



# Status of Galileo and EGNOS

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ICG#7, Beijing

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European  
Commission



# Key achievement since the last ICG – four Galileo satellites launched!



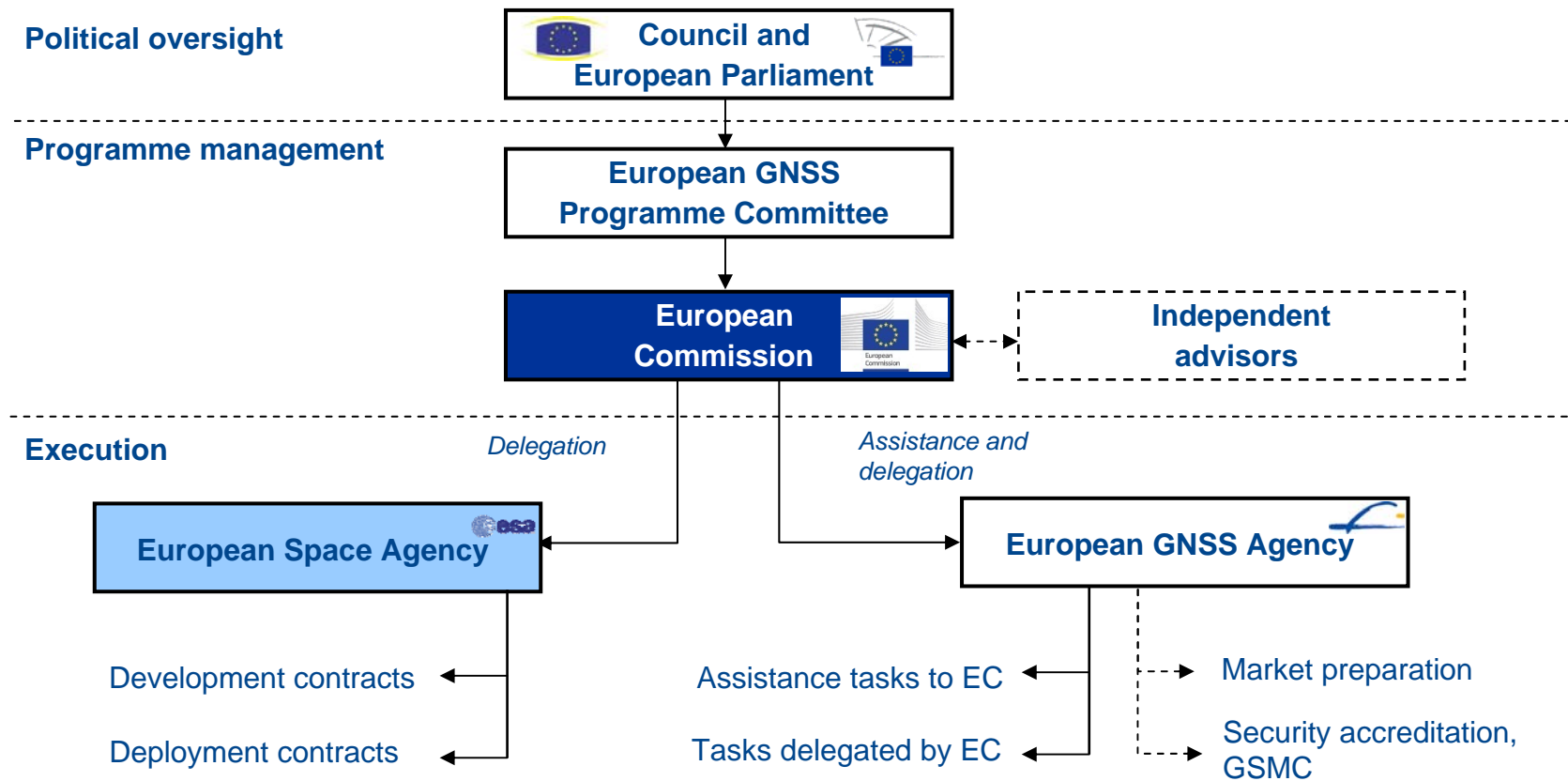
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- ★ **21 October 2011**, the first two operational satellites launched from Europe's Spaceport in Kourou, French Guiana
- ★ First Soyuz launch from French Guiana
- ★ **12 October 2012**, two further satellites launched from Kourou
- ★ All satellites successfully released into target orbits at 23,222 km
- ★ Operations nominal
- ★ 2005/08 GIOVE test satellites are retired
  - ★ Secured frequencies and tested key technologies



