



# EGNOS

EUROPEAN GEOSTATIONARY NAVIGATION OVERLAY SERVICE

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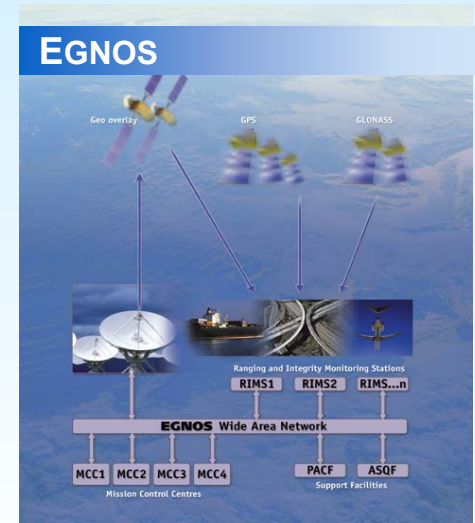
**EGNOS Receiver Manufacturers Workshop, Paris, ESA HQ, July 3, 2003**



# EUROPEAN GNSS STRATEGY

**Step 1: EGNOS to provide civil and safe complement to GPS (and GLONASS), into operations in 2004**

EGNOS is an initiative of the European Commission, Eurocontrol and the European Space Agency (ESA)

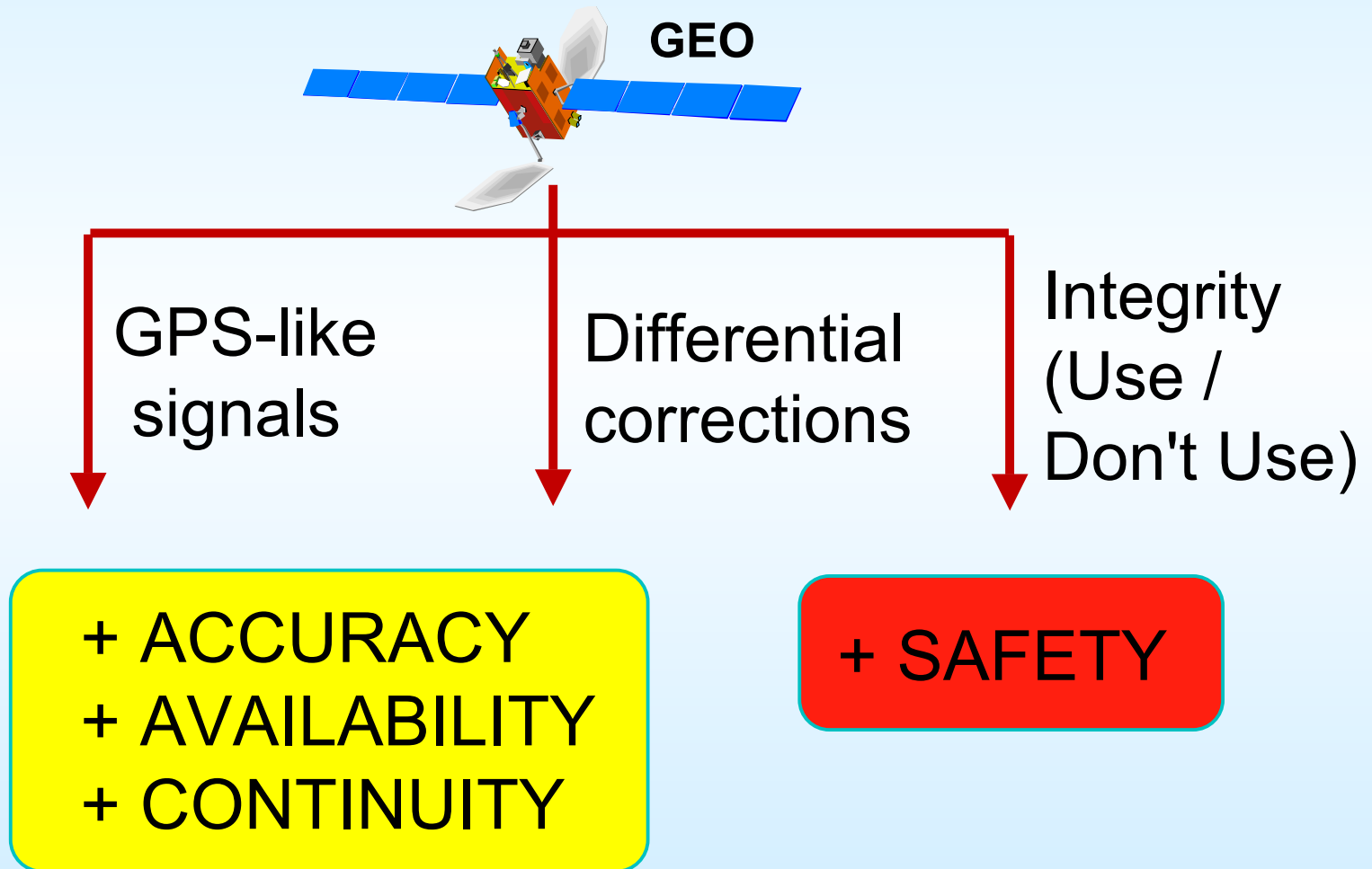


**Step 2: GALILEO is to achieve European sovereignty through dedicated system under civil control: into operations by 2008**

