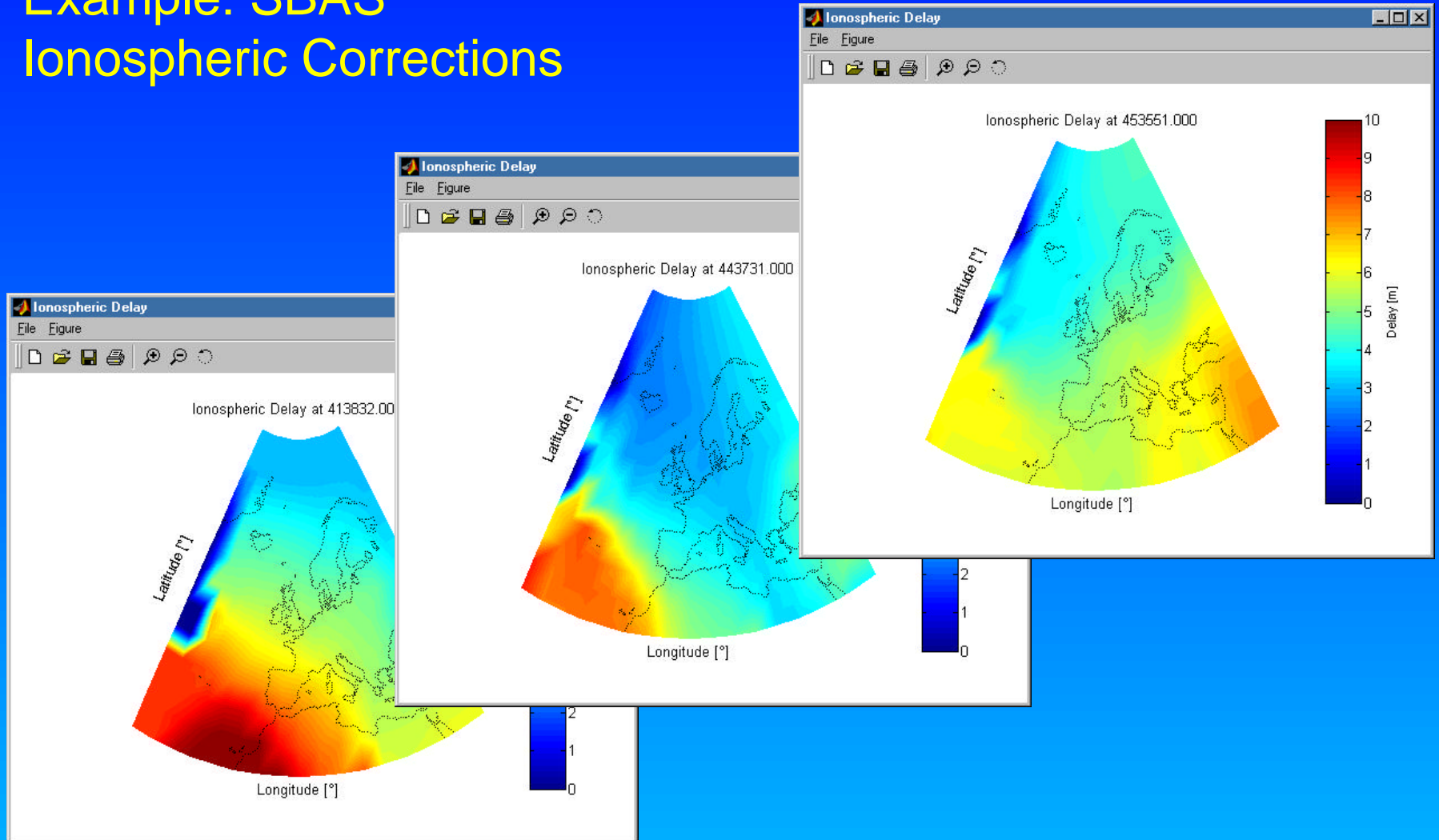
Experimental
use only



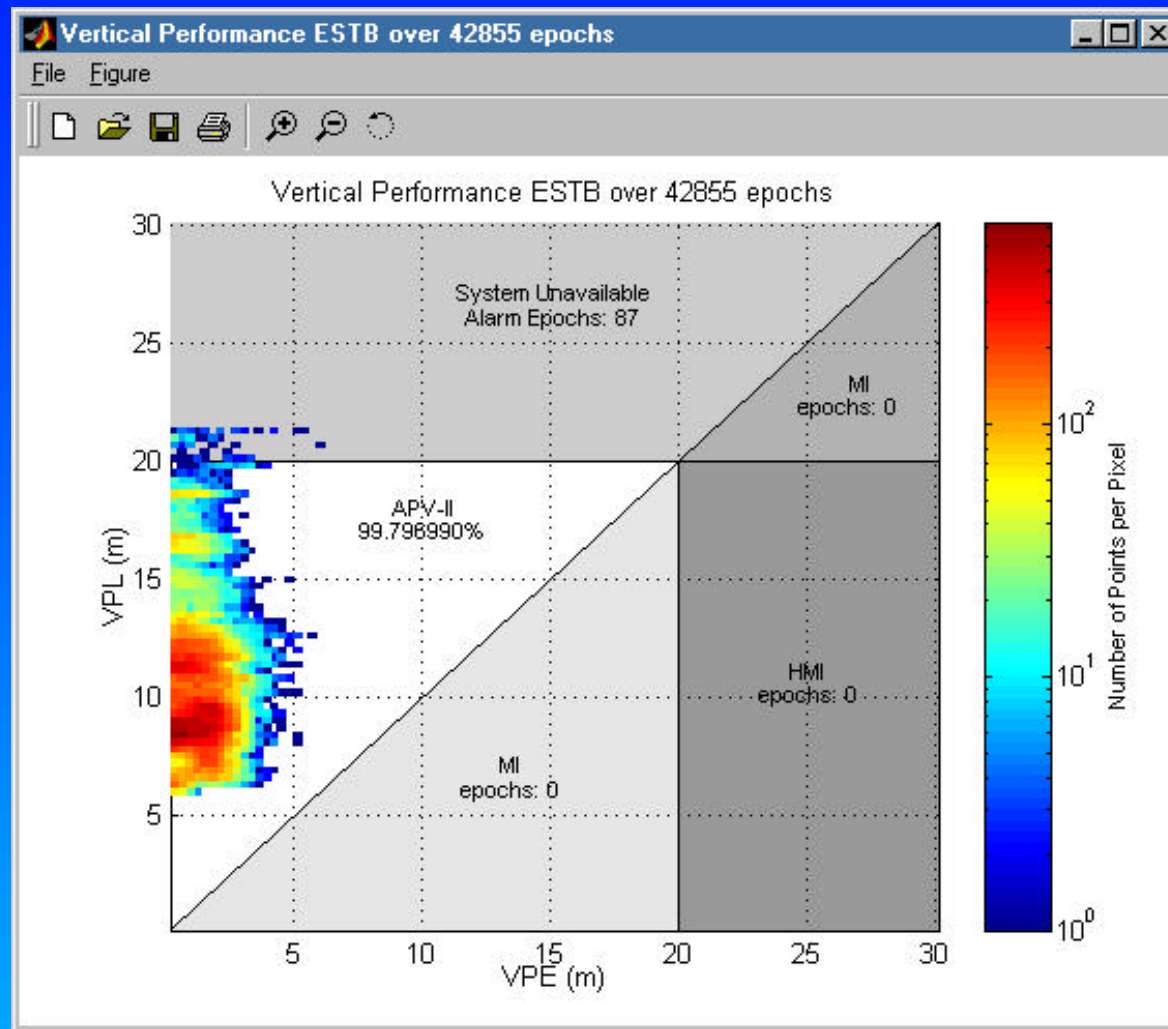
Parameter Influence Visualisation

Example: SBAS Ionospheric Corrections

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Static GNSS Integrity Evaluation



GNSS-1 - SAFETY REGULATION ASPECTS

- SBAS

- ↓ EGNOS Safety Case
- ↓ Formal relationship to SRC
- ↓ Transfer to Service Provider

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- GBAS

- ↓ Common European Approach
- ↓ EATMP Safety Assessment Methodology
- ↓ Application of ESARR Requirements
- ↓ Link to JAA, SRC, EUROCAE



GBAS SAFETY ASSESSMENT

- GBAS Safety Policy and Safety Plan endorsed by SRC in January 2002
- 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

