ESSP

EGNOS

# EGNOS Programme and System

## ESESA Aviation Workshop

## 26th - 27th October 2010

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2. EGNOS System

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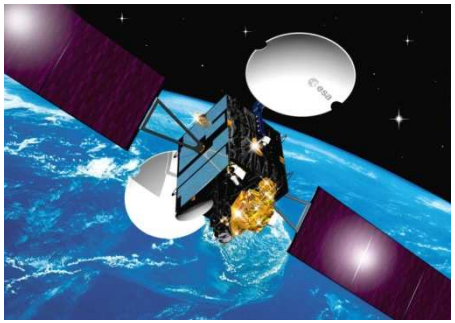
4. EGNOS Programme evolutions

# 1. Introduction to EGNOS Programme



# EGNOS foundations

EGNOS foundations

2/3

(ETG)
European Tripartite Group

1/3

(EOIG) Egnos Operators
and Infrastructure Group

esa

ESSP

Air traffic service providers

Aena

DFS Deutsche Flugsicherung

ENAV

NATS

NAV

skyguide

Other organisations

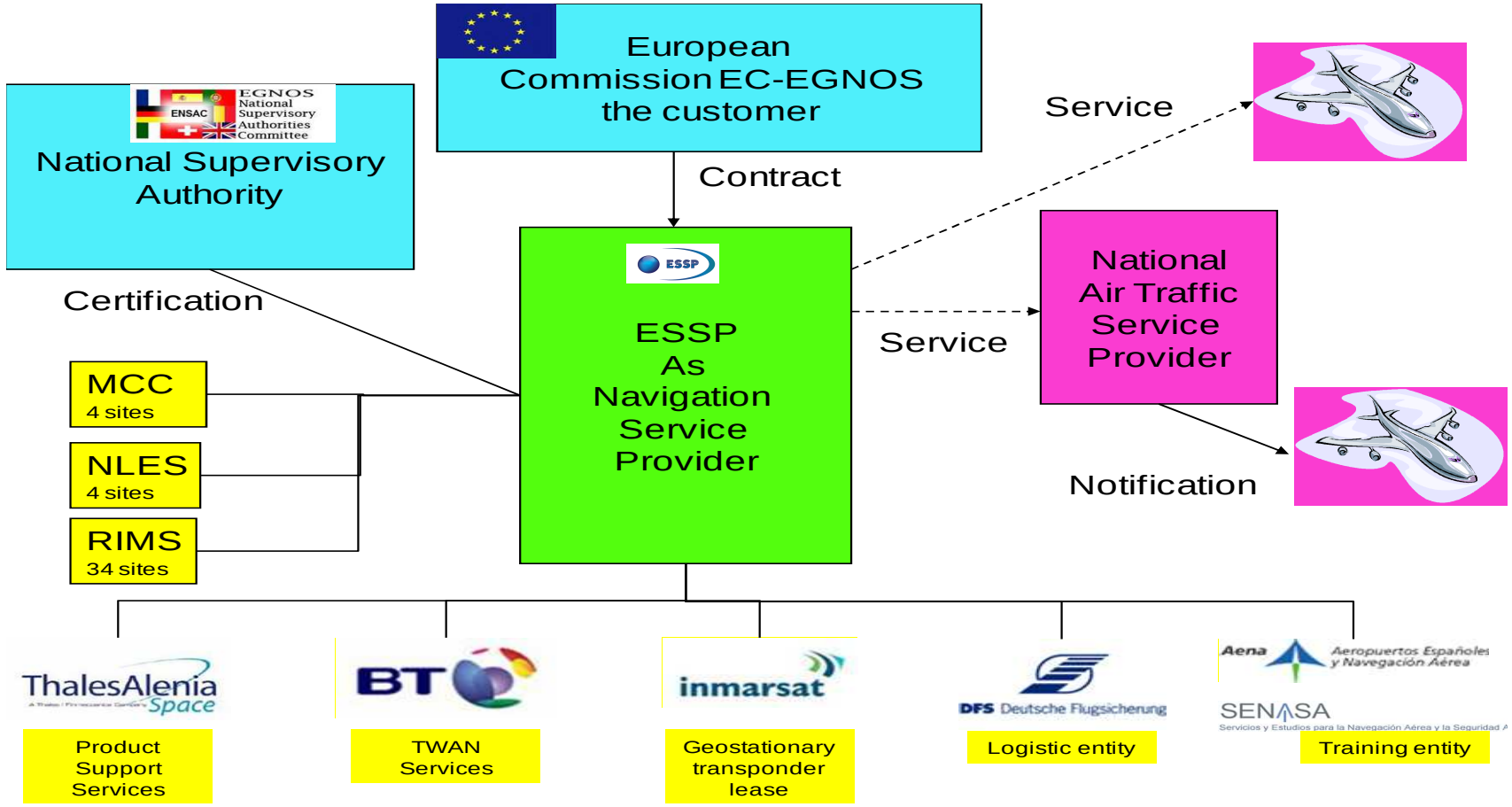
cnes

NOR EGIAN MAPPING AUTHORITY

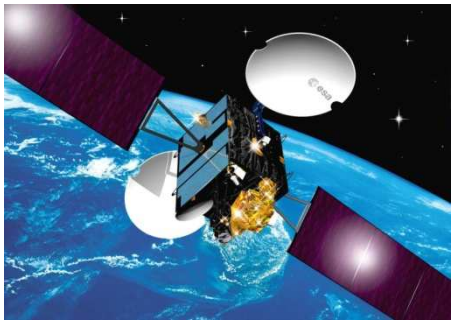
EGNOS

European Geostationary Navigation Overlay Service

# EGNOS
# (Actors, Roles & Responsibilities)



# 2. EGNOS System



EGNOS

# What is EGNOS?

EGNOS = *European Geostationary Navigation Overlay Service*

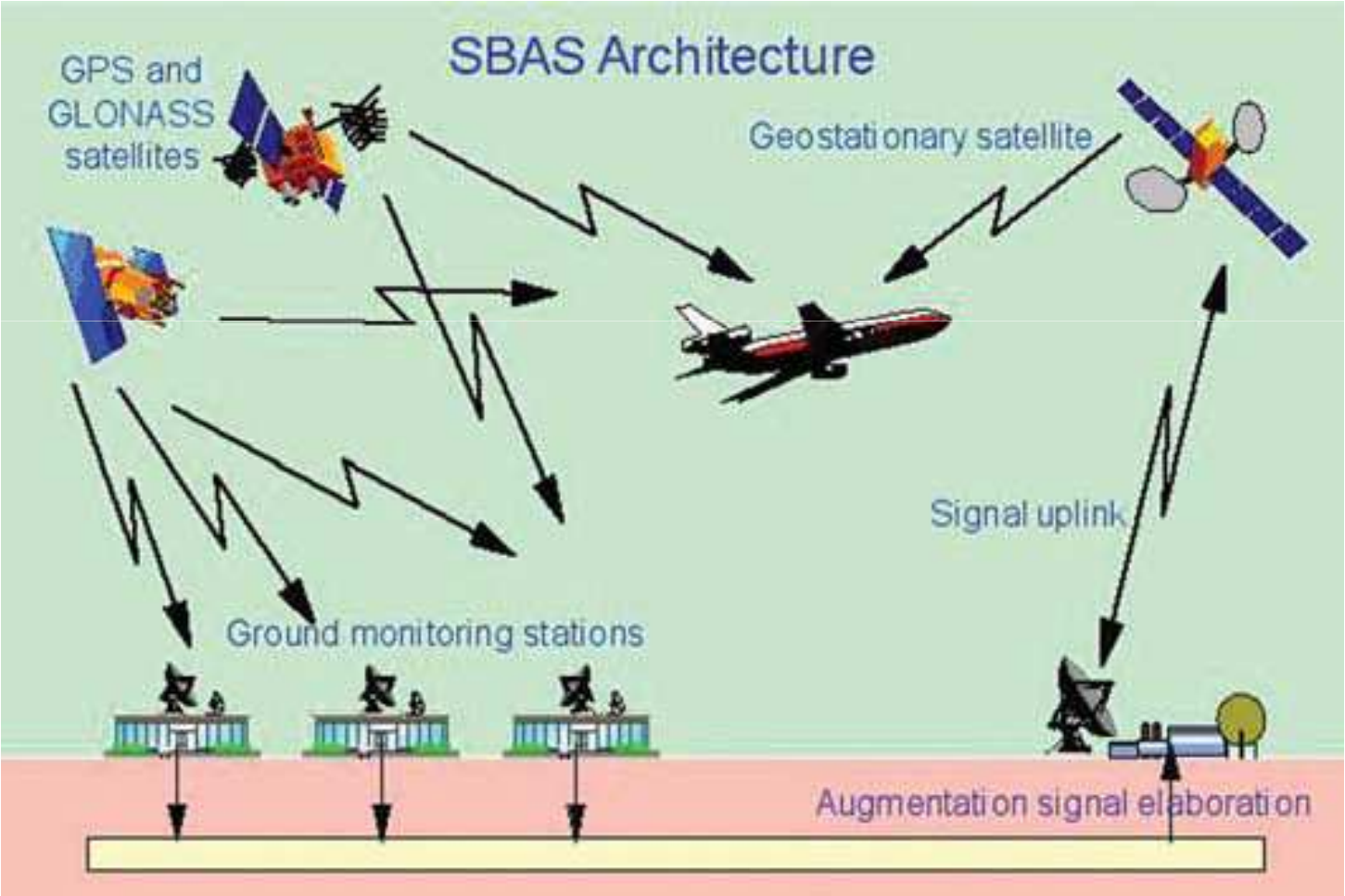
EGNOS is the European Satellite Base Augmentation System (SBAS)