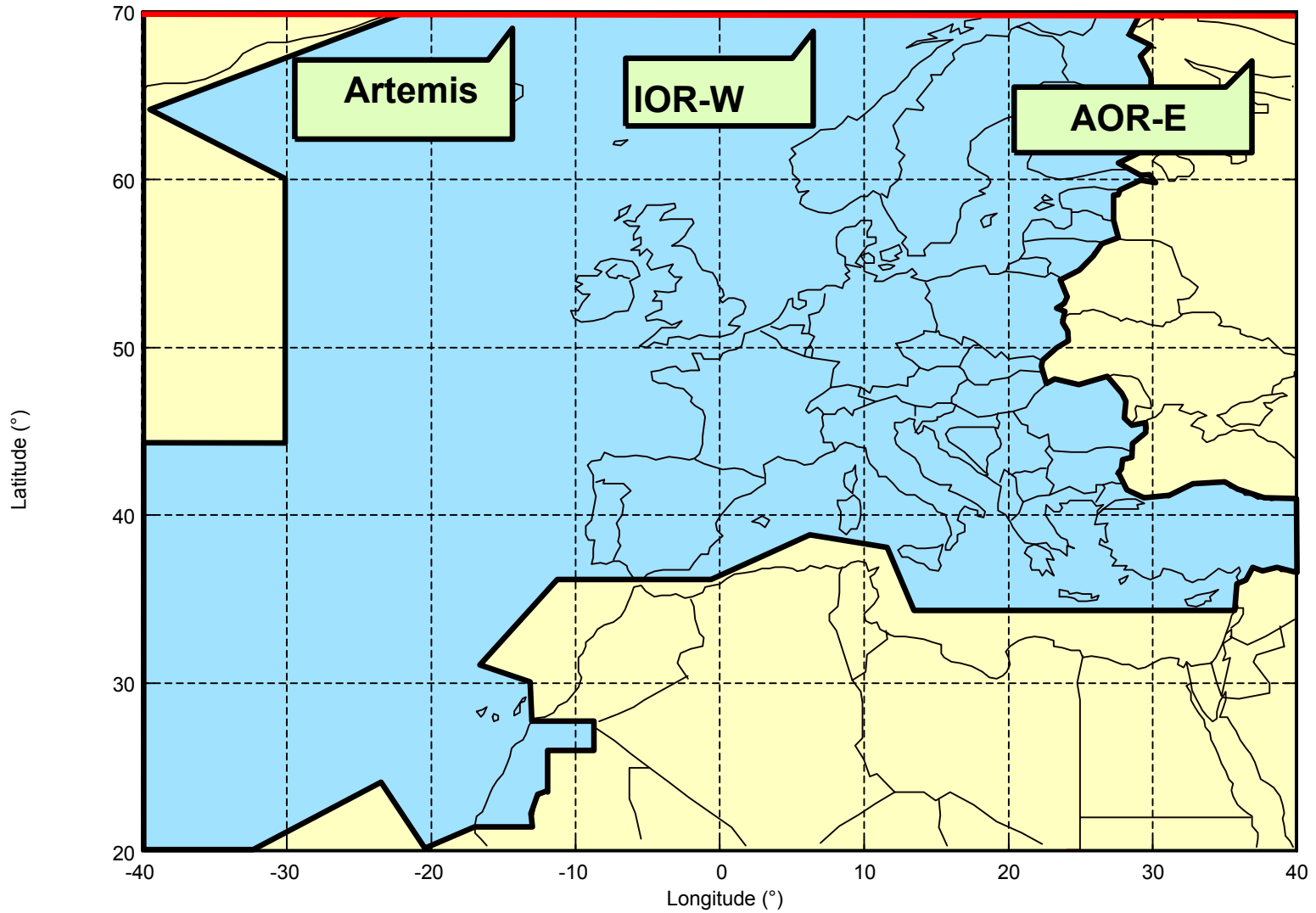


GALILEO is an initiative of the European Commission and ESA

# GNSS1 / EGNOS Services Overview



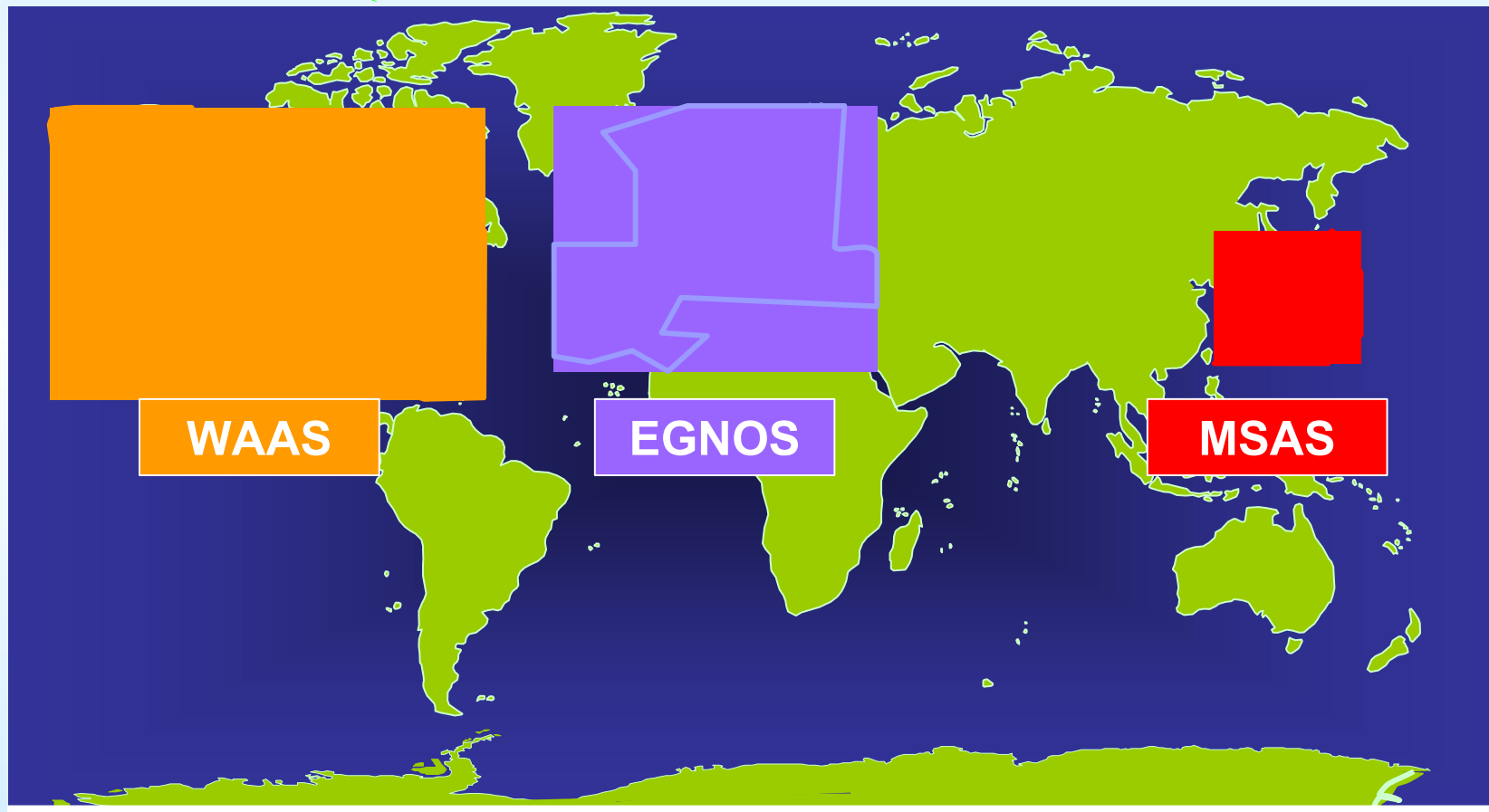
# ECAC Area



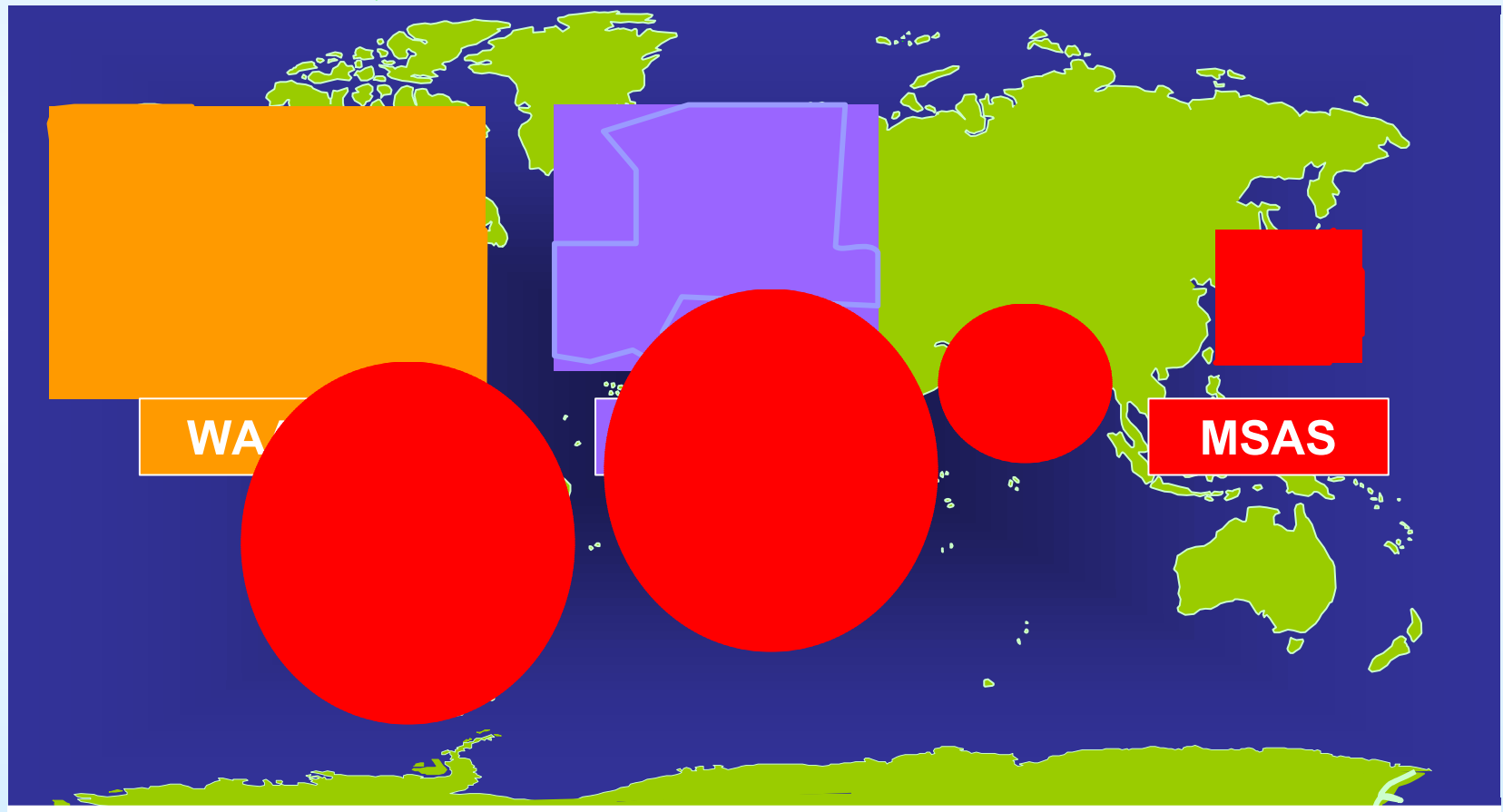
European Space Agency  
GNSS-1 Project Office



# EGNOS is fully interoperable with other existing GNSS 1 services...



# And future likely service extensions ..





# EGNOS Multimodal Performance Objectives

## Civil Aviation:

- Primary means of navigation down to Precision Approach (**APV-1 and APV-2**) with a 99% availability for APV-2 (VAL=20m) over ECAC.