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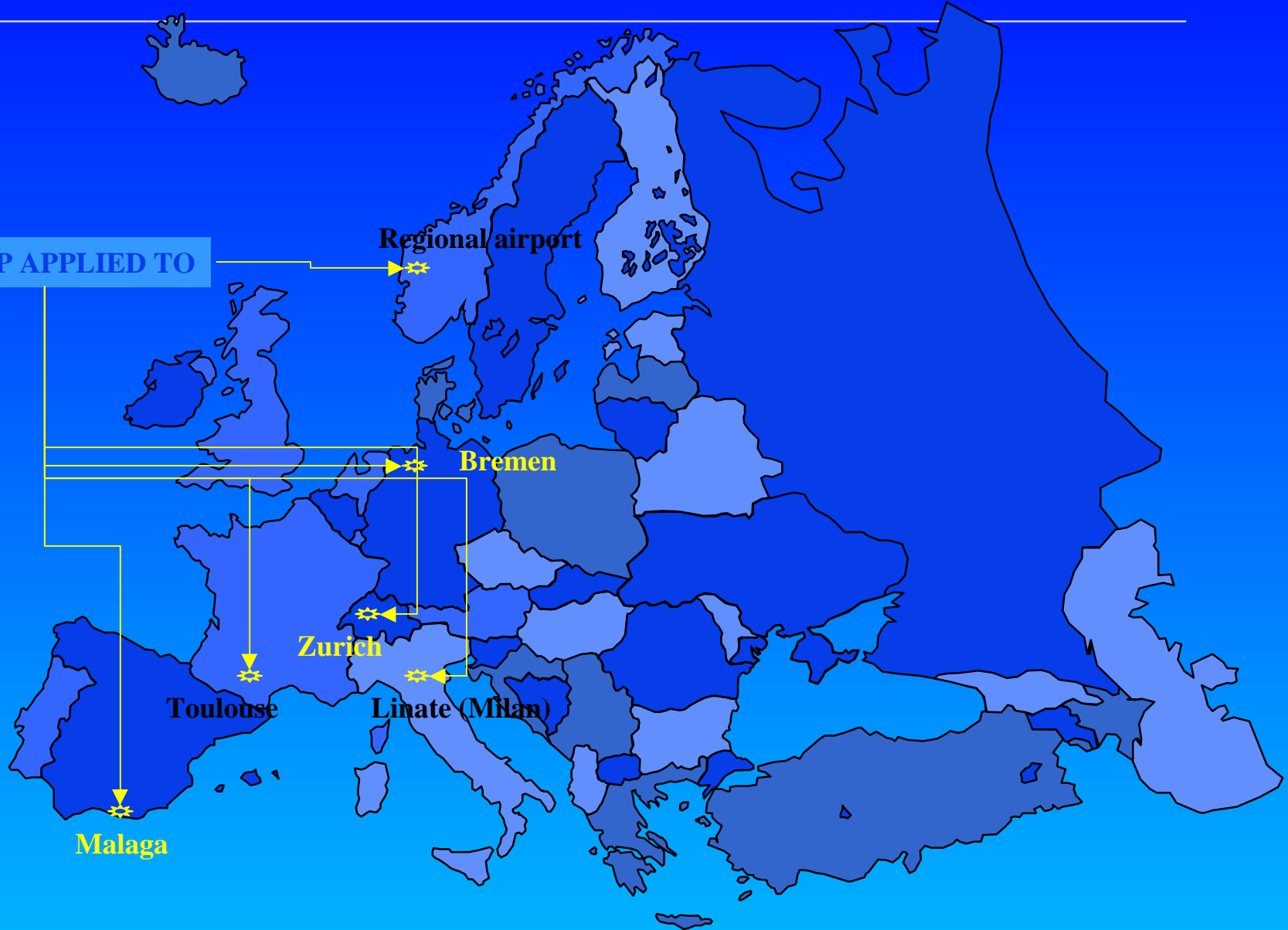
Bremen

Zurich

Toulouse

Linate (Milan)

Malaga



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



EC Communication on GALILEO

- 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



Aviation Community Views

- 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



FINAL GOAL

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.

β

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



GNSS STRATEGY and POSITION

EUROCONTROL C.O.M. 1994 & 1998

- * EARLY BENEFITS FROM EXISTING SYSTEMS

β
GNSS1

- * MULTI-MODAL



- * GLOBAL FOR AVIATION



- * ULTIMATELY SOLE MEANS FOR ALL PHASES OF FLIGHT



β
GNSS2

Common Civil Aviation Community Position ACG 06/01 P PC

- * Aviation to be treated in a fair and non-discriminatory manner in the provision of a multi-modal service
- * Creation of a world-wide seamless system
- * Sole-service navigation system for provision of positioning and timing data for all phases of flight

SAFE and COST BENEFICIAL

