# The EU Space Programme

Horizon Europe,
a programme of the
European Union

# Regulatory Context

# Space Strategy for Europe (2016)

Objectives :

- **Maximise the benefits of space for society and the EU economy**
- **Ensure a globally competitive and innovative European space sector**
- **Reinforce Europe's autonomy in accessing space** in a safe and secure environment
- **Strengthen Europe’s role as a global actor** and promoting international cooperation

# From multiple EU Space Programmes…

- Regulation 912/2010 of 22 September 2010 setting up the **European GNSS Agency**
- Regulation 1285/2013 of 11 December 2013 on the implementation and exploitation of **European satellite navigation systems**
- Regulation 377/2014 of 3 April 2014 establishing the **Copernicus Programme**
- (Decision No 541/2014/EU of 16 April 2014 establishing a Framework for **Space Surveillance and Tracking** Support)

# ...To a single EU Space Programme

- Regulation (EU) 2021/696 establishing the **Space Programme of the Union** and the **European Union Agency for the Space Programme**
- One single legal basis: Art. 189 TFEU for all Space Programme components (Galileo, EGNOS, Copernicus, SSA, GOVSATCOM)
- A new European Union Agency for the Space Programme, that has replaced the European GNSS Agency
- New Regulation (EU) 2023/588 of the European Parliament and of the Council of 15 March 2023 establishing the Union Secure Connectivity Programme for the period 2023-2027 – legal basis Art. 189 TFEU

# EU-ESA cooperation

- The EU Space Programme is implemented in close cooperation with the EU Member States, the European Union Agency for the Space Programme (EUSPA), the European Space Agency (ESA), EUMETSAT and many other stakeholders
- The principles of the EU-ESA cooperation were established in the 2004 **Framework Agreement** between the European Community and the European Space Agency
- The **Financial Framework Partnership Agreement,** signed in 2021, FFPA defines the roles and responsibilities of all partners, the European Commission, ESA and EUSPA. The Commission entrusts tasks related to the EU Space Programme to both EUSPA and ESA

# The EU Space Programme