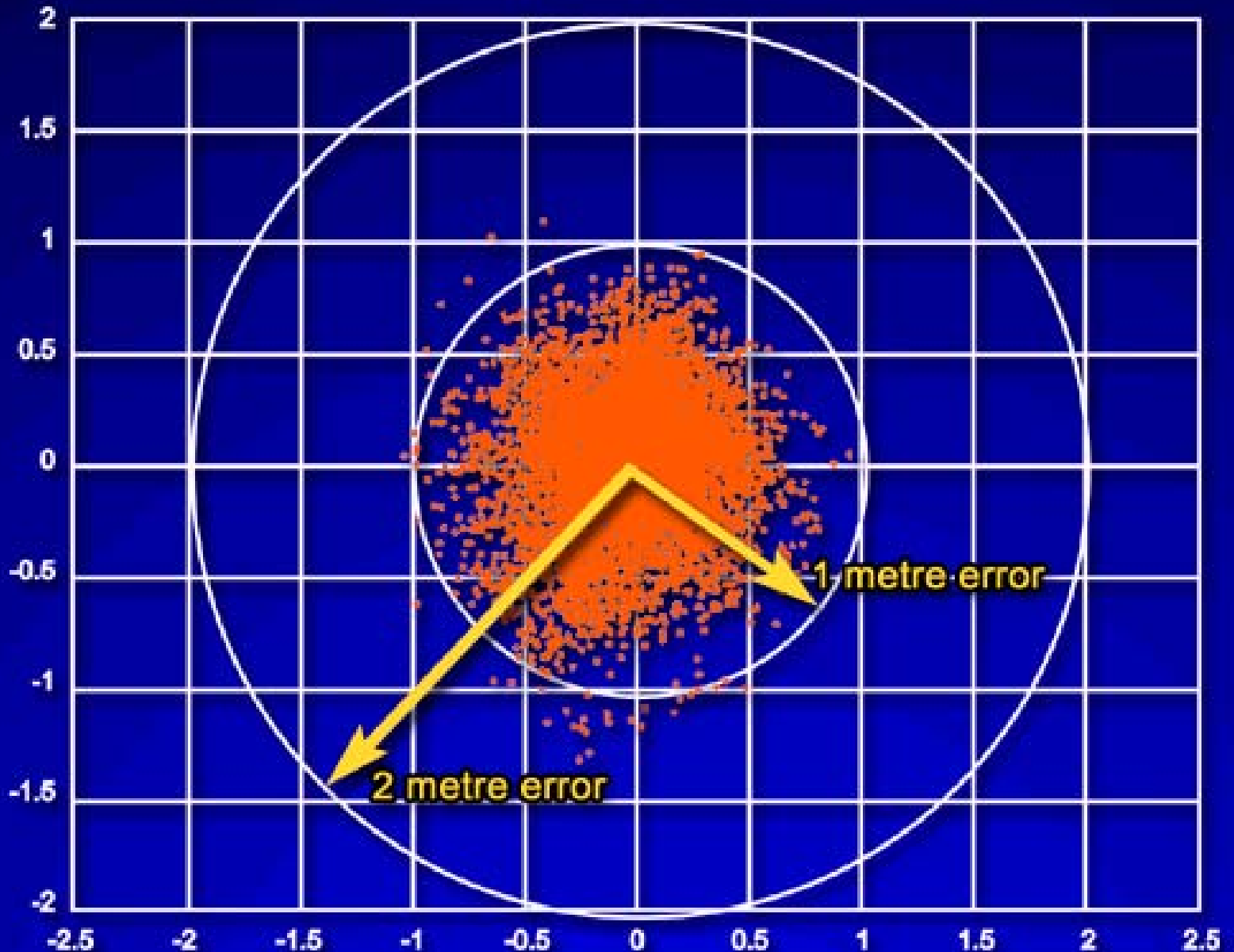
## Maritime:

- Specified to be better than 4 meters in European Coastal waters
- Expected performance around **1-2 meter horizontal accuracy**

## Land Applications (Road community, agriculture, ...):

- Specified to be better than 4 meters in continental Europe
- Expected performance around **1-2 meter horizontal accuracy**