EGNOS “augment” the GPS L1 signal

**Accuracy** of positioning is improved up to 1 and 2 meters

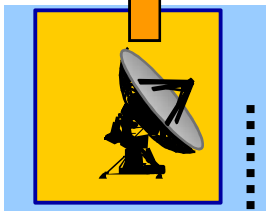
**Integrity** and safety is improved by broadcasting alerts within a few seconds of the occurrence of a failure in GPS and by providing a level of confidence on the position computation with EGNOS

# EGNOS Basis


SBAS Architecture
GPS and
GLONASS
satellites
Geostationary satellite
Signal uplink
Ground monitoring stations
Augmentation signal elaboration

# EGNOS elements

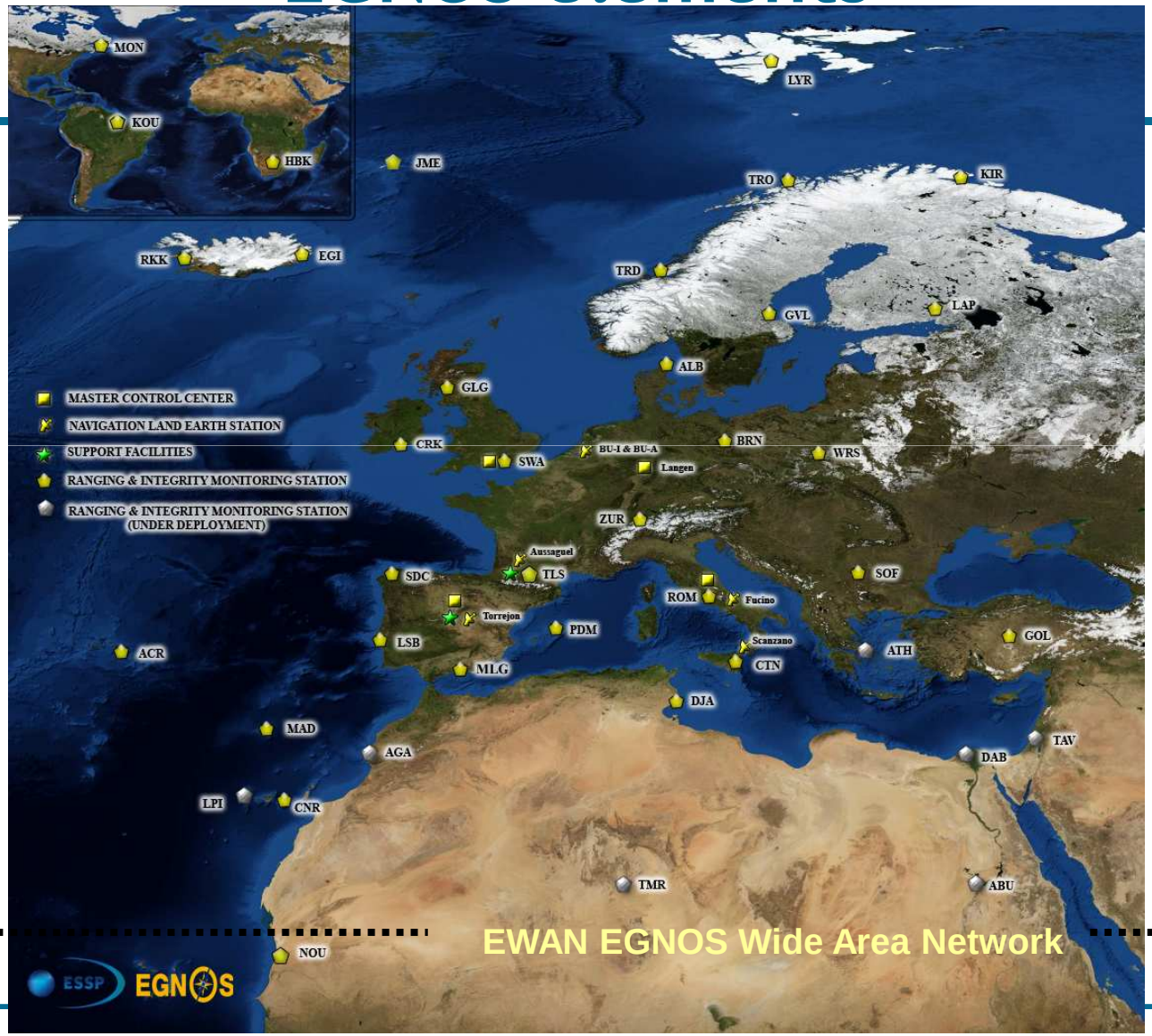
3 Satellites EGNOS



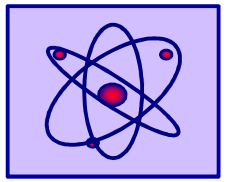
6 NLES Navigation Land Earth Stations

4 MCC Mission Control Centers

2 Support Facilities



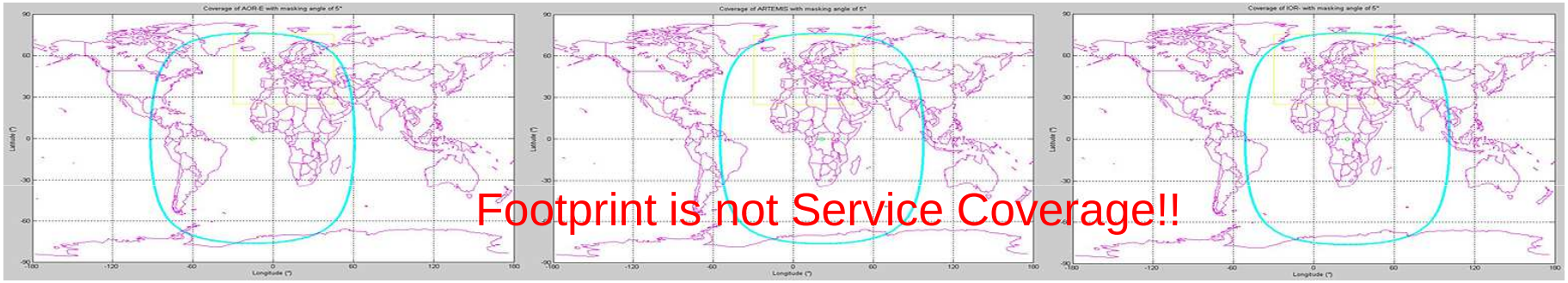

