



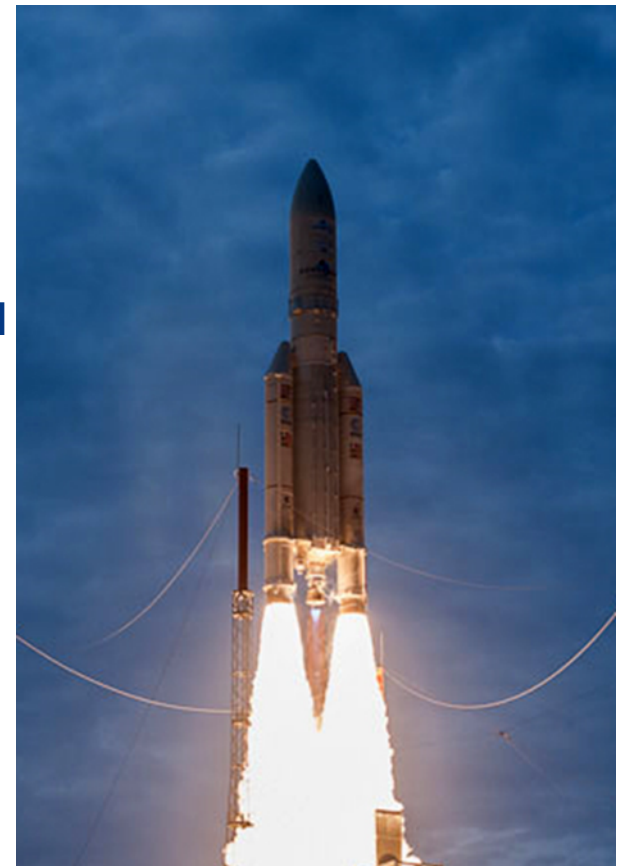
EU SPACE POLICY AND PROGRAMMES

AUGUSTO GONZÁLEZ



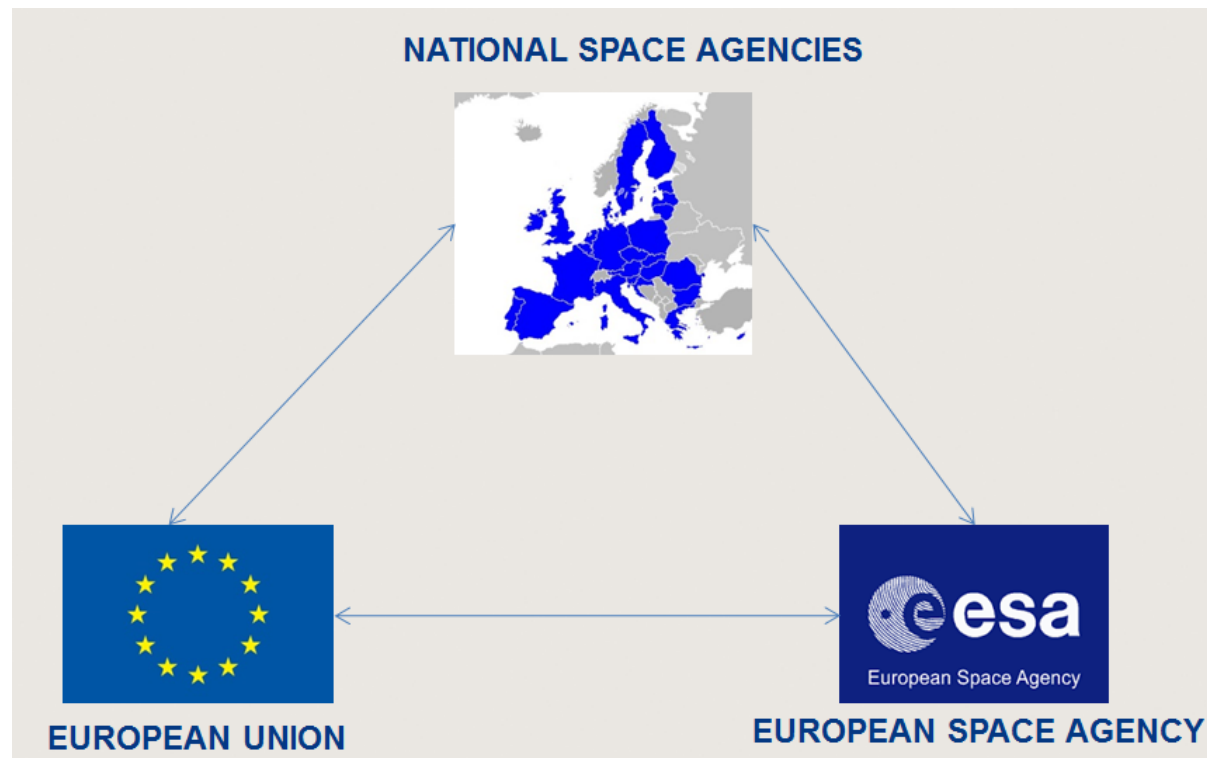
A HIGHLY DEVELOPED SPACE INDUSTRIAL BASE AND RESEARCH COMMUNITY

- **The European space industry sustains around 38,000 direct jobs**
- **Europe is successful in the commercial arena, with a significant market share of telecom and launch services worldwide**
- **European scientific communities are world-class and attract international cooperation**
- **Research and innovation centres are recognized worldwide**



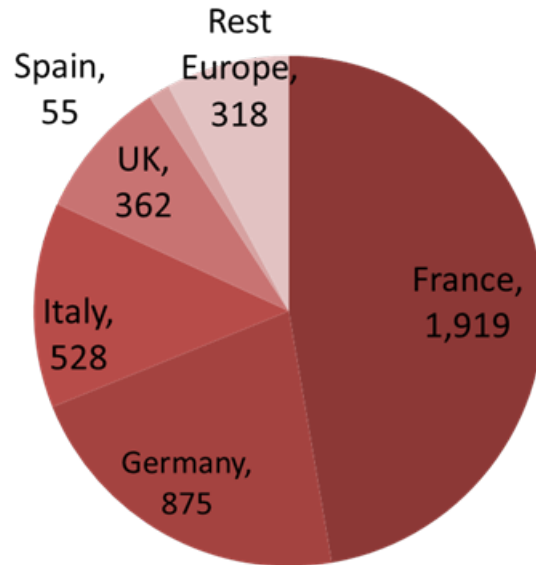


MAIN INSTITUTIONAL SPACE ACTORS IN EUROPE



MEMBER STATES' SPACE ACTIVITIES

Examples of national space budgets in Europe, 2014



Source: European Space Policy Institute report #54, November 2015

- ☐ Historical starting point of European space efforts
- ☐ Pursuit of national policy objectives:
 - Service own citizens and priorities
 - National defense
 - Research and innovation
 - National industrial base
- ☐ Bilateral and multi-lateral cooperation in Europe and worldwide on an ad-hoc basis



EUROPEAN SPACE AGENCY

“To provide for and promote, for exclusively peaceful purposes, cooperation among European states in **space research** and **technology** and their **space applications.**”

Article 2 of ESA Convention

- Over 50 years of experience
- 22 Member States
- Eight sites/facilities in Europe, about 2200 staff
- 5.2 billion Euro budget (2016)
- Over 80 satellites designed, tested and operated in flight