# CURRENT ESTB PERFORMANCES (HNSE(95%) close to 1 m accuracy !!)

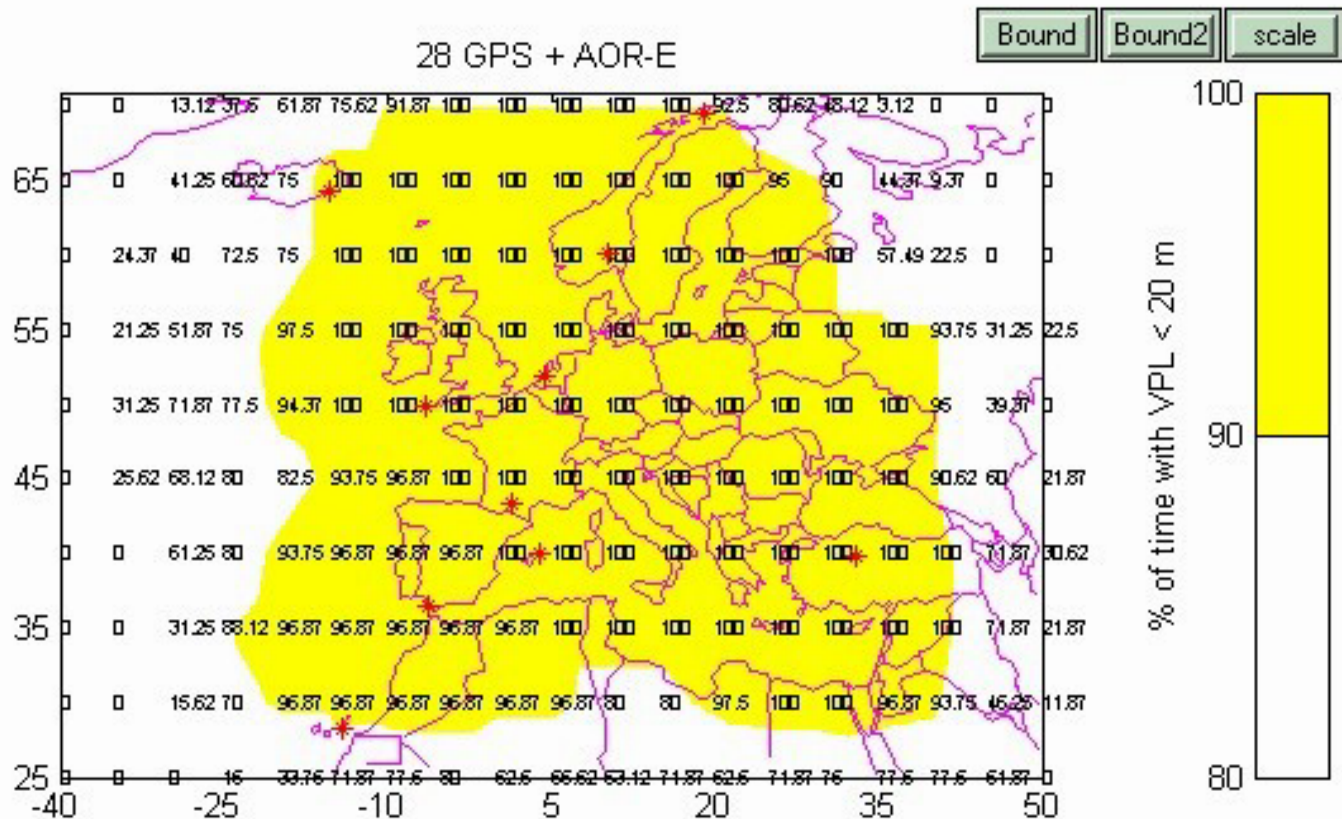




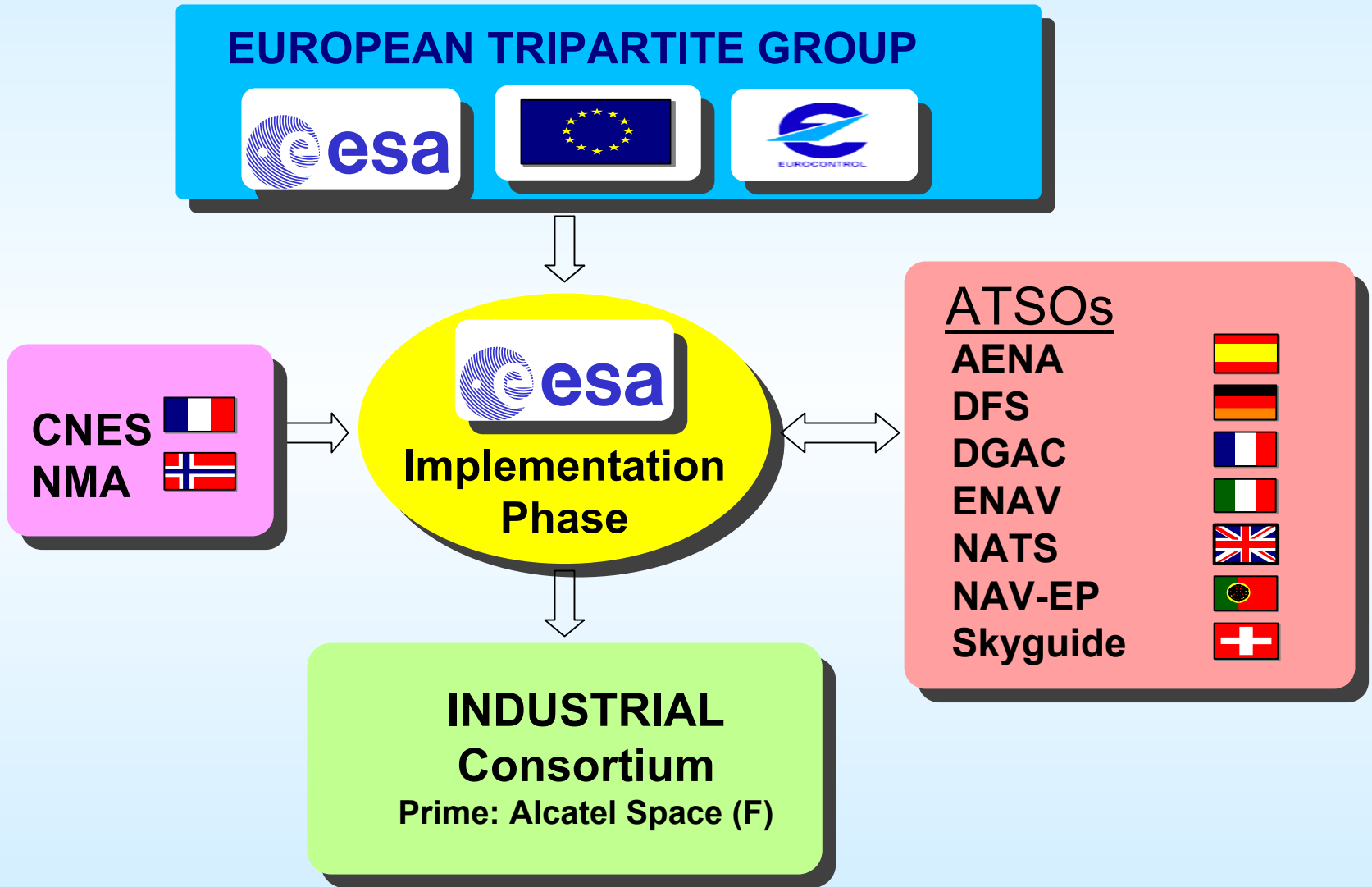
# ESTB APV-2 SERVICE AREA

Last 24 hours of ESTB data. 02-Oct-2002 12:38:05 (CET)

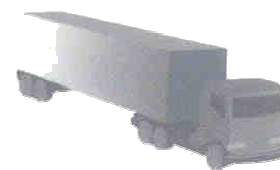
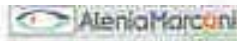
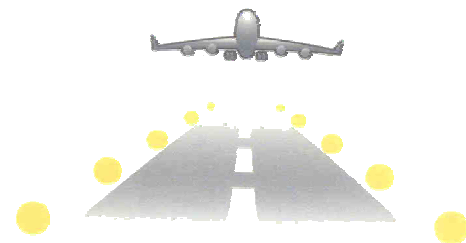
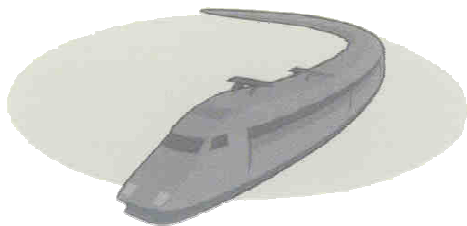
print close