GPS



34 RIMS + 7 under deployment

# EGNOS
# Space Segment

3 Geostationary Satellites




**PRN120** Inmarsat AOR-E

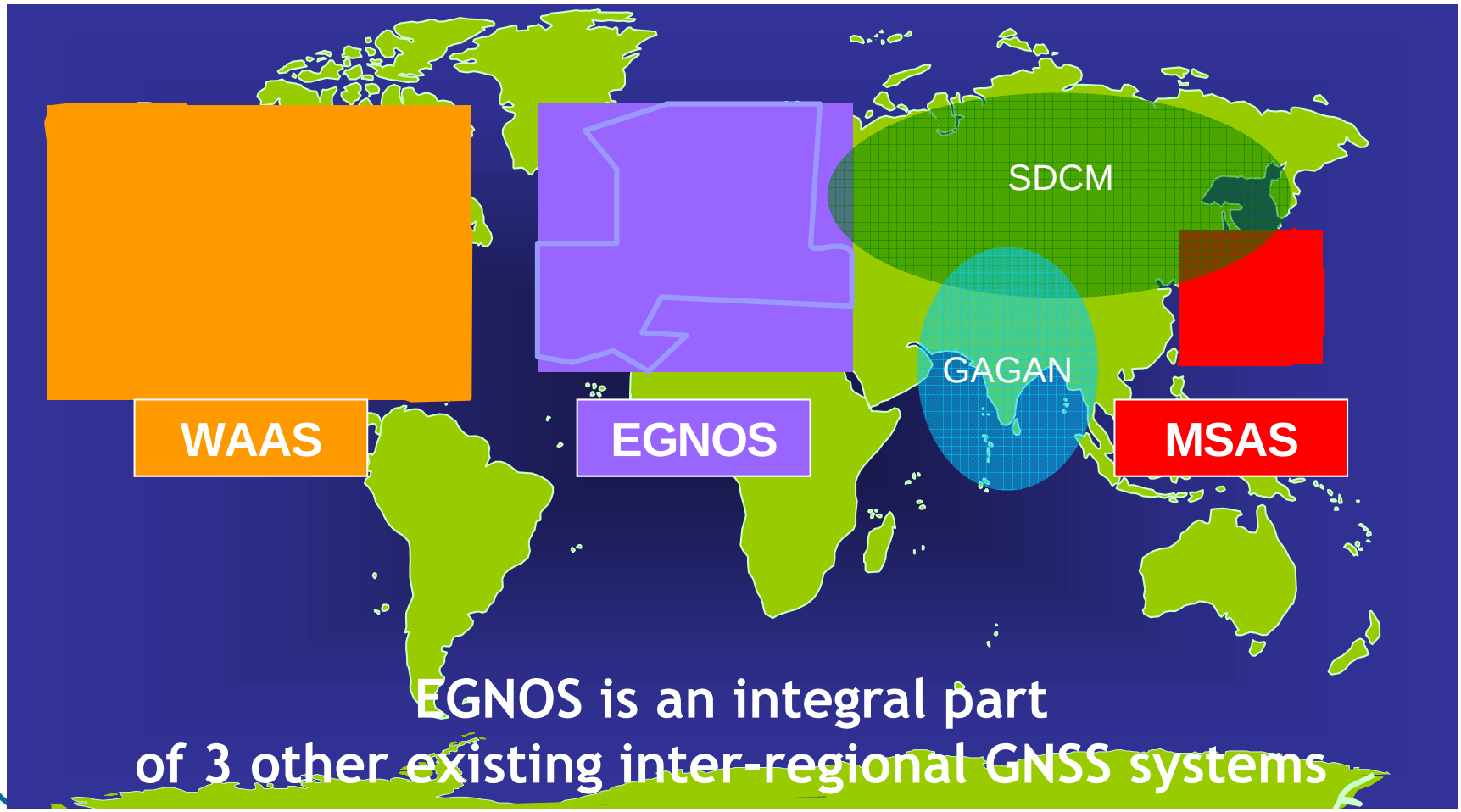
**PRN124** ESA Artemis

**PRN126** Inmarsat IOR-W

- PRN120 and PRN124 broadcast EGNOS messages
  - Operational signal (test mode), since July 2006
  - Broadcast EGNOS messages **MT0** usable by non-SoL users