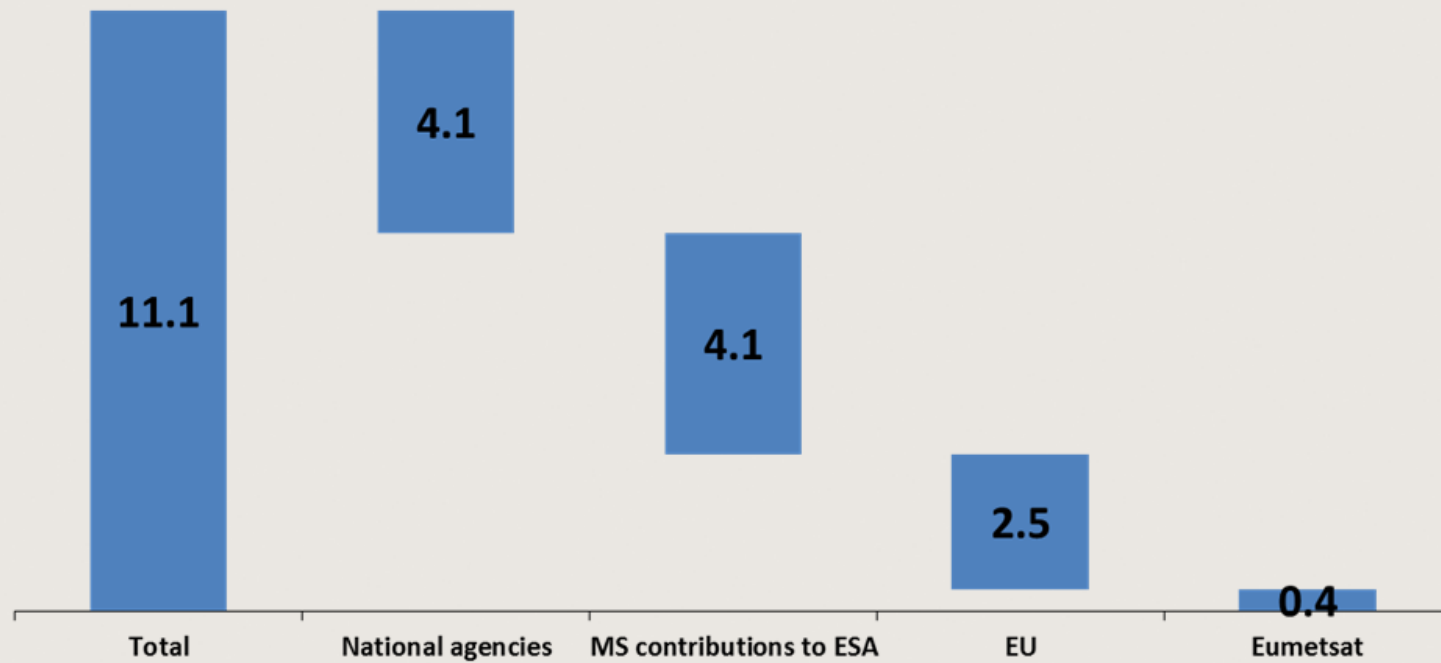
THE EUROPEAN UNION

Article 189 of the Treaty on the Functioning of the European Union:

- ❑ Objective:
 - To promote scientific and technical progress as well as industrial competitiveness
 - Coordinate space exploitation and exploration efforts
- ❑ Means:
 - EU space policy
 - Programmes
 - Appropriate relations with ESA



2014 SPACE BUDGETS IN EUROPE



Source: European Space Policy Institute report #54, November 2015



WHY DOES SPACE MATTER TO THE EU?

- ☐ **SPACE CONTRIBUTES TO ADDRESSING BIG SOCIETAL CHALLENGES AND TO CITIZENS' WELL-BEING**
- ☐ **SPACE GENERATE INNOVATION AND CONTRIBUTES TO ECONOMIC GROWTH**
- ☐ **SPACE CONTRIBUTES TO SECURITY AND DEFENCE POLICIES**





EU SPACE PROGRAMMES

☐ **Satellite navigation**



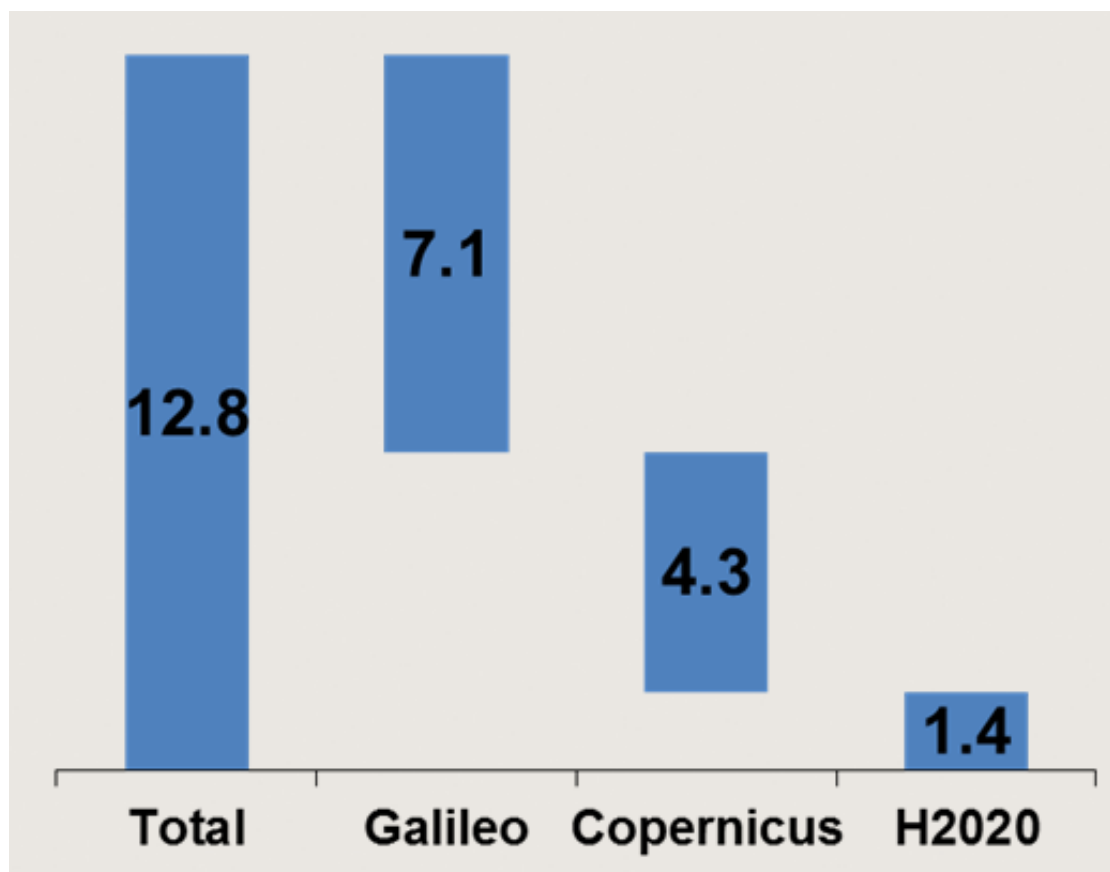
☐ **Earth Observation**



☐ **Space R&D**



EU SPACE PROGRAMMES 2014-2020



Billion euros, current economic conditions



THE SENTINELS



S1: Radar Mission



S2: High Resolution Optical Mission



S3: Medium Resolution Imaging and Altimetry Mission



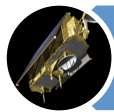
S4: Geostationary Atmospheric Chemistry Mission