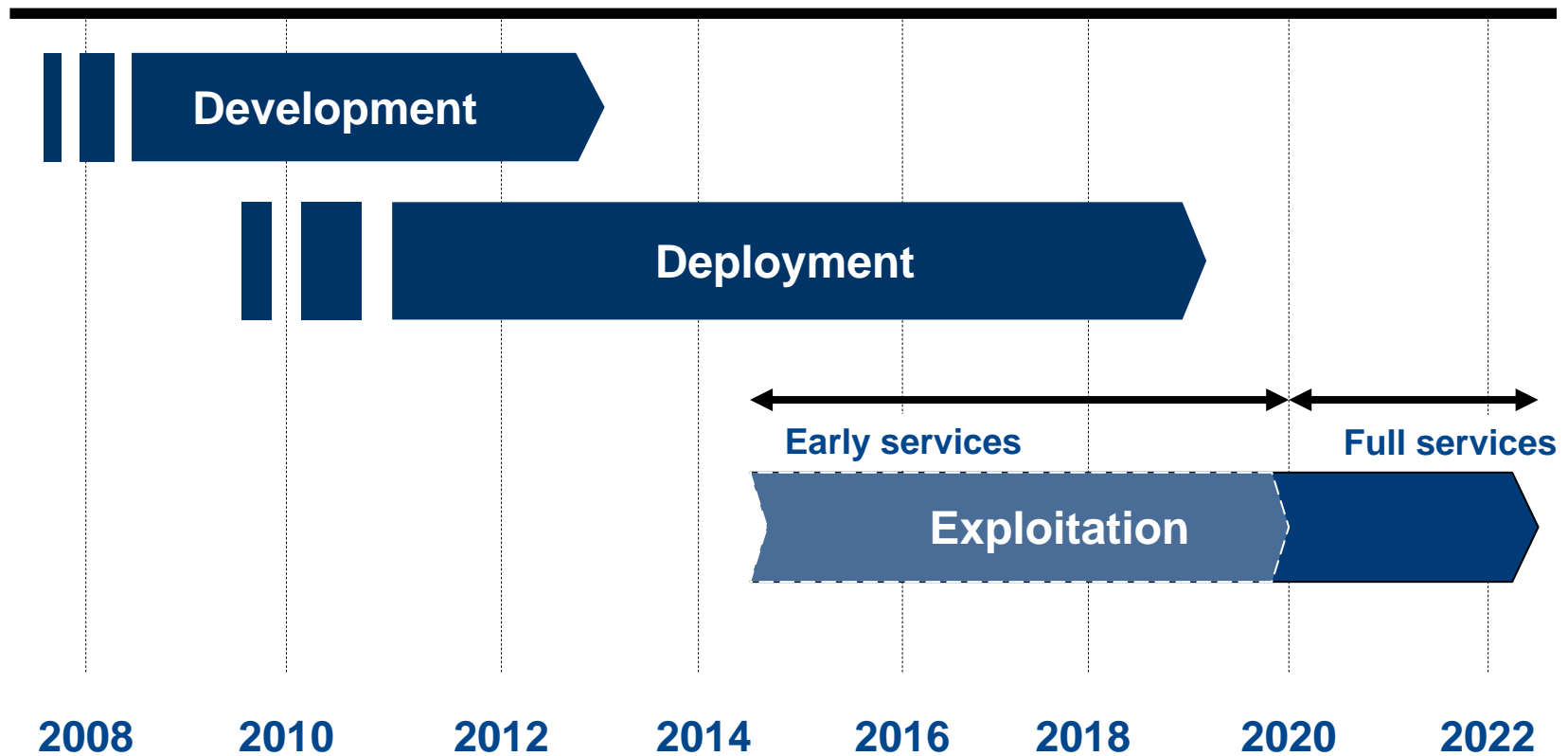
IOV: In-Orbit Validation  
Photos: ESA

## The GNSS Regulation entrusts the European