- PRN126 is used by industry for EGNOS System Releases tests

# EGNOS Service Coverage

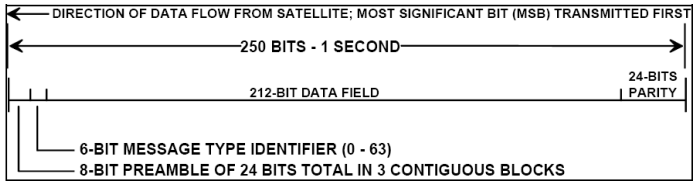


# EGNOS Signal-In-Space Message Type 0

## Message Type 0 *(Don't Use for Safety Applications message)*

Message currently transmitted by the EGNOS Signal in Space

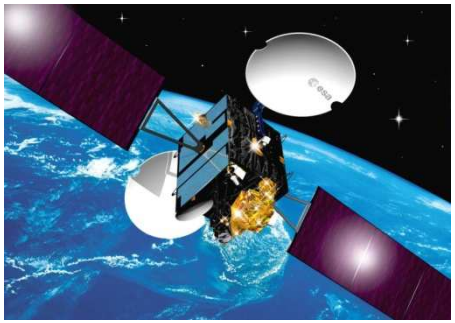
**When the Message Type 0 is on, EGNOS can not be used** for Safety of Life applications and therefore is not usable **for aviation**.




| Type | Contents |
|---|---|
| 0 | Don't use for safety applications (for SBAS testing) |
| 1 | PRN Mask assignments, set up to 51 of 210 bits |
| 2 to 5 | Fast corrections |
| 6 | Integrity information |
| 7 | Fast correction degradation factor |
| 8 | Reserved for future messages |
| 9 | GEO navigation message (*X*, *Y*, *Z*, time, etc.) |
| 10 | Degradation Parameters |
| 11 | Reserved for future messages |
| 12 | SBAS Network Time/UTC offset parameters |
| 13 to 16 | Reserved for future messages |
| 17 | GEO satellite almanacs |
| 18 | Ionospheric grid point masks |
| 19 to 23 | Reserved for future messages |
| 24 | Mixed fast corrections/long term satellite error corrections |
| 25 | Long term satellite error corrections |
| 26 | Ionospheric delay corrections |
| 27 | SBAS Service Message |
| 28 | Clock-Ephemeris Covariance Matrix Message |
| 29 to 61 | Reserved for future messages |
| 62 | Internal Test Message |
| 63 | Null Message |