S5P: Low Earth Orbit Atmospheric Chemistry Precursor Mission

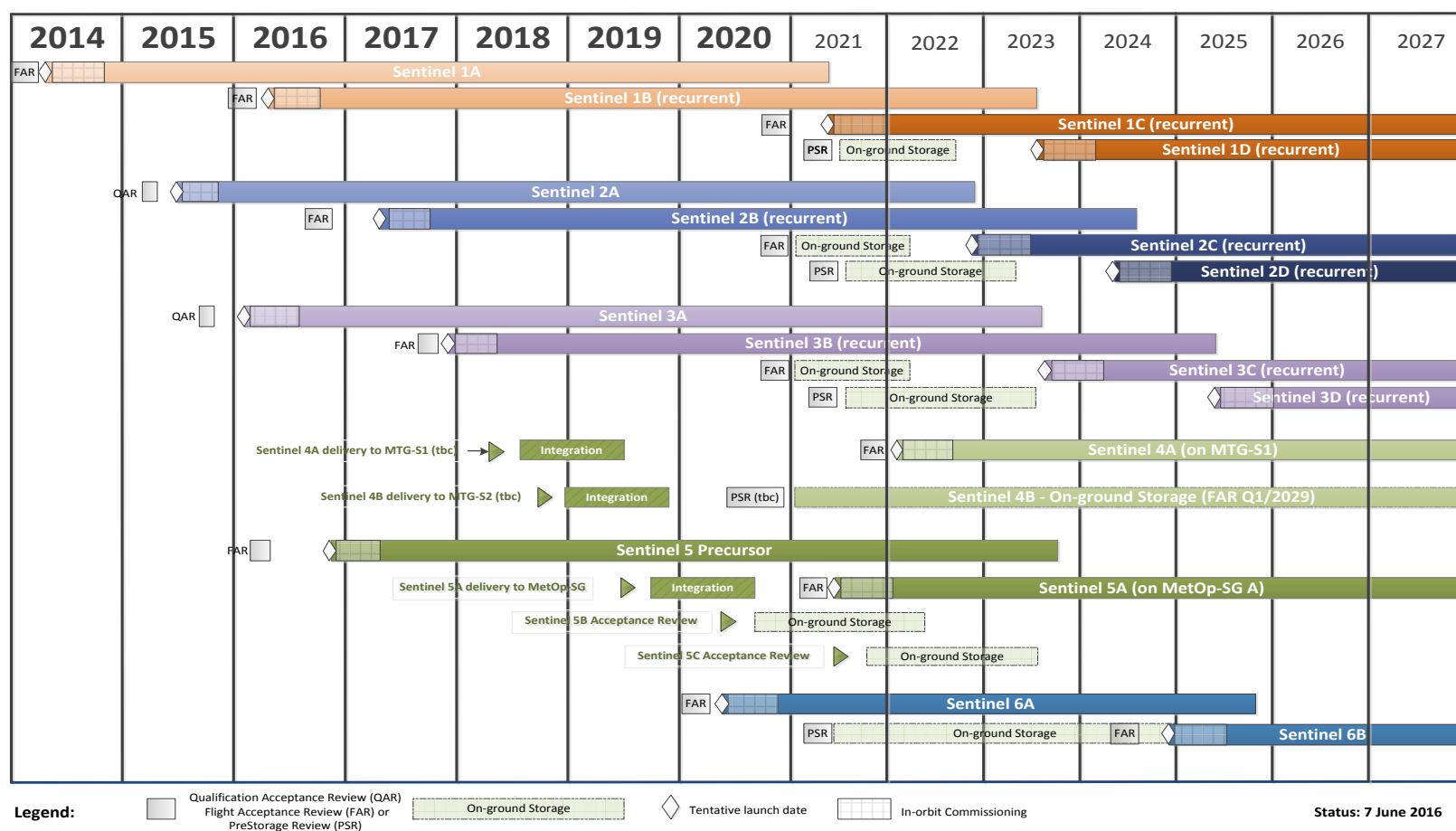


S5: Low Earth Orbit Atmospheric Chemistry Mission



S6 (Jason-CS): Altimetry Mission

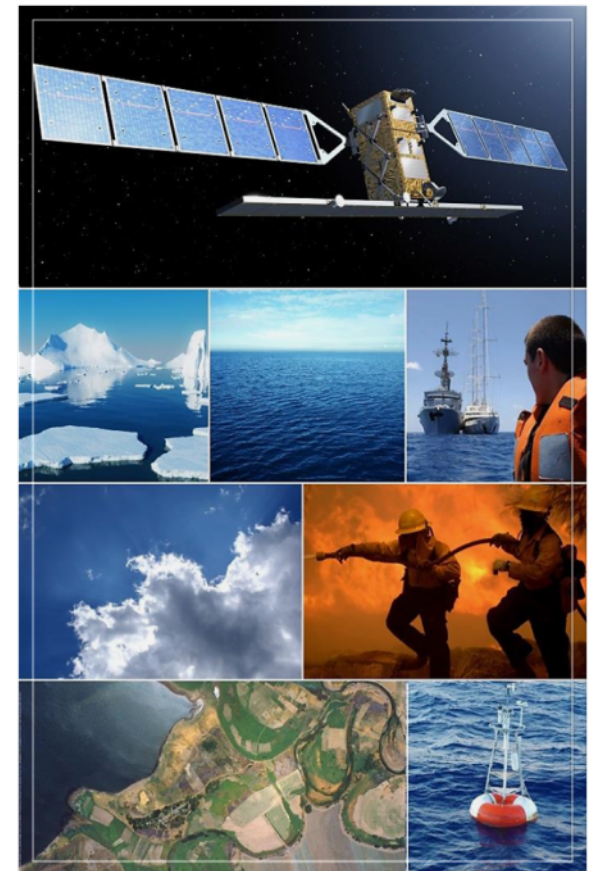
Copernicus Constellation Deployment Schedule