Commission with the role of programme manager



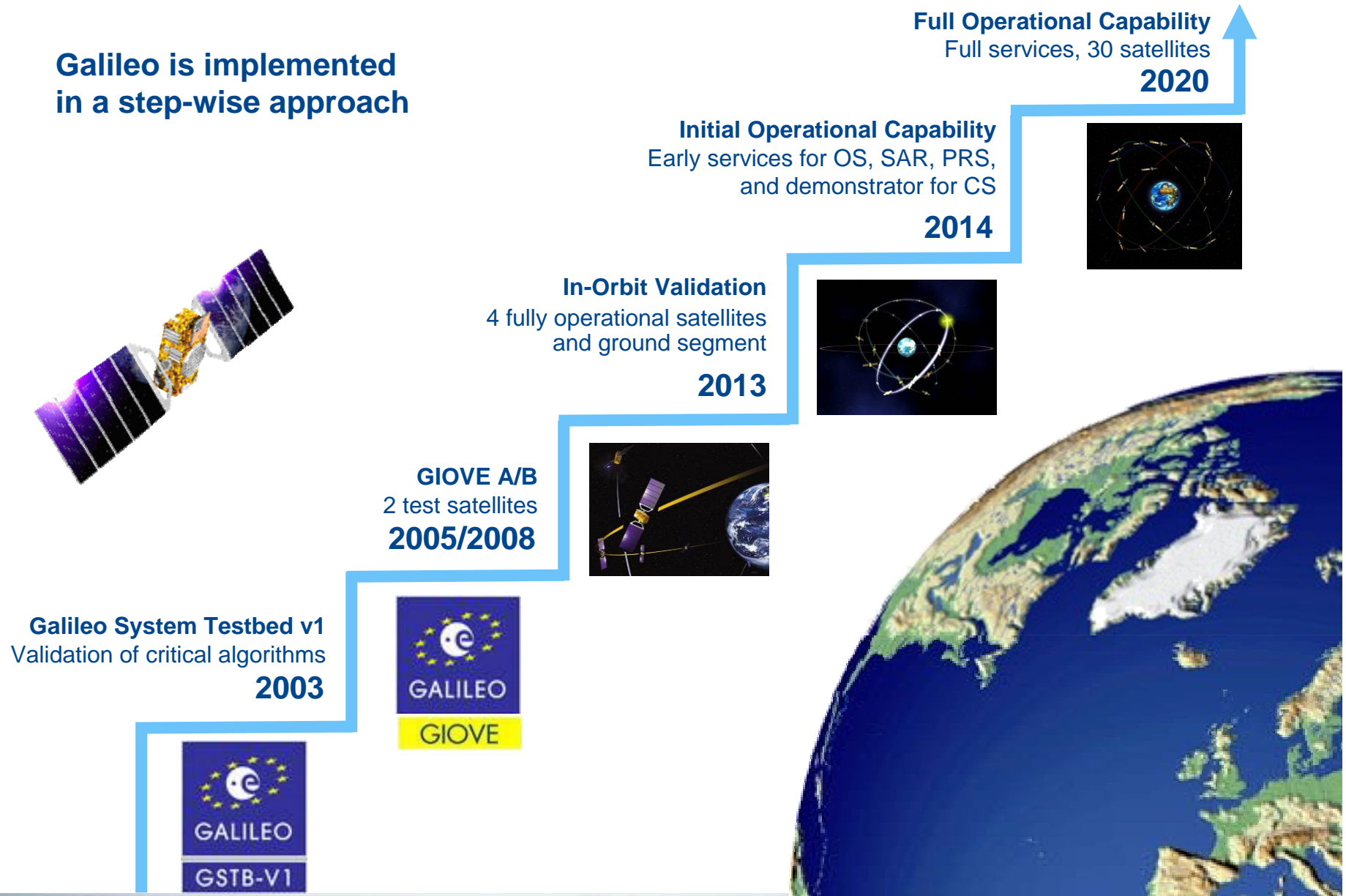
GSMC: Galileo Security Monitoring Centre