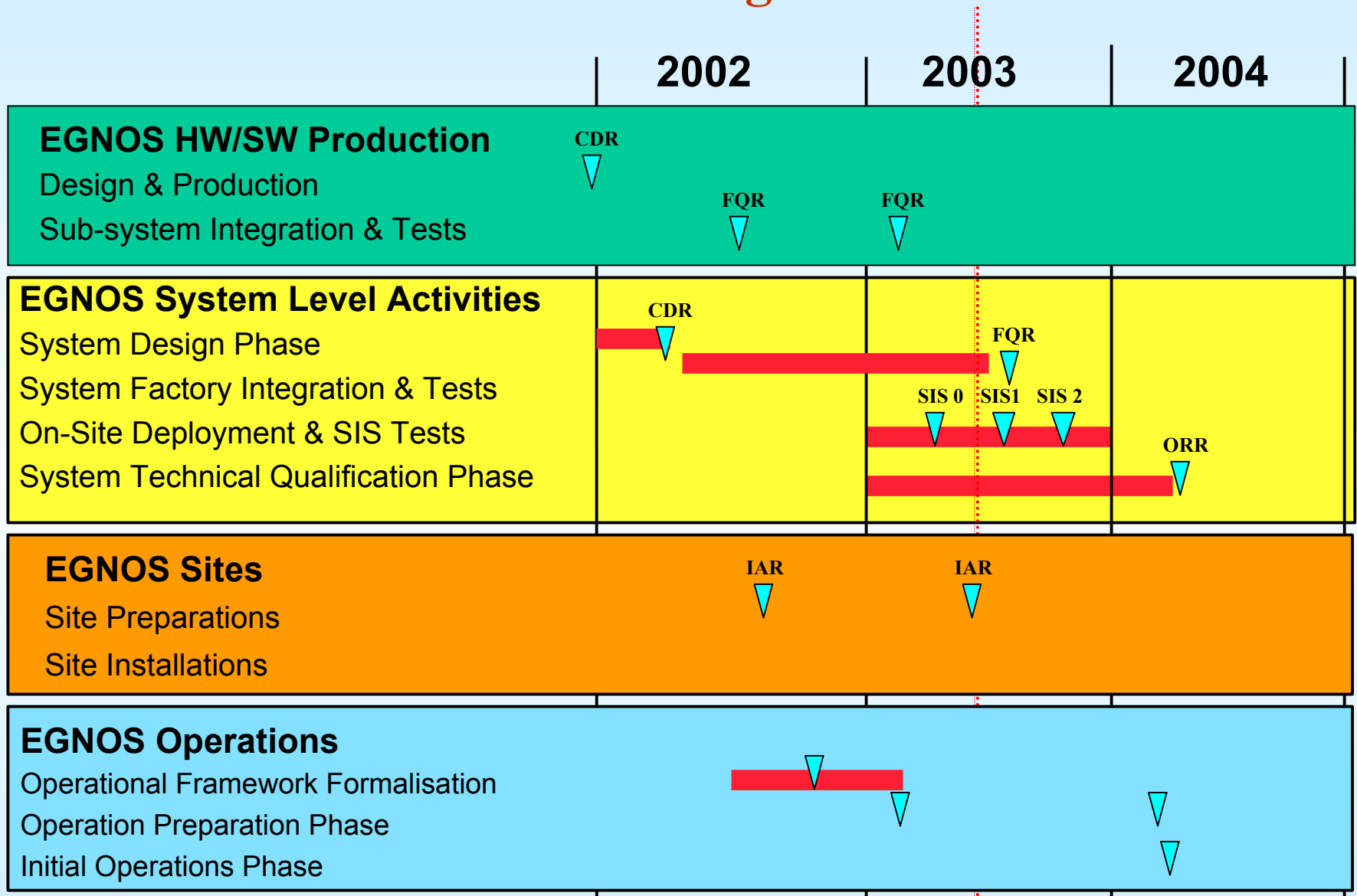
# EGNOS Implementation Partners



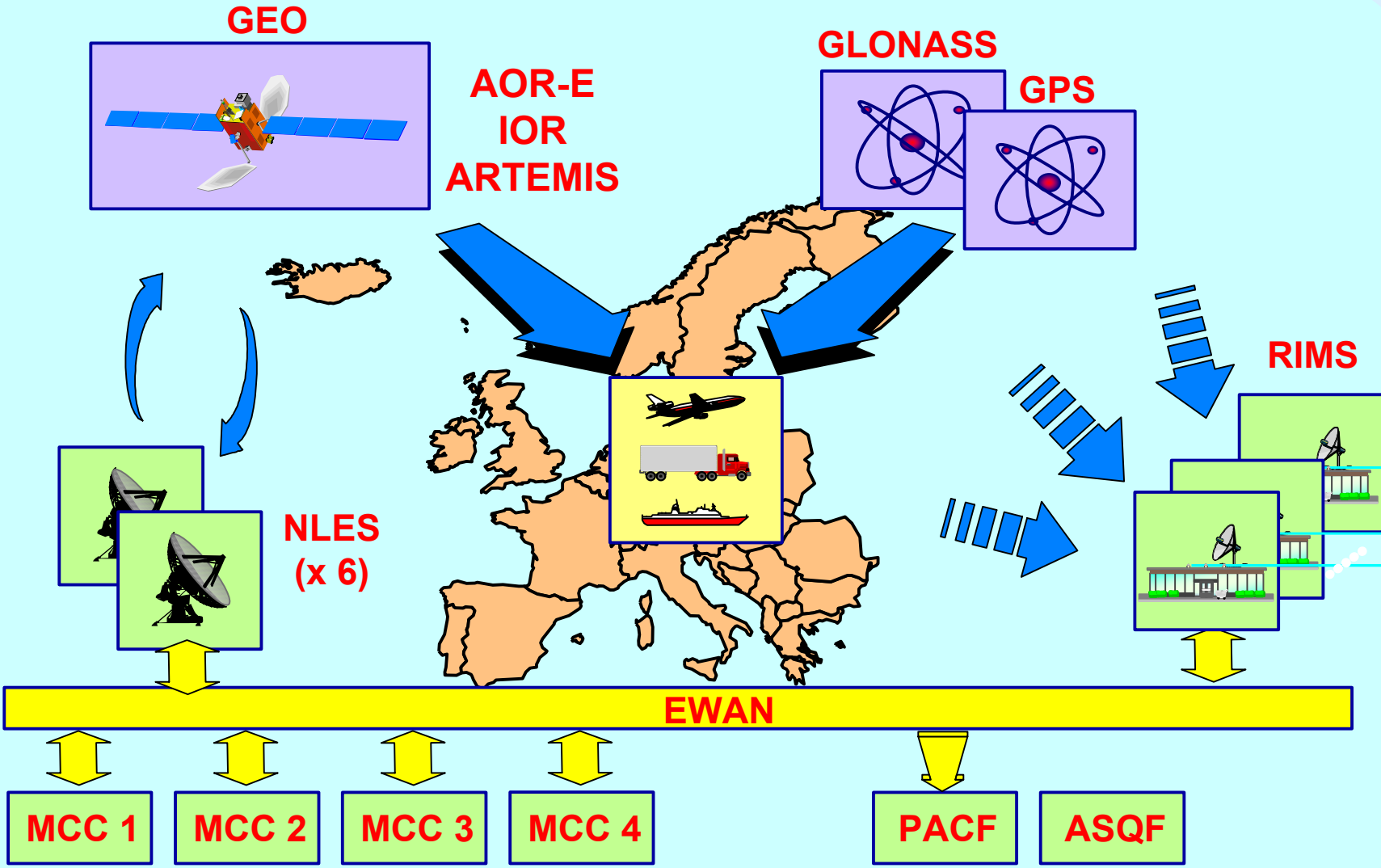
# EGNOS INDUSTRIAL CONSORTIUM (II)



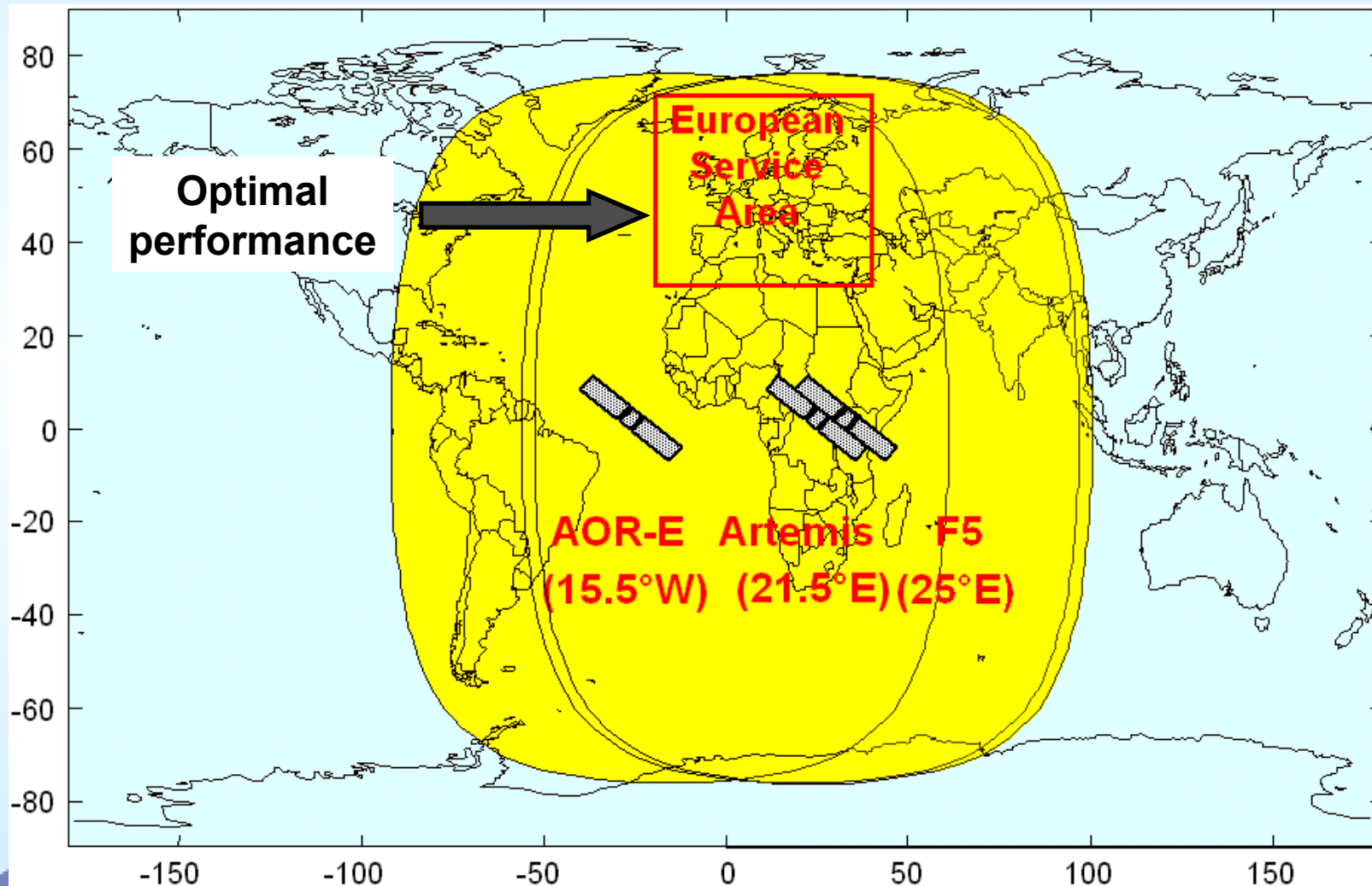
# EGNOS AOC Program Status



# EGNOS AOC Architecture



# Space Segment: The three GEOs provide triple coverage over Europe, the Mediterranean and Africa





# EGNOS Ground Segment Development

EGNOS Ground Segment is made of

- Four Mission Control Centers,
- Collecting data from 34 Reference Stations (called RIMS) Sites,
- Feeding Six Land Earth Stations (2 x GEO)
  - Broadcasting EGNOS Messages to users via 3 GEO Satellites