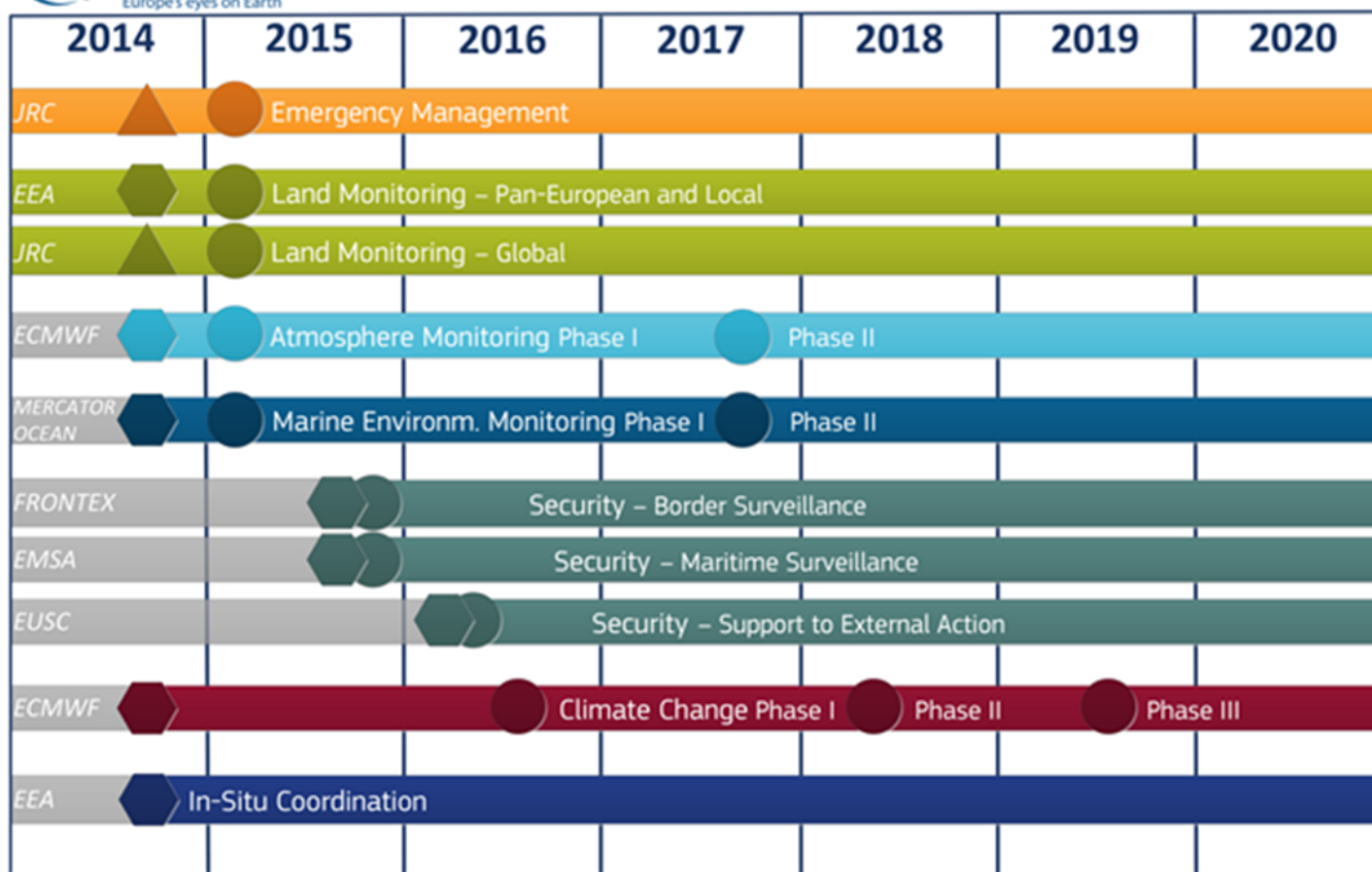


THE SERVICES

- ☐ **LAND SERVICES**
- ☐ **MARINE**
- ☐ **ATMOSPHERE**
- ☐ **EMERGENCY**
- ☐ **SECURITY**
- ☐ **CLIMATE CHANGE**



Copernicus Services Implementation Schedule



Legend: ● Delegation agreement ▲ Direct management ○ Operational phase



Land monitoring – Pan EU & local
In-situ coordination



Atmosphere monitoring
Climate change



Marine Environment monitoring



Security – Border Surveillance



Security – Maritime Surveillance



Security – Support to External Actions

DOWNSTREAM INDUSTRY END USERS

Security, defence



Environment,
pollution and
climate



Oil and gas



Maritime



Agriculture



Fisheries



Emergency
services



Utilities (water,
electricity,
waste)



Forestry



Minerals and
mining



Local and
regional planners



Humanitarian
Operations &
Health



Communications



Insurance and
finance



Real estate
management



Construction



Alternative
energy



Retail and geo-
marketing



Travel, tourism,
and leisure



News and media



Education,
training and
research



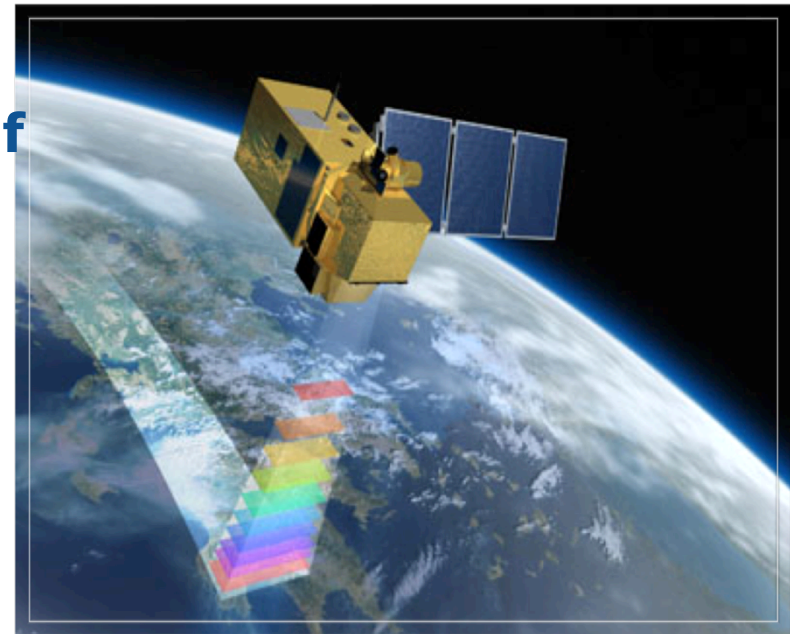
Transportation



DATA

Copernicus collects, processes, and archives massive amounts of data (approx. 8 Terabyte/day or almost 3 Petabyte/year when Sentinels-1, -2 and -3 are fully operational).

Dedicated Sentinel-data and Copernicus information are being **made available on a full, open and free-of-charge basis.**





EASY ACCESS TO AND USE OF THE DATA

- ☐ A robust data dissemination infrastructure
- ☐ Make the most of new technologies to facilitate use of the data and avoid duplications
- ☐ Improved interoperability (both EO and non-EO data)
- ☐ Creating critical mass of EO data around Copernicus



FOSTERING THE ADOPTION OF NEW BUSINESS MODELS IN THE DOWNSTREAM SECTOR

☐ **Framework conditions**

- Improving predictability: clear boundary between public and private, dialogue with industry

☐ **Supply-side measures**

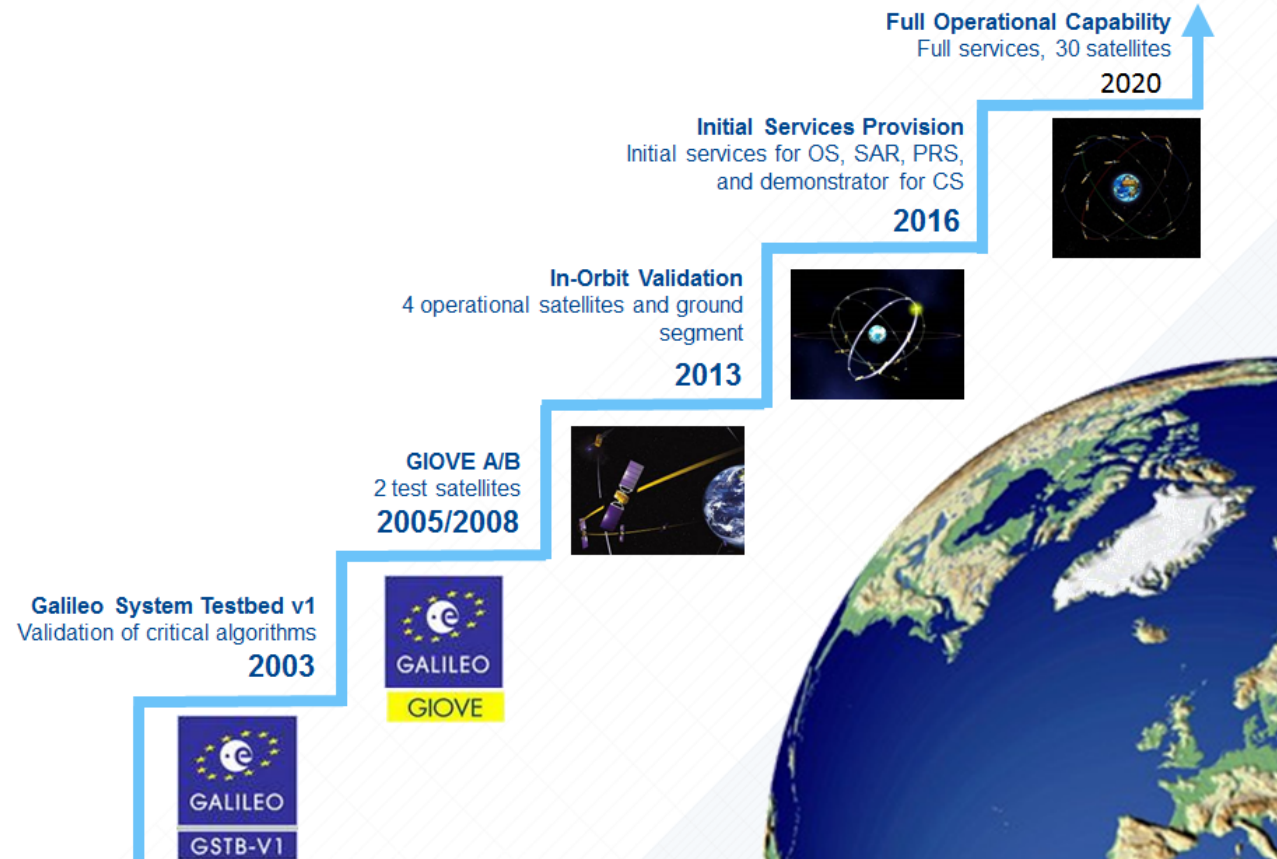
- Incubators, ICT skills, financial instruments, internationalisation