EGNOS SIS Message Types

# 2. EGNOS Services



# EGNOS Services

## EGNOS Open Service (OS)

Service Declaration: 1st October 2009

Target: mass market applications

Service Definition Document available

http://www.essp-sas.eu/docs/printed_documents/egnos_sdd_os_v1.pdf

## EGNOS Safety-of-Life (SoL) Service

Service Declaration: Planned Oct/Nov 2010

Target: civil aviation

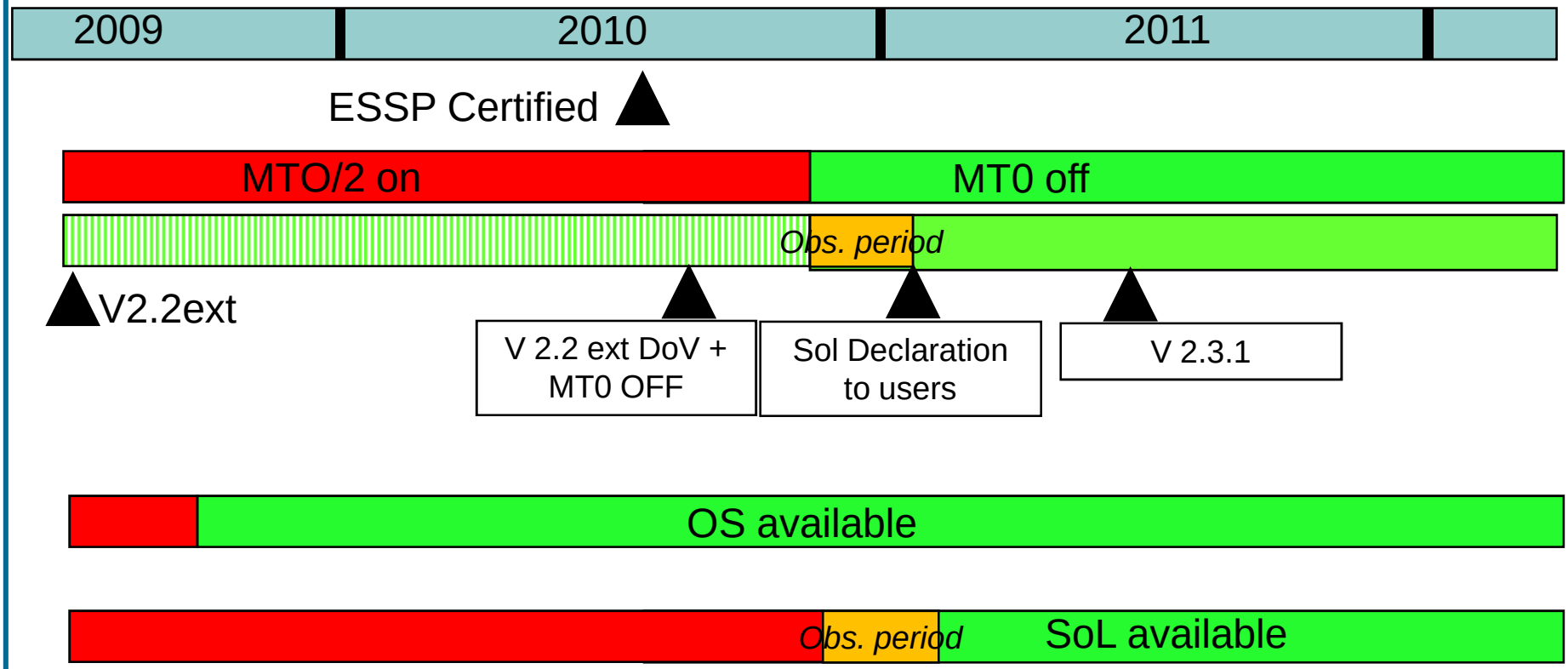
## Commercial Data Distribution Service (CDDS)

Target : application development

Future CDDS under definition by GSA & EC

CDDS expected to be available in 2011

# EGNOS Services Schedule



# EGNOS SoL: WHY ?
# Civil Aviation GNSS strategy

**11th ICAO ANC (2003):**

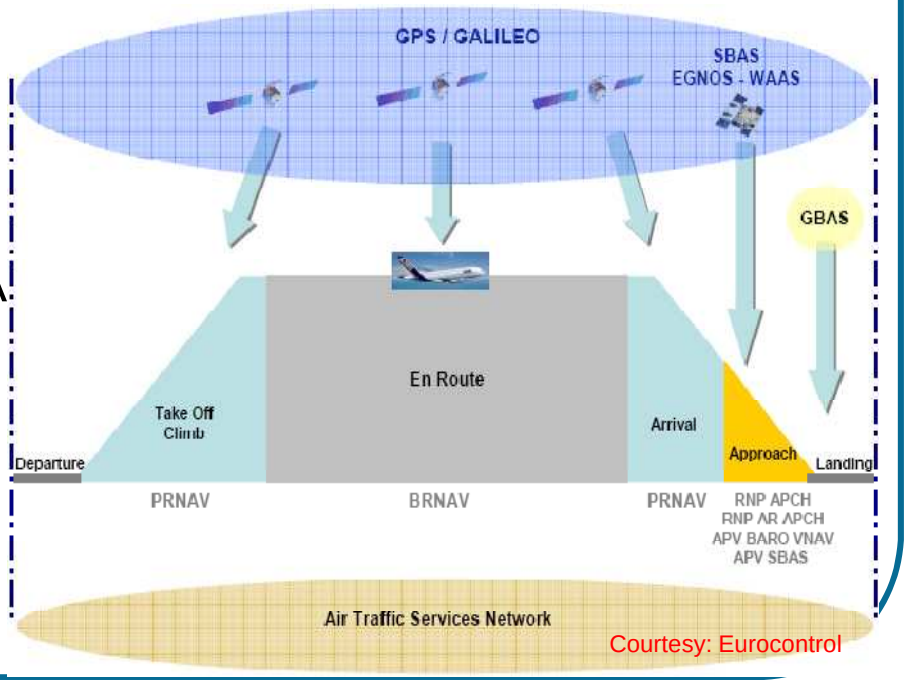
Aviation approach for GNSS:

Final Objective: If GNSS is the better solution with regard to safety and cost/benefit, it should be used as “unique navigation means” for all phases of flight.

**36th ICAO Assembly (2007):**

Implementation of RNAV and RNP ops for en-route and TMA

Implementation of APV (Baro-VNAV and/or SBAS) in every IFR runway in 2016




Courtesy: Eurocontrol

# Advantages of EGNOS for Aviation

EGNOS Safety-of-Life Service is an enabler for Approach with Vertical Guidance (APV) and provides both, lateral and vertical guidance, with the following identified benefits:

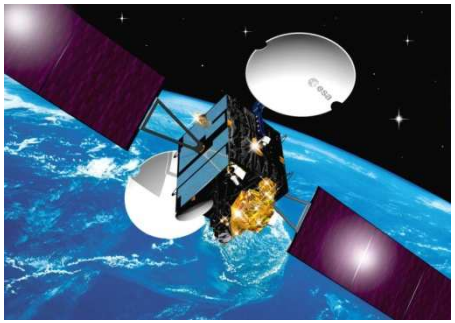
- Reduce decision height Minima:
  - APV SBAS (GPS + EGNOS): 250 ft
- Safety increase by providing vertical guidance during approach (statistics show that a high proportion of accidents due to Controlled Flight Into Terrain (CFIT) occur during Non-Precision Approach (NPA)).
- Increased accessibility with lower minima, making landings possible with lower visibility levels at airports not already equipped with ILS or during ILS outages.
- More flexibility in procedure design:
  - Curved/segmented precision approaches possible with time and fuel savings, and environmental benefits from reduced noise impact and avoidance of high-density populated areas during approach.
  - Possibility to exploit different approach angles for wake-vortex avoidance.
- Limited impact on user avionics:
  - Software upgrade of avionics receiver. Receivers are currently available.
  - Utilization of the same frequency as GPS.
  - Limited impact on the Flight Management System (FMS) related to the enabling of APV operations.

# EGNOS SoL Service implementation

ESSP as a provider of the EGNOS SoL Service is based on:

1. ESSP Certification as ANSP and EGNOS system verification
2. Service agreements between the ESSP and the different European Air Navigation Service Providers (ANSPs)

# 2. EGNOS Programme Evolutions



# EGNOS System Releases

1. **ESRv2.2ext** : operational since November 2008
2. **ESRv2.3.1** : delivery by EC planned in Oct. 2010
   - Deployment : mid-2011
   - Contents : CPF upgrade + Inmarsat 4 GEO + Athens/Alexandria RIMS + CCF upgrade
   - ➢ Agadir/Abu Simbel/Tamanrasset RIMS
3. **ESRv2.4.1** : expected delivery end 2011
   - Deployment : mid-2012
   - Expected contents : RIMS-D, NLES New Generation, CCF Hardware & COTS, ASQF/PACF HW/SW
   - LPV200 & NOTAM tool ATC I/F
4. **ESRv2.4.2** : expected delivery end 2013

# Expected improvements

## **ESRv2.3.1** (operational mid-2011)

*Coverage Area extension*

*South ECAC (additional RIMS)*

*Northern ECAC (improved ionosphere monitoring)*

*Improved robustness (CPF upgrades)*

## **ESRv2.4.1** (operational mid-2012)

*Improved robustness & performance (resolution of obsolescence issues: RIMS-D, new NLES, CCF hardware)*

*Coverage Area extension*

*Improved level of service with LPV200*

*Improved NOTAM service*


Thank You!
ESSP
The EGNOS Services Provider

# Questions?