# Central Processing Facility

- The « brain » of EGNOS
- Installed in Mission Control Centers
- Perform all real time processing and checks
- The more complex sub-system - 19 Computer Boards
- Excellent technical Progress
- Lead Contractors:  
Alcatel (F), GMV (E), IFEN (D)



# Central Command Facility (CCF)

- The « arms » of EGNOS
- Perform Monitoring and Command of all EGNOS Elements
- To equip each Mission Control Center
- Lead Contractor: Alenia (I)



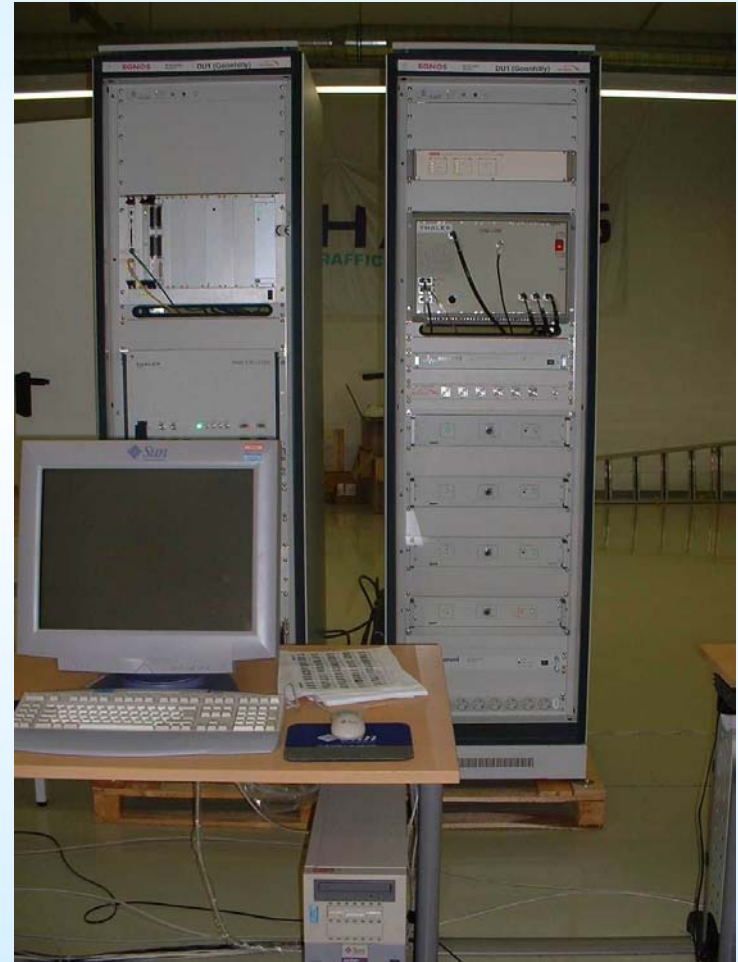
# Ranging and Integrity Monitoring Stations

- 34 « eyes » for EGNOS
- Three branch (A/B/C)
- Made of GPS receiver, Atomic clock, core computer
- Main contractors:
  - Branch A: Indra (E) / Thales (F)
  - Branch B: Alenia (I) / Laben (I)
  - Branch C: Thales(UK) / Novatel (C)



# Land Earth Station equipment

- The « mouth » of EGNOS
- To equip 6 RF GEO uplink Stations
- Broadcast EGNOS Messages to GEOs
- Lead Contractor: Astrium (D)





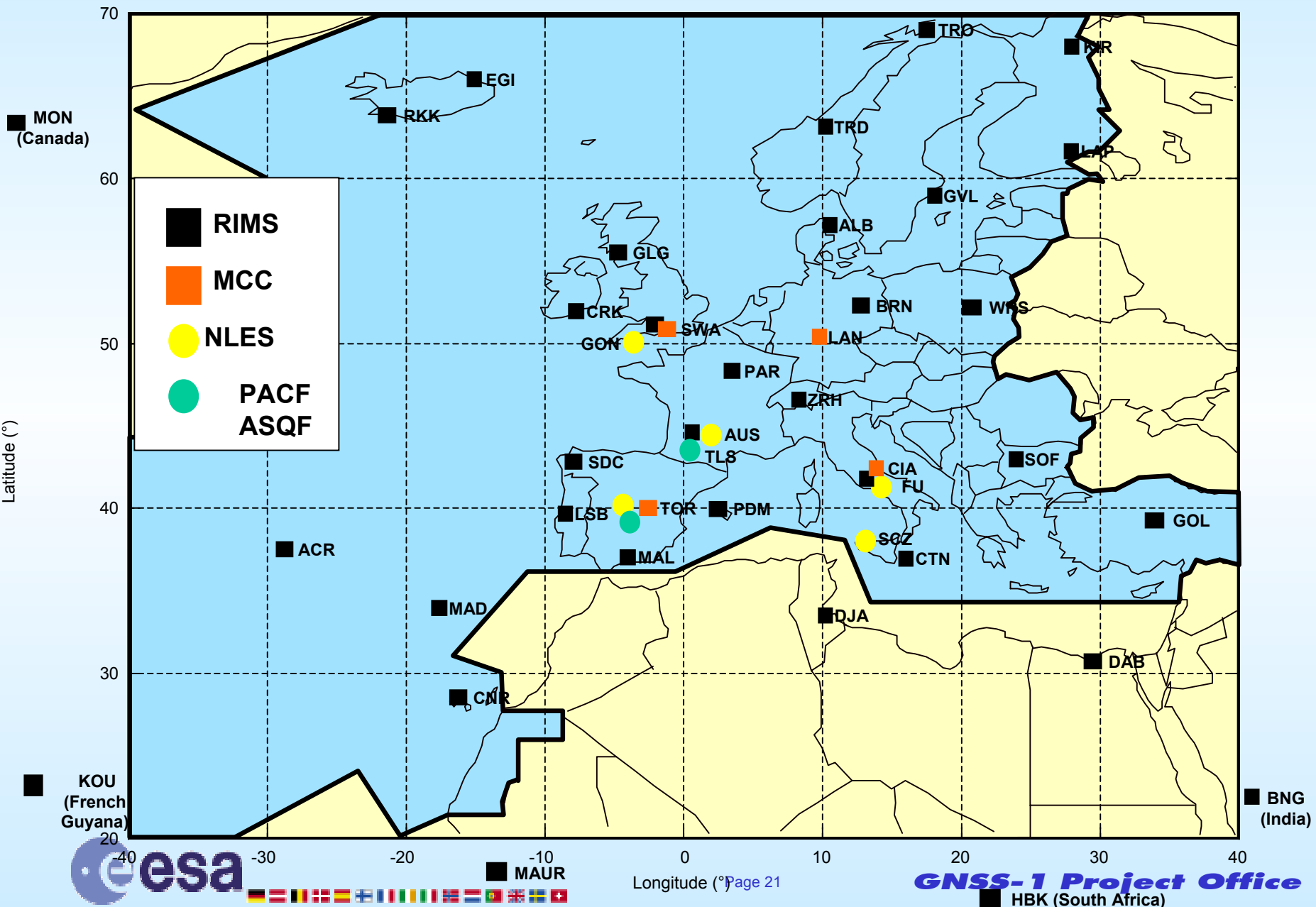
# EGNOS System Integration in Langen



- All EGNOS Hardware in Factory since Sept 2002
- System Functional Verification Tests on-going
- Lead AIV contractor: Thales ATM (D)