☐ **Demand-side measures**

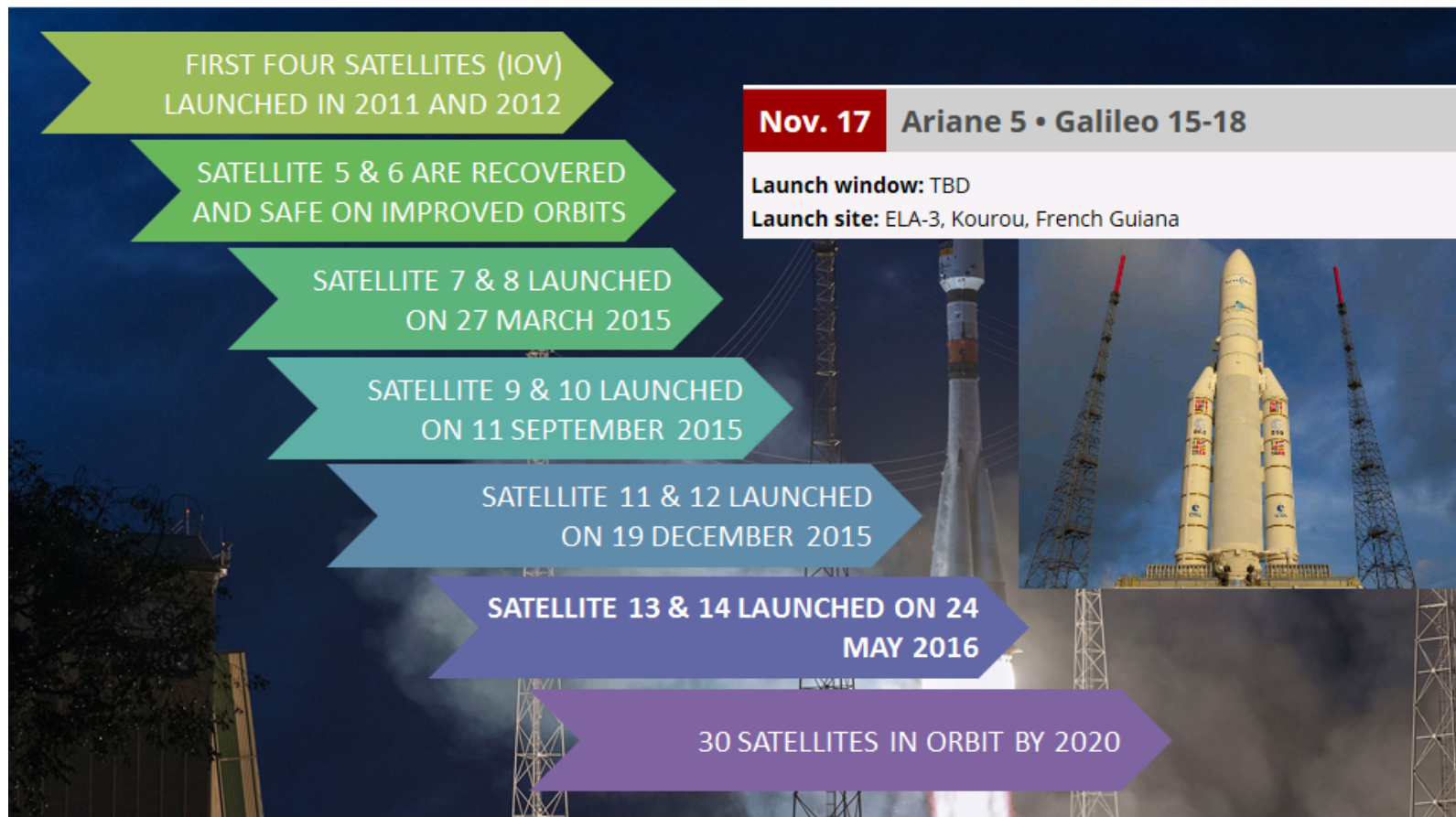
- Innovative public procurement, awareness of end users