## Galileo is moving from the development phase to the deployment phase

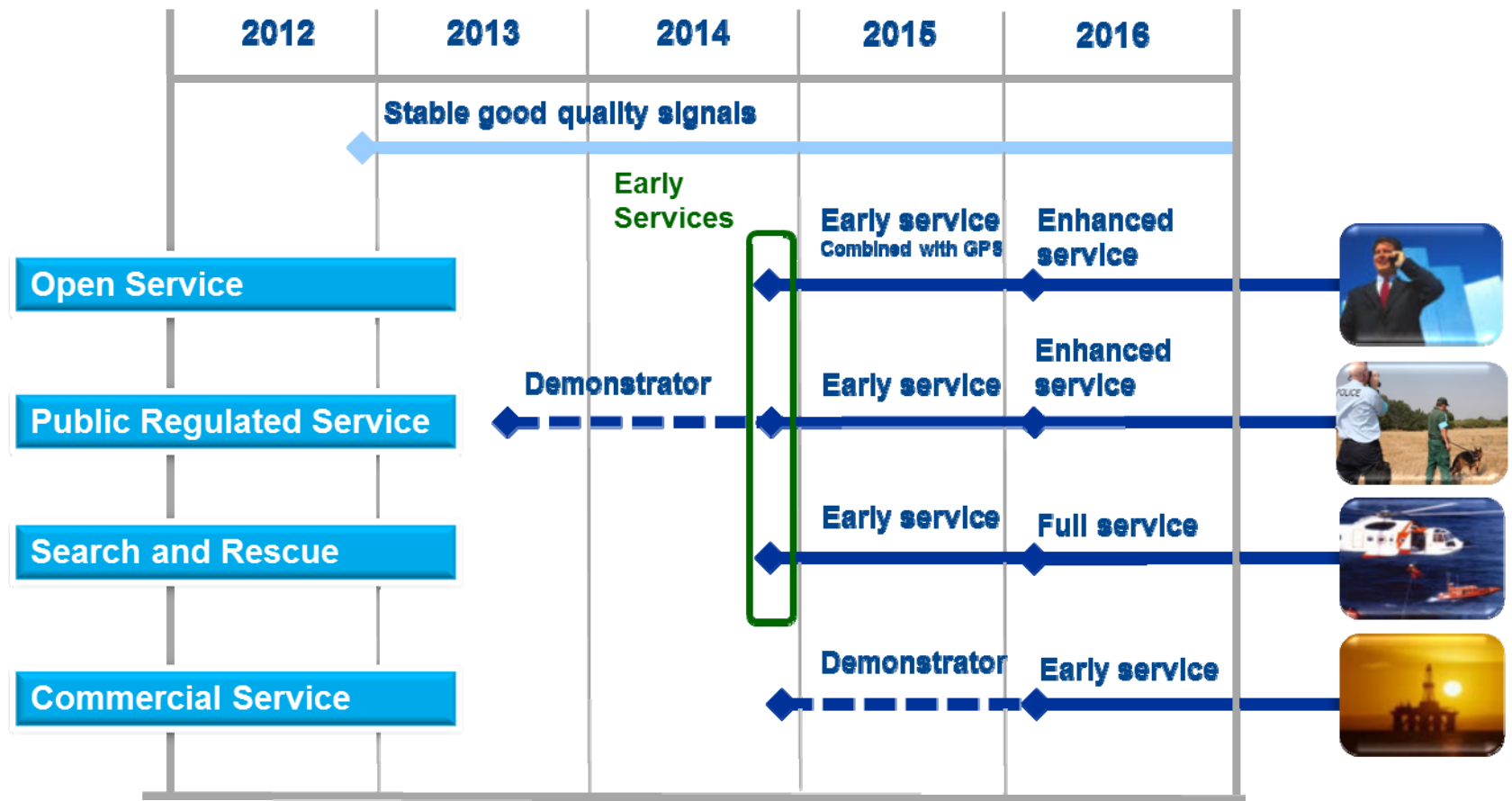


# Galileo implementation plan

**Galileo is implemented  
in a step-wise approach**



**Early services will be provided from 2014 with a gradual transition towards full services as more satellites become available**



## Early services for OS, SAR and PRS will be provided from 2014

<b>Open Service (OS)</b>	Freely accessible service for positioning, navigation and timing	
<b>Public Regulated Service (PRS)</b>	Encrypted service designed for greater robustness and higher availability	
<b>Search and Rescue Service (SAR)</b>	Assists locating people in distress and confirms that help is on the way	
<b>Commercial Service (CS)</b>	Delivers authentication and high accuracy services for commercial applications	

The former "Safety-of-Life" service is being re-profiled:

<b>Integrity Monitoring Service</b>	Provides vital integrity information for life-critical applications	
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**All six contracts awarded for: system support, ground segment, 22 satellites, ten satellite launches, and operations**

Work Package	Contract Signature Date	Contract awarded to
WP1 System Support	January 2010	<b>Thales Alenia Space</b> (Italy)
WP2 Ground Mission Segment	June 2011	<b>Thales Alenia Space</b> (France)
WP3 Ground Control Segment	June 2011	<b>Astrium</b> (UK)
WP4 Space Segment	January 2010 February 2012	<b>OHB System</b> (Germany) for 14 satellites <b>OHB System</b> (Germany) for 8 additional satellites
WP5 Launcher Services	January 2010	<b>Arianespace</b> (France)
WP6 Operations	October 2010	<b>SpaceOpal</b> (Italian-German joint venture)

WP: Work Package

## Several important ground installations have been set up around the globe



TTC Kiruna



GSS/ULS Papeete



GSS/ULS Svalbard



GSS Redu

TTC: Telemetry, Tracking and Command  
Photos: ESA

GSS: Ground Sensor Station

ULS: Uplink Station

## As remote as it gets... Jan Mayen Island



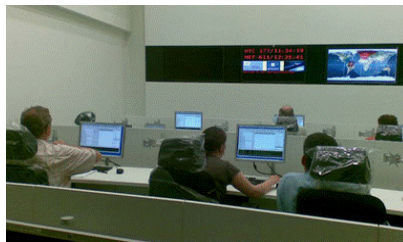
Photos: ESA

# Galileo ground segment for IOC



Note: Target set-up for IOC. Not all facilities are shown. USNO to host the Galileo to GPS time offset facility. IOC: Initial Operational Capability