# EGNOS Deployment



# EGNOS Monitoring Station Sites

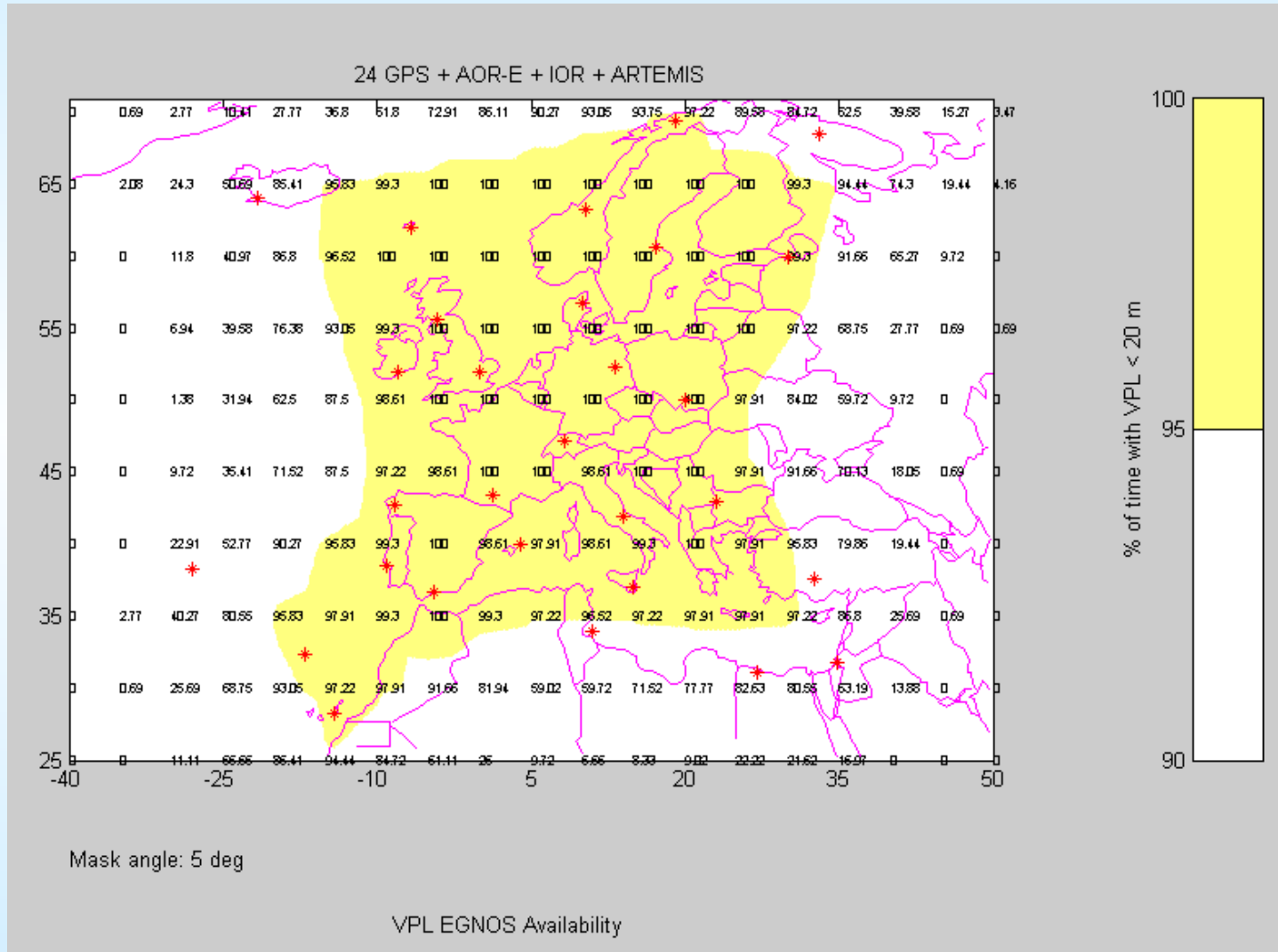
- Each RIMS site has been surveyed wrt Electromagnetic Interference & Multipath environment
- Most sites confirmed suitable for EGNOS



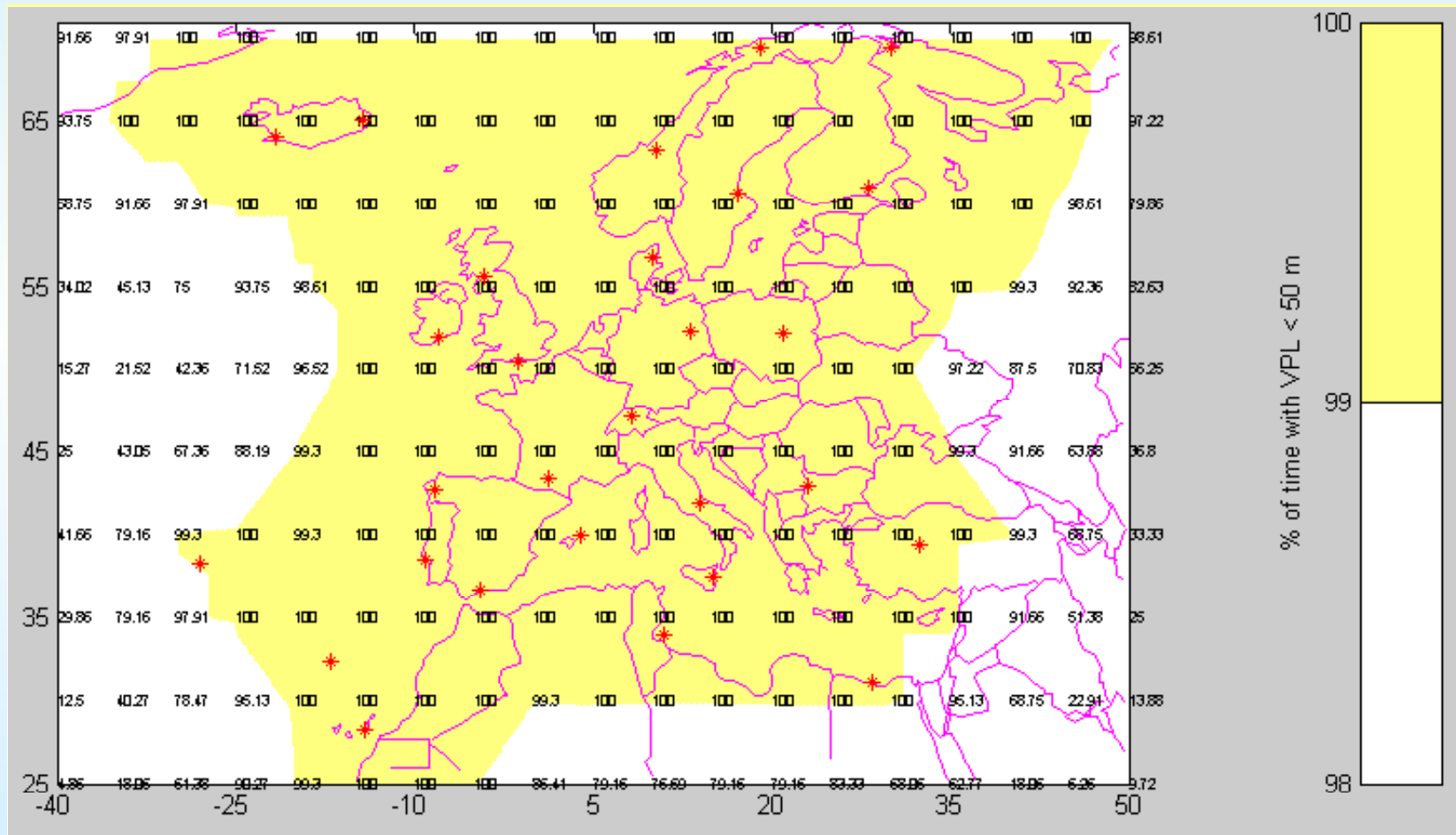
# EGNOS System Signal Availability

- **First EGNOS Signal in Space SIS-0 achieved !**
  - started in April 2003, on Ind-W Inmarsat Satellite
  - Integration Test signal, not yet useable for users
- **Stepped SIS improvement via SIS-1 (August 03) and SIS-2 (November 03) as EGNOS System is deployed**
  - Addition of AOR-E and Artemis broadcasts
  - System behaviour stabilization via planned SW releases
- **Target EGNOS Signal available in early 2004**
  - Directly useable by non-safety of life Applications
  - To initiate Operational Validation Phase until Certification for safety of Life user by 2006