GALILEO PROGRESSIVE DEPLOYMENT



GALILEO SPACE SEGMENT

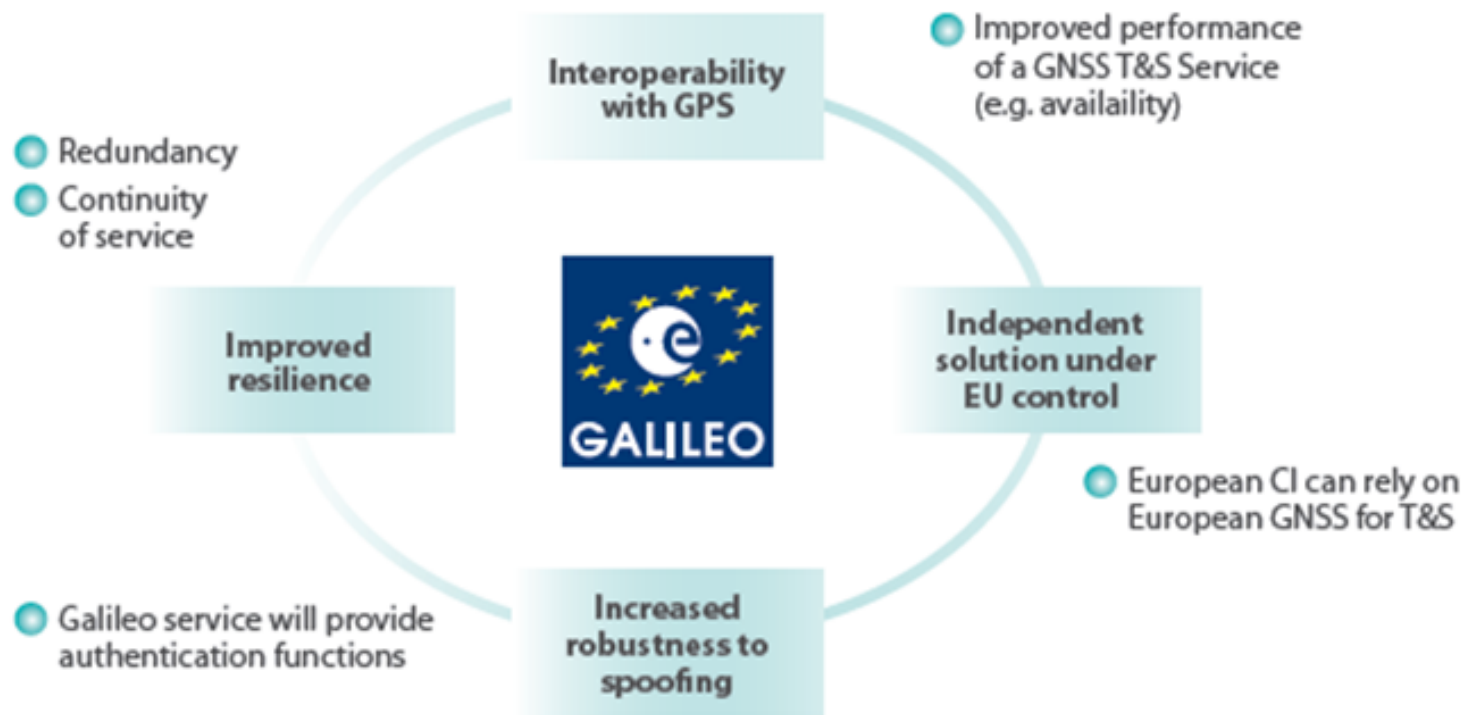


SYSTEM ARCHITECTURE

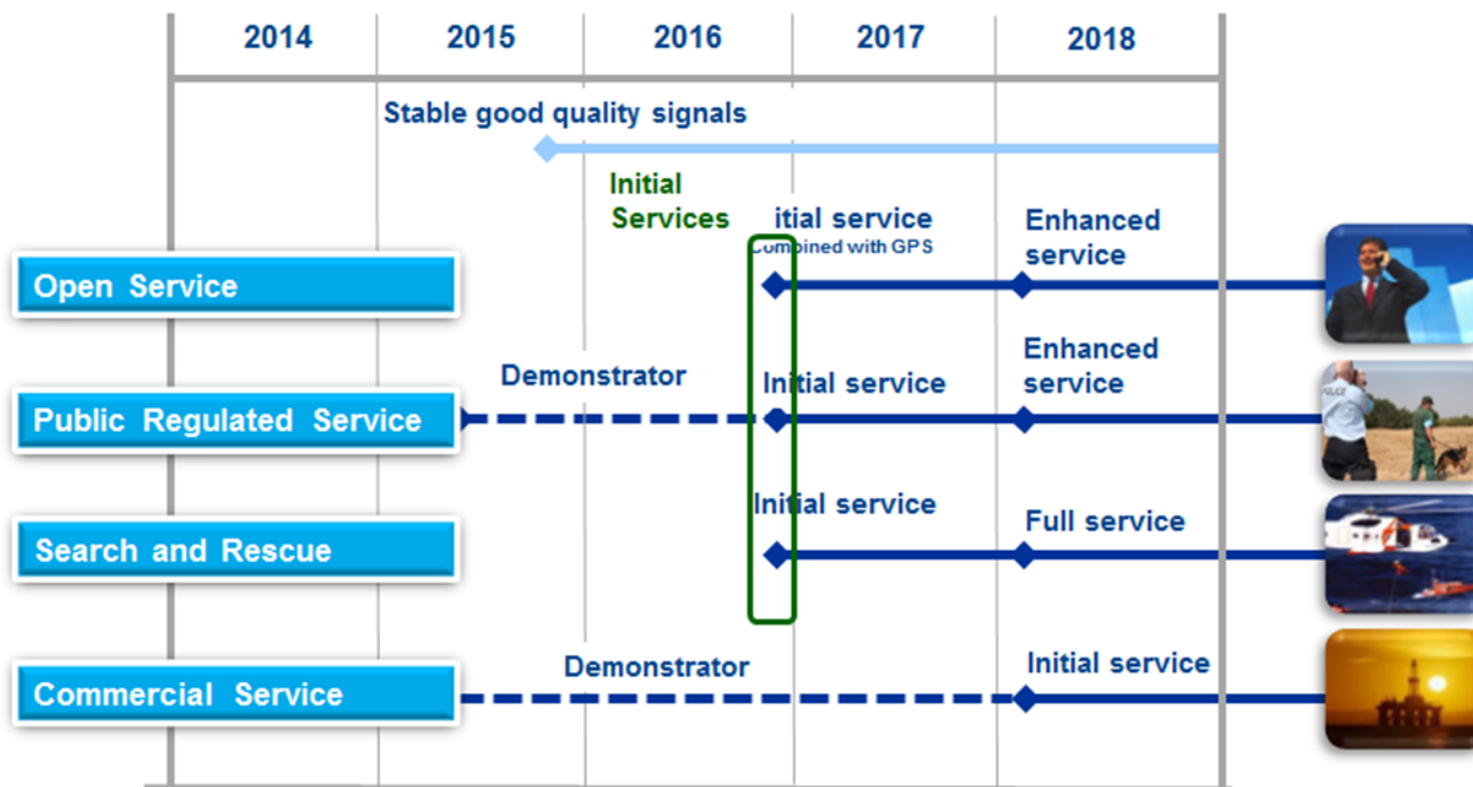


GALILEO DIFFERENTIATORS

EGNSS differentiators

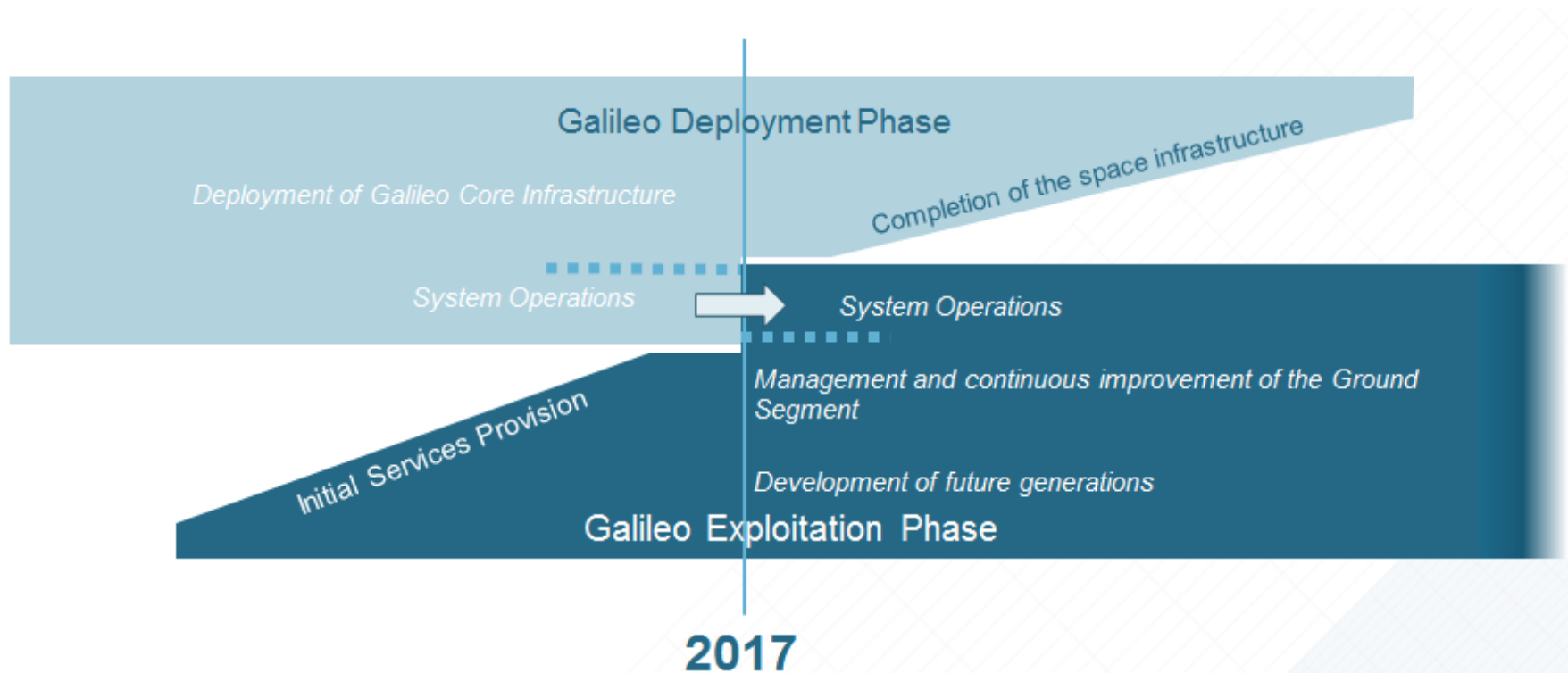


GALILEO SERVICES

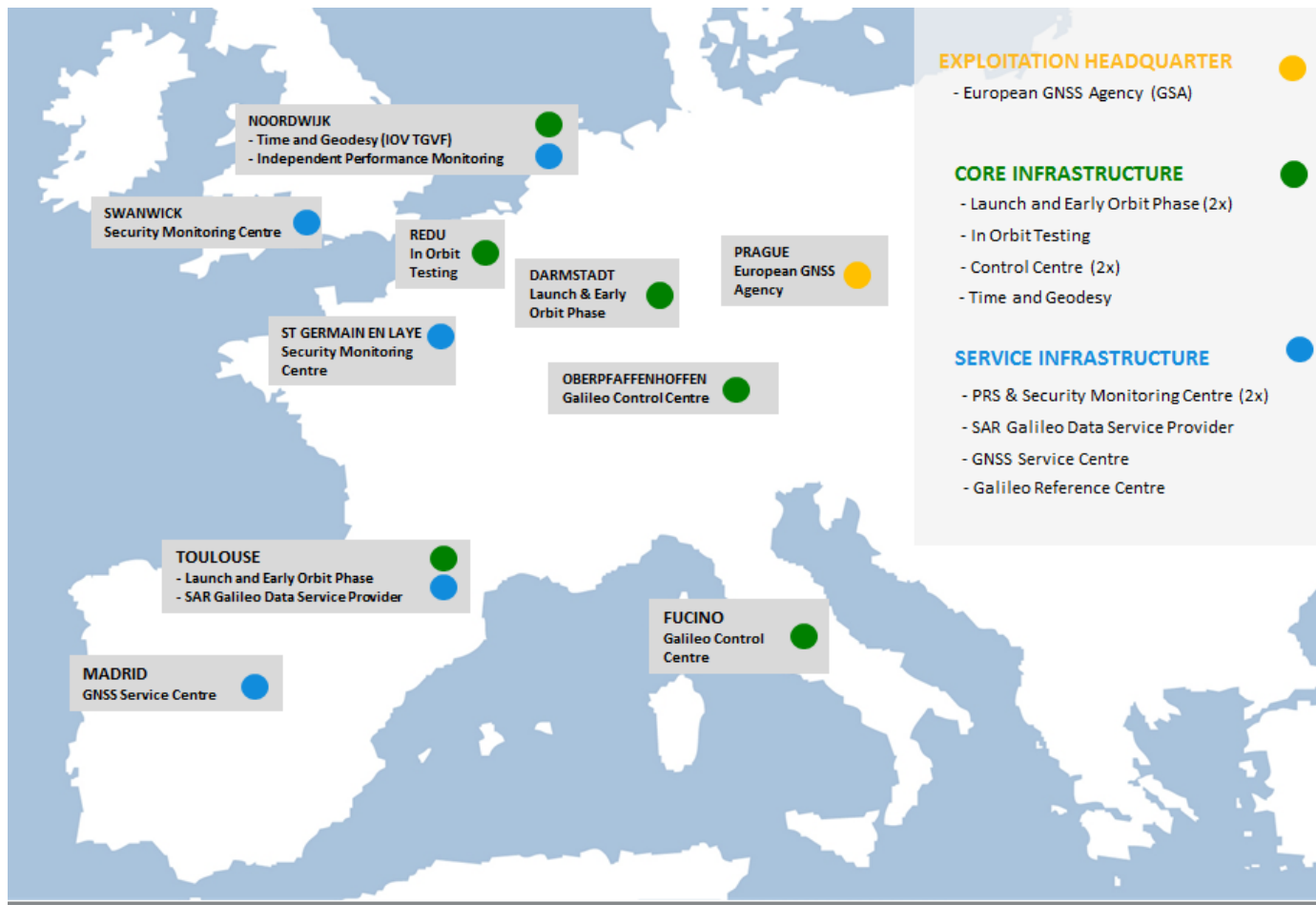




TURNING POINT



GALILEO – DESIGNED FOR SERVICE



REFERENCE DOCUMENTATION

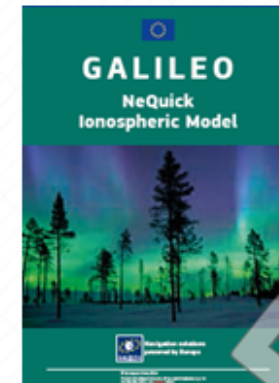


Galileo Open Service Signal In Space Interface Control Document (OS SIS ICD)

Version 1.2 published
end 2015

Galileo NeQuick Ionospheric Model

Version 1.2 published
in Sept 2016



Galileo SIS Operational Status Definition

Version 1.1 published in July 2016



Galileo OS Service Definition Document

First version in 2016 with Initial Service performance
Updated version in 2017-18 with more
consolidated FOC performance





GALILEO SERVICE CENTER

GALILEO SERVICE CENTER (based in Madrid, operated by GSA): A one-stop shop for Galileo users

www.gsc-europa.eu CENTER

Regular Publication of Notice Advisories to Galileo Users (NAGUs)] and publication of Galileo constellation progress reports.

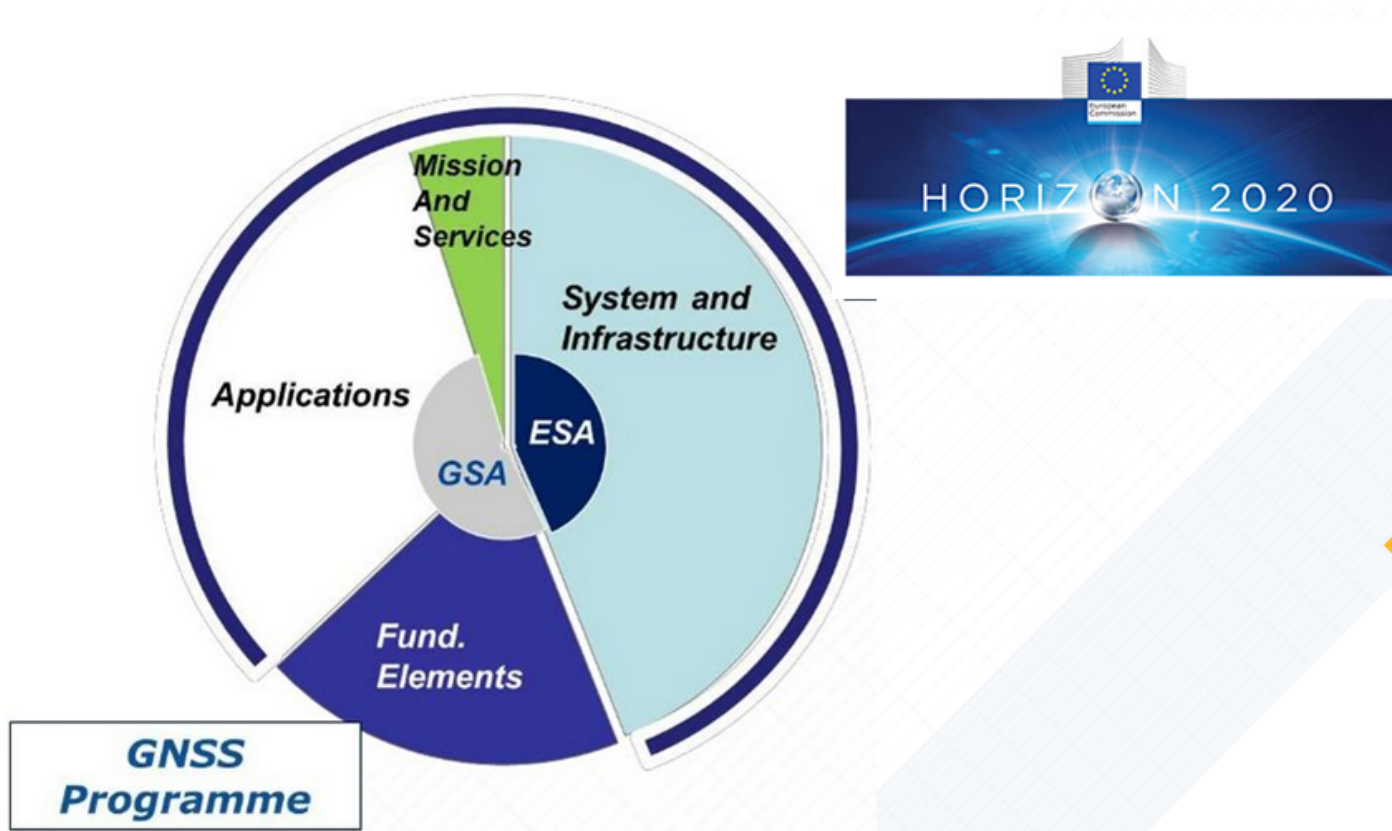
Response to increasing numbers of visits and enquiries from users.

New functionalities being developed:

- Subscription services;
- Monthly service report.



EGNSS R&D





GNSS IMPORTANT FEATURES

Availability: Percentage of time the minimum number of satellites are in view, so the position, navigation or timing solution can be computed by the user.

Accuracy: difference between true and computed position (absolute positioning).

Continuity: Ability to provide the required performances during an operation without interruption, once the operation has started.

Integrity: Additional user information on the reliability of the signal within the operational requirements.

Robustness to spoofing and jamming: Authentication information provided to users ensuring the signal comes from a satellite in space (enabling sensitive applications).

Indoor penetration: Ability of signal to penetrate inside buildings, e.g. through windows.



GNSS MAIN MARKET SEGMENTS

LOCATION BASED SERVICES

ROAD

AVIATION

RAIL

MARITIME

AGRICULTURE

SURVEYING

TIMING AND SYNCHRONISATION



EGNSS RESPONSE TO USERS' REQUIREMENTS

User Groups of	Mass Market Consumer Applications	Workforce, Fleet, Traffic and Asset Management	Liability-critical Applications*	Safety-critical Applications	High Precision Applications	Timing Applications For Financial Services, Energy and Telecom
Relevant Market Segments	LBS, Road, VFR General Aviation, Maritime (leisure boats navigation), Rail (passenger information)	LBS, Road, Rail and Agriculture (farm and livestock mgmt)	Road (tolling operators, insurance telematics), LBS (mobile payments), Maritime (fisheries, marine park management)	Aviation, Road, LBS (emergency caller location), Rail and Maritime	Agriculture and Surveying	Timing & Synchronization
EGNOS	Accuracy, especially in remote areas	Accuracy, sometimes integrity	Integrity, accuracy	Integrity, accuracy, compliance with safety requirements and standards	Accuracy	Potentially improved quality of synchronization
Galileo	Availability, better resistance to multipath, accuracy, time to first fix (TTFF)	Availability, better resistance to multipath, accuracy, TTFF, authentication	Authentication, availability, accuracy, continuity	Availability, accuracy, compliance with safety requirements and standards, dedicated SAR service with return link	Accuracy, availability, TTFF	Accurate time, authentication



GNSS MARKET REPORT

ISSUE 4

March 2015

Issue 4





European

6 Navigation
Ground
Stations



40 Ranging & Integrity Monitoring
Stations (RIMS)

GPS Signals

2 Support
Centers



4 Mission
Control
Centres



**EGNOS
Service Area**

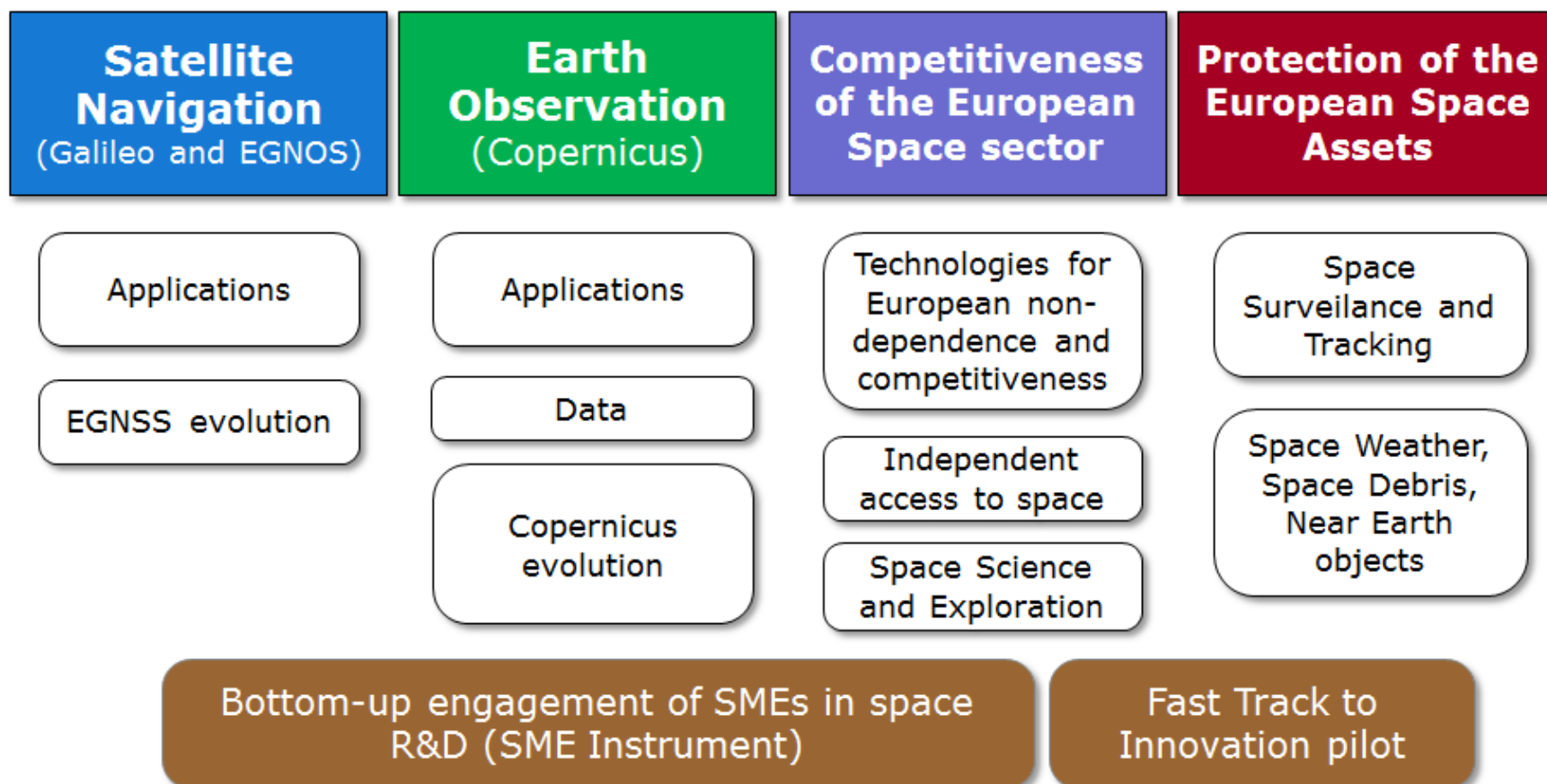
GEO
Satellites

Geostationary Satellites

- INMARSAT AOR-E 3F2 (15.5 W)
- INMARSAT IOR-W 4F2 (25 E)
- SES 5 – (5 E)
- ASTRA 5B – ordered (31,5 E)

EGNOS

HORIZON 2020 SPACE





SPACE SURVEILLANCE AND TRACKING

EU legal framework to establish a space surveillance and tracking capability at European level and with an appropriate level of European autonomy.

Support provided for the networking of Member State ground-based and/or space-based sensors; the operation and processing of data to produce SST information; SST services.

SST services: collision and uncontrolled re-entry risk assessment; generation of avoidance alerts and relevant re-entry information





ONGOING REFLECTION - CHANGING SPACE ENVIRONMENT

- ❑ TRANSFORMATIVE IMPACT OF SPACE DATA**
- ❑ INCREASED GLOBALISATION AND COMMERCIALISATION OF SPACE ACTIVITIES**
- ❑ DISRUPTIVE TECHNOLOGIES AND BUSINESS INNOVATION**
- ❑ SHIFT FROM PUBLIC SECTOR DOMINATED ACTIVITIES TOWARDS A GROWING INVESTMENT BY PRIVATE ACTORS**
- ❑ INCREASED IMPORTANCE OF SECURITY AND DEFENCE CHALLENGES WHICH CALL FOR GREATER SYNERGIES BETWEEN CIVIL AND MILITARY ASPECTS**





ONGOING REFLECTION - POSSIBLE FUTURE MAIN LINES OF ACTION

- ☐ **ENCOURAGE THE UPTAKE OF SPACE SERVICES, DATA AND DEVELOPMENT OF APPLICATIONS**
- ☐ **FOSTER A COMPETITIVE AND INNOVATIVE EUROPEAN SPACE SECTOR**
- ☐ **ENSURE EUROPEAN AUTONOMY IN ACCESSING AND USING SPACE IN A SAFE AND SECURE ENVIRONMENT**
- ☐ **PROMOTE INTERNATIONAL COOPERATION**





**THANK YOU FOR YOUR
ATTENTION**