## The two Galileo Control Centres control the satellites and manage the navigation mission



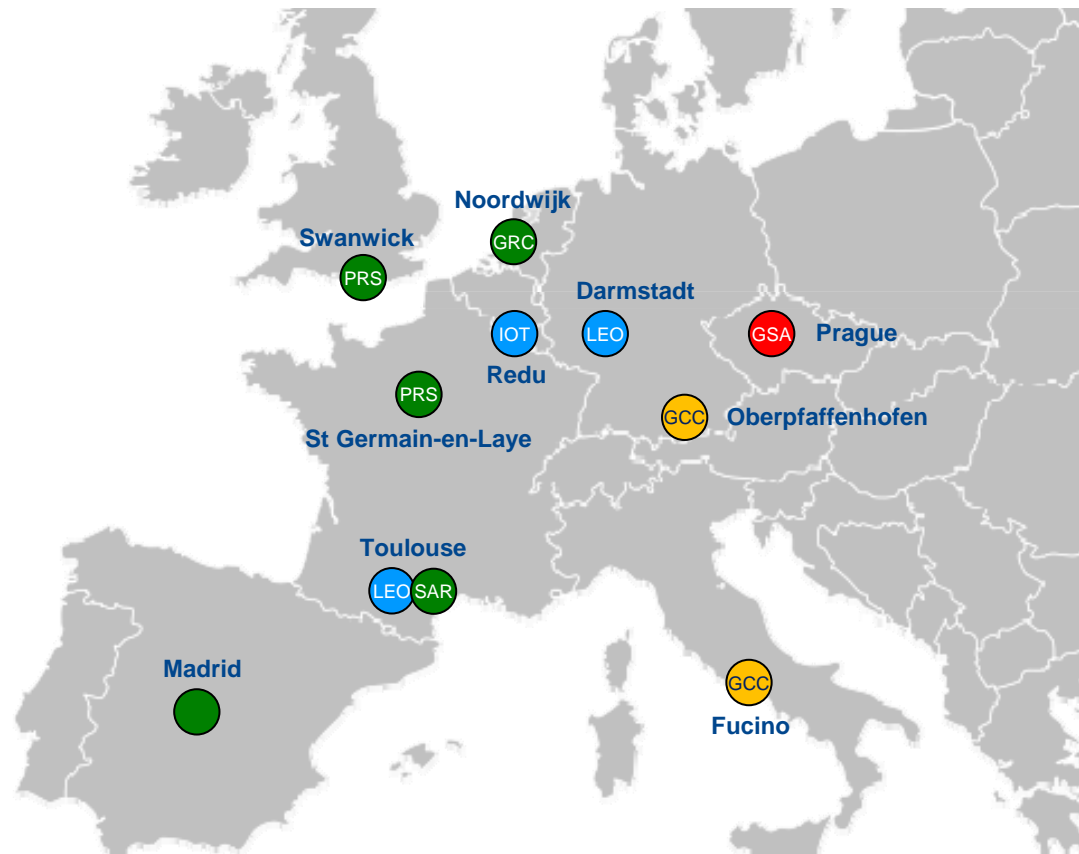
Oberpfaffenhofen, Germany



Fucino, Italy

Photo: ESA

## Major Galileo centres and facilities are being built throughout Europe



- GSA** European GNSS Agency
- GCC** Galileo Control Centre
- IOT** Galileo In-Orbit Testing Centre
- LEO** LEOP Centre
- GRC** Galileo Reference Centre
- PRS** Galileo Security Monitoring Centre (PRS)
- GSC** Galileo Service Centre (OS/CS/Integrity)
- SAR** SAR Data Provider Centre

Note: Only major centres, facilities and stations are shown. Not all of them are (fully) implemented yet.

## The first two Galileo satellites are transmitting signals

- ★ Oct/November 2011: satellites launched and control passed to the **Galileo Control Centre** in Oberpfaffenhofen
- ★ Galileo SIS in E1: 10 December 2011
- ★ E5, E5a/b signals: 14 December 2011
- ★ PRS signals successfully received on 14 February 2012
- ★ Latest two satellites: LEOP completed due to start transmissions soon



## Policy

- ★ Publication of PRS access rules
- ★ Publication of a Commission Decision with regard to the ground-based centres and stations
- ★ "Elements of Consensus" signed with China
- ★ Adoption of Council general approach for new EGNSS regulation

## Programme implementation

- ★ Signature of the final industrial contracts
- ★ Successful launch of the first four Galileo satellites aboard a Soyuz rocket from Kourou
- ★ Contract placed for 8 additional satellites and for adapting Ariane-5 to launch four satellites, as well as "booking" an Ariane-5 launch
- ★ Numerous ground facilities established





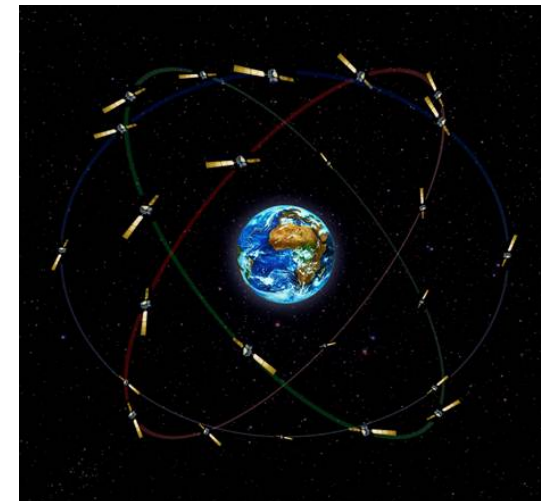
## On the 2020 horizon, Europe plans to establish itself as a reliable and attractive partner for satellite navigation services worldwide

### Policy challenges

- ★ Implement new GNSS regulation from 2014
- ★ Further improve cooperation with other GNSS providers
- ★ Build confidence and attract users

### Programme implementation challenges

- ★ Deliver early Galileo OS/SAR/PRS services from 2014
- ★ Deliver early Galileo CS services from 2016
- ★ Achieve full Galileo constellation of 30 satellites by 2020 and deliver full services



GNSS: Global Navigation Satellite System



European  
Commission

**EGNOS**

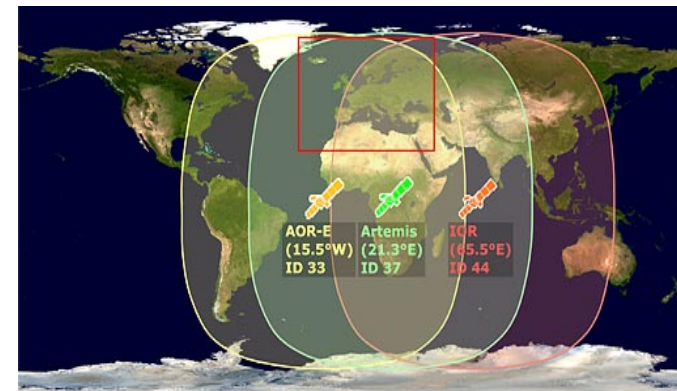
**'It's there, use it'**

# EGNOS is fully operational



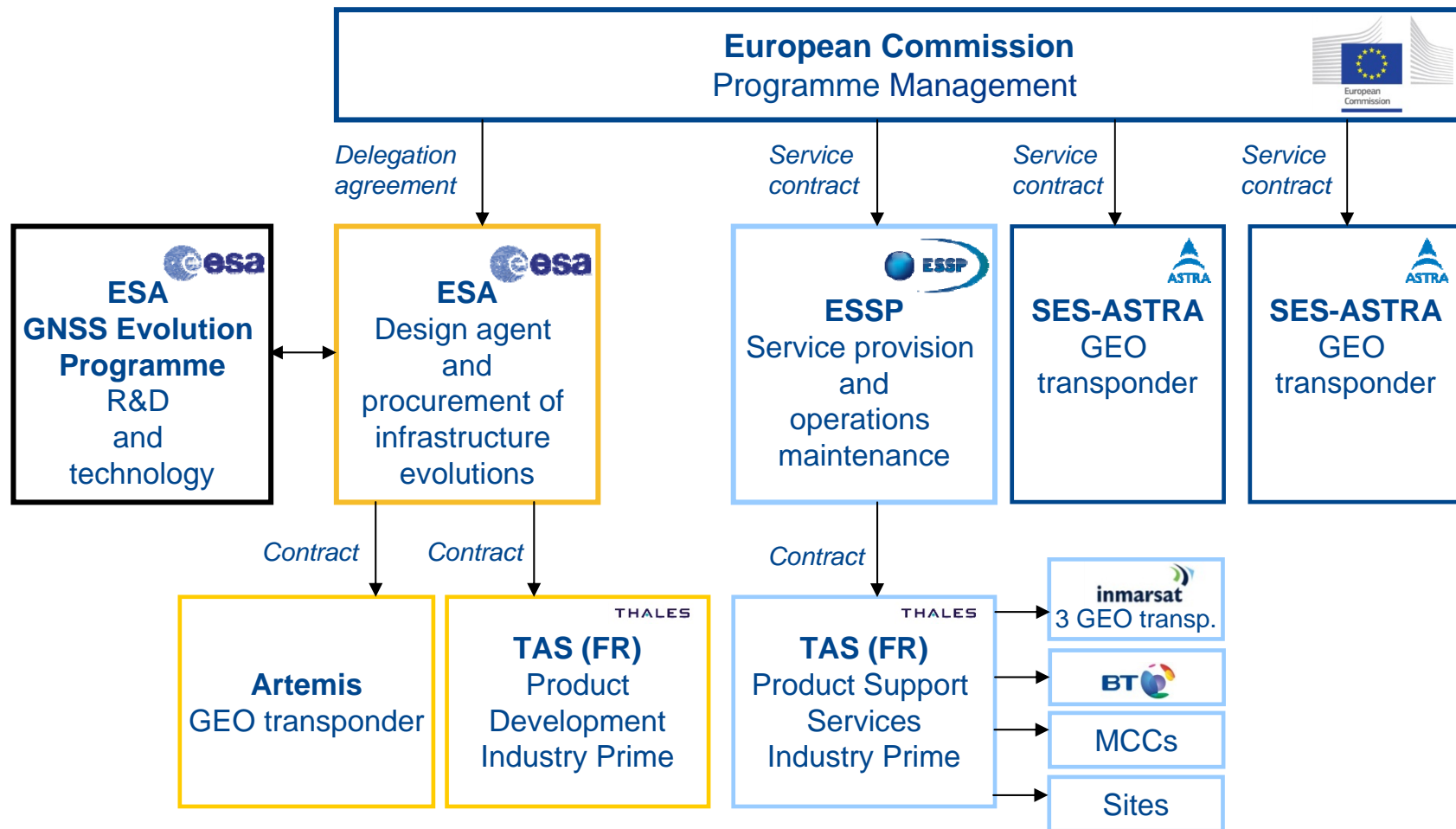
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- ★ **EGNOS Open Service is operational** since October 2009
- ★ **Safety of Life** service declared operational March 2011
- ★ Since December 2011, the EGNOS-based LPV procedures at Alderney airport (Channel Islands) are the first in Europe enabled for **revenue services on commercial flights**
- ★ Around **100** approach procedures are approved to use EGNOS for aircraft landings
- ★ The **EGNOS Data Access Service (EDAS)** was declared in July 2012



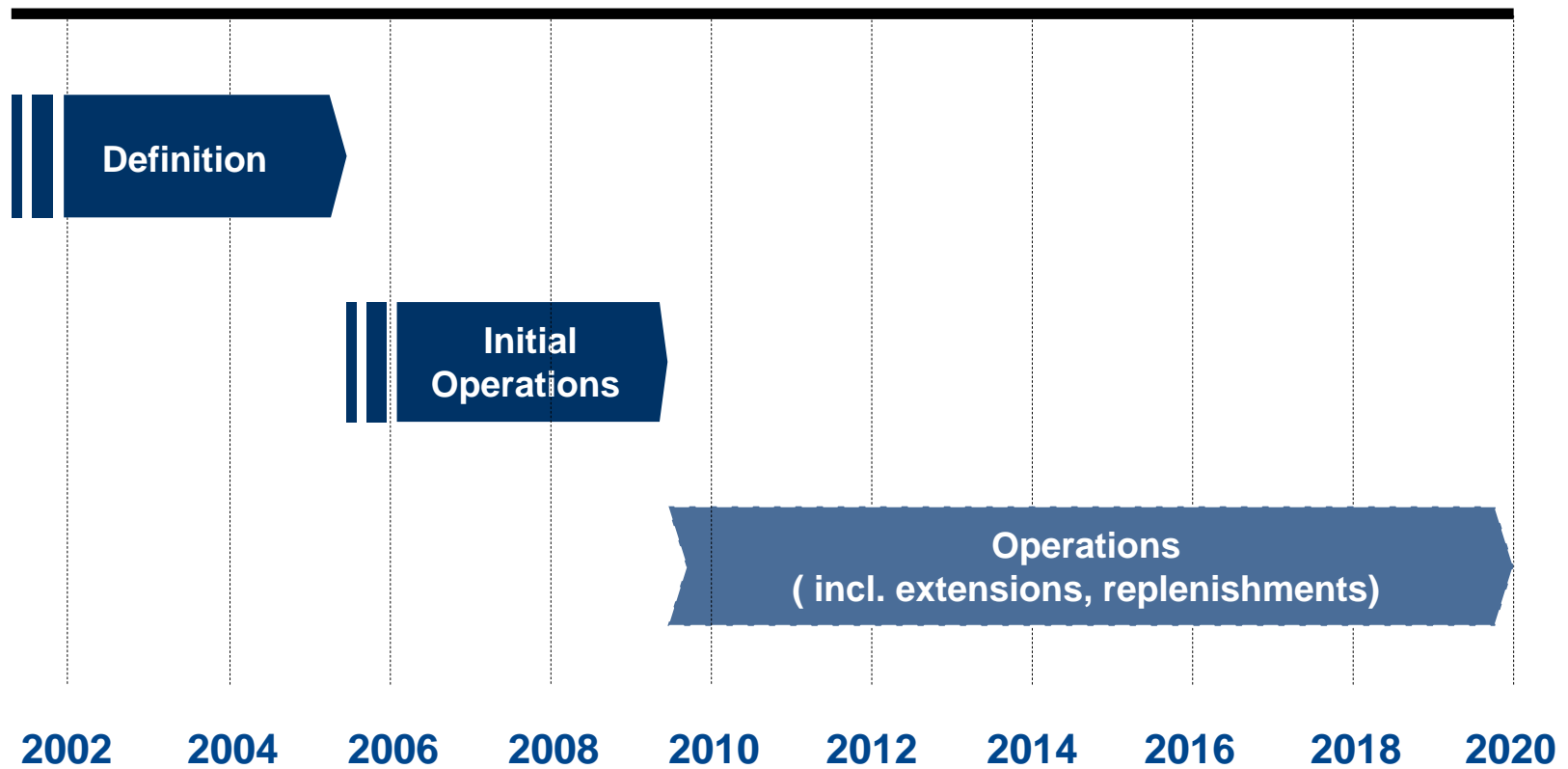
LPV: Localizer Performance with Vertical guidance

## The European Commission is the EGNOS programme manager






GEO: Geostationary Earth Orbit    MCC: Mission Control Centre

**EGNOS is delivering a free Open Service since October 2009 and a Safety of Life Service for aviation since March 2011**



## EGNOS services will be delivered on a long-term basis (> 20 years)

<b>Open Service (OS)</b>	Accuracy ~1m, free	Available since October 2009	
<b>Safety of Life Service (SoL)</b>	Accuracy ~1m, compliant to aviation standards	Available since March 2011	
<b>EGNOS Data Access Service (EDAS)</b>	Accuracy <1m, corrections provided by terrestrial networks	Available since July 2012	

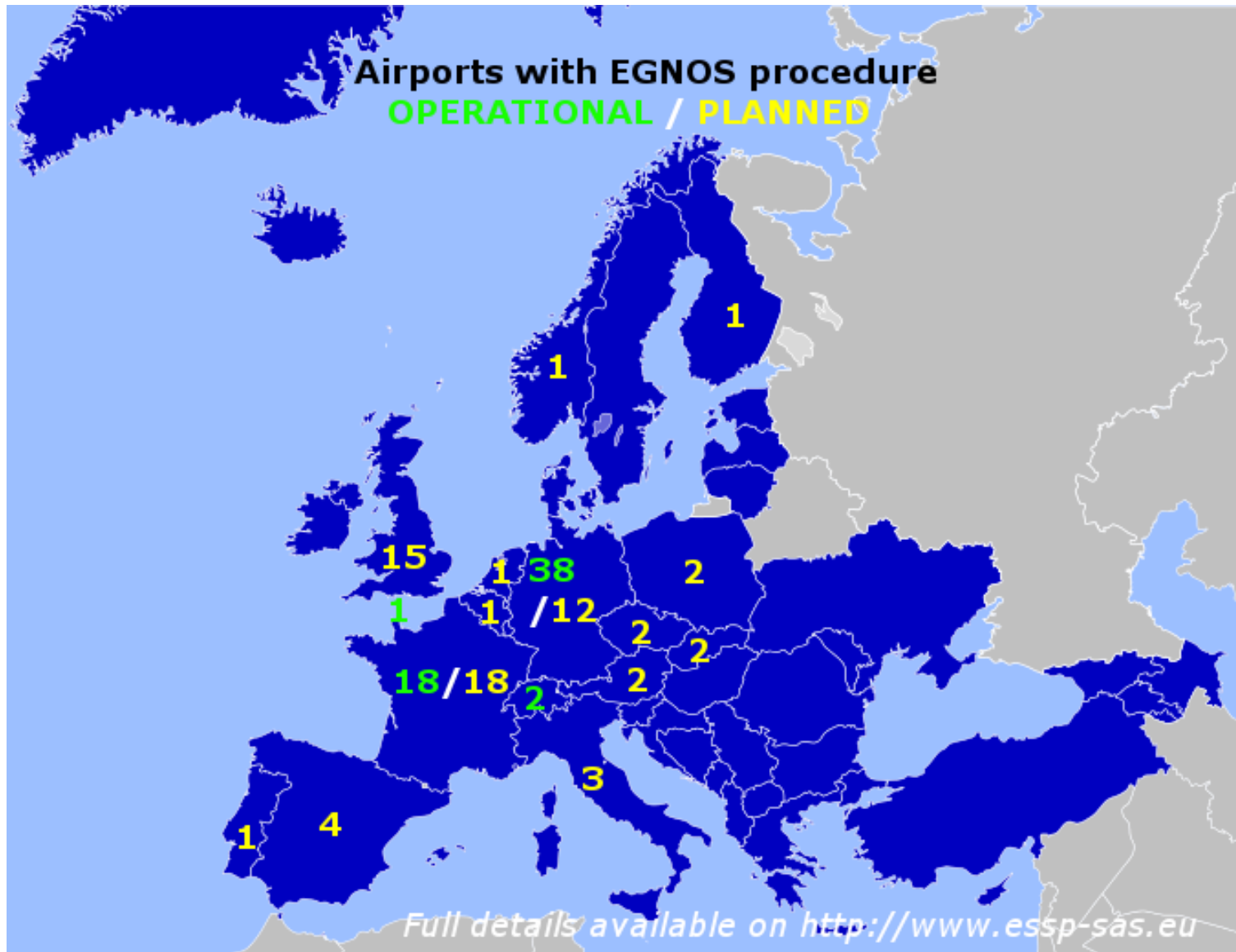
## EGNOS has entered into its operational phase

- ★ EGNOS programme management and assets transferred to the European Union (April 2009)
- ★ Service provision contract with ESSP signed (September 2009)
- ★ Open Service declared operational (October 2009)
  - ★ EGNOS now achieves almost 100% availability
  - ★ EGNOS now enables 1m GPS performance in central Europe ESSP certified as air navigation services provider (July 2010)
- ★ Safety of Life Service declared operational (March 2011)
- ★ Around 100 procedures making use of EGNOS approved in Europe (end of 2012)
- ★ New Geo-1 Transponder launched on Astra satellite (July 2012)
- ★ EGNOS Data Access Service (EDAS) declared (July 2012)

# Existing and planned EGNOS procedures



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## EGNOS services will further improve over time

### 2012

- ★ Declare EGNOS coverage extension for a large number of EU countries
- ★ Provide full EGNOS Data Access Service (EDAS)

### Medium term

- ★ Implement LPV200 service level
- ★ Extend coverage to South Africa

### Long term

- ★ Make use of E5a/E5b frequencies
- ★ Implement augmentation of Galileo and potentially other GNSS

LPV: Localizer Performance with Vertical guidance

## International cooperation is crucial for the development of European GNSS

- ★ **Objectives of international co-operation**
  - ★ Compatibility and interoperability with other GNSS providers
  - ★ Fostering uptake of EGNOS and Galileo worldwide,
  - ★ Also: Development activities, Standardisation, Galileo applications, Research, SBAS and EGNOS extensions, Security, Trade matters
  
- ★ **Implementation**
  - ★ Conclude GNSS co-operation agreements
    - ★ In place for: PR China, USA, Israel, South Korea, Ukraine, Morocco, Norway
    - ★ Under discussion for: Russia, Switzerland, Brazil, Chile, Argentina
  - ★ Expansion of EGNOS to cover the whole of Europe and then to extend to Africa

## ★ **EGNOS is operational**

- ★ EGNOS OS since October 2009
- ★ EGNOS SoL service since March 2011
- ★ EGNOS Data Access Service since July 2012



## ★ **Galileo is taking off**

- ★ All procurement contracts awarded
- ★ First four operational Galileo satellites launched in October 2011 and in October 2012
- ★ Deployment is being accelerated
- ★ Early Galileo OS/SAR/PRS services from 2014
- ★ Early Galileo CS services from 2016



## ★ **International coordination is key**

- ★ Ensure compatibility with other GNSS as a minimum
- ★ Achieve interoperability when mutually beneficial

Photos: Eurocontrol, ESA

A satellite with purple solar panels and a gold thermal blanket is shown in space. A yellow streak representing a satellite trajectory curves across the dark background. The Earth is visible on the right side of the frame.

**We're getting there!**

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**EGNOS**

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<http://ec.europa.eu/galileo>