# EGNOS APV-2 (VAL=20m) availability performances over ECAC



# Expected coverage for an APV-1 service (equivalent to the current WAAS)



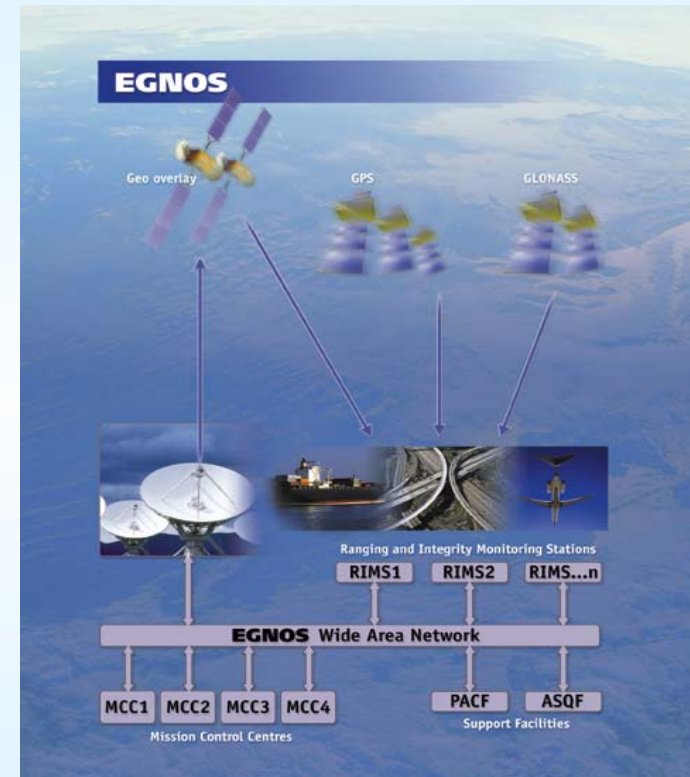
# Possible EGNOS Evolutions: Context

- On-going International Standards efforts towards SBAS L5 service definition in 2004.
- GEOs with L1/L5 capability will be available in Europe in 2004
- GPS modernization program: First GPS IIR-M (L2C) in 2003. 50% constellation in 2006. First GPS IIF (L5) in 2005.
- WAAS evolution plans (WAAS FOC)
- EGNOS integration into GALILEO (e.g. combined services)
- European strategy to provide GNSS services outside Europe (e.g. MEDA, Africa, etc)



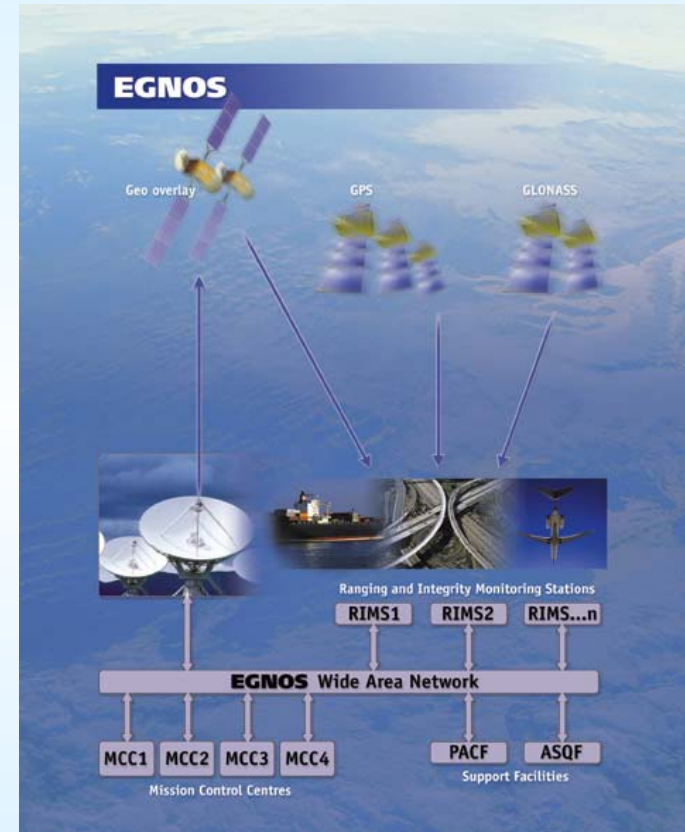
# In response to the new Mission Requirements EGNOS V2 (2004/ 2008) could ... (I)

- Incorporate additional Expansion and Interoperability message
  - Type 28 as done by WAAS/MSAS.
  - Message Type 0/2 WAAS
- Provide SBAS service on L1 and L5 frequencies
  - full robustness to L1 loss/interference
- Include additional RIMS
  - for Service coverage expansion area
- Include additional GEOs



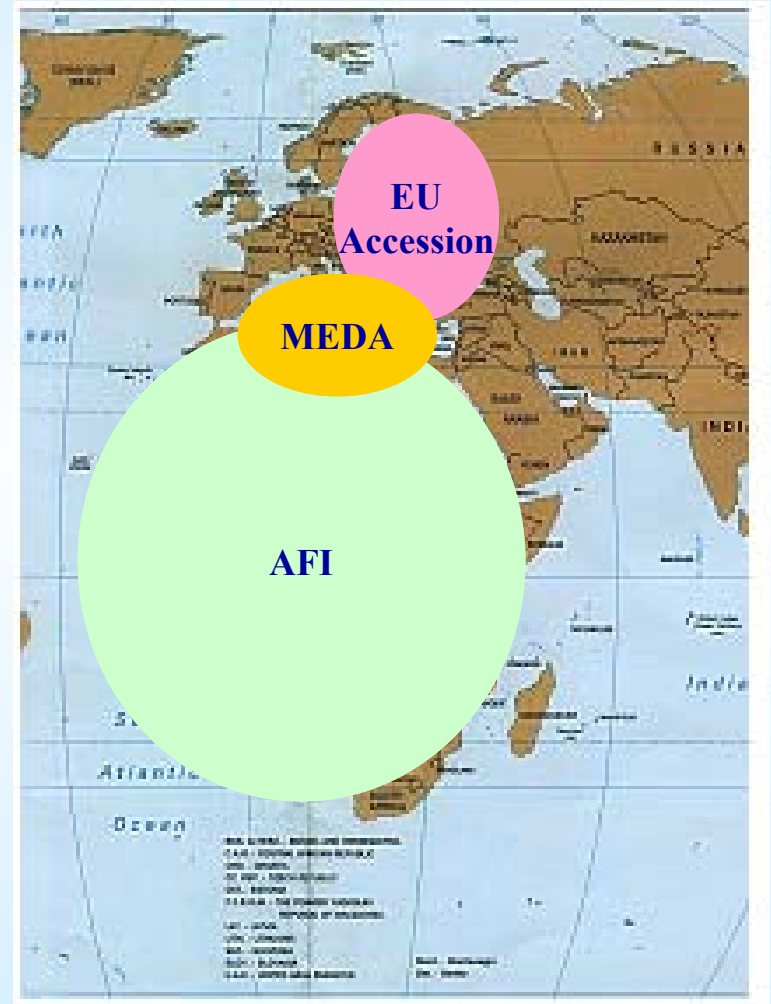
# In response to the new Mission Requirements EGNOS V2 (2004/ 2008) could ...(II)

- Adapt Ranging Stations to GPS L2C
  - further robustness to interference, iono scintillation and improved coverage
- Provide additional EGNOS services
  - provision through non-GEO means
- Be implemented gradually
  - without EGNOS service interruption.
  - Ensuring backwards compatibility



# Potential EGNOS Service Coverage Extensions

- Thanks to built-in expansion capabilities, EGNOS service can easily expand coverage area via simple addition of extra Monitoring Stations



# SUMMARY: EGNOS Signals soon available to users

- EGNOS Implementation Phase close of completion (SIS 1 with 15 reference stations in August 2003)
- EGNOS Signals available to users from 2004 onwards (15 years design life)
- EGNOS is sole source of advanced pan-european GNSS Services in 2004-2009 timeframe
- EGNOS confirmed as first step to Galileo and part of the European GNSS Strategy
- EGNOS will follow WAAS and International standards evolution





A collage image featuring a satellite in space, a globe, a commercial airplane, a truck, and a ship, with a large yellow text overlay. The satellite is at the top, with a large black dish and purple solar panels. The globe is in the center, showing a yellow and orange color scheme. The airplane is on the right, flying over the globe. The truck is on the bottom left, and the ship is on the bottom right. The text "Thank you for your attention" is written in yellow across the center of the image.

Thank you for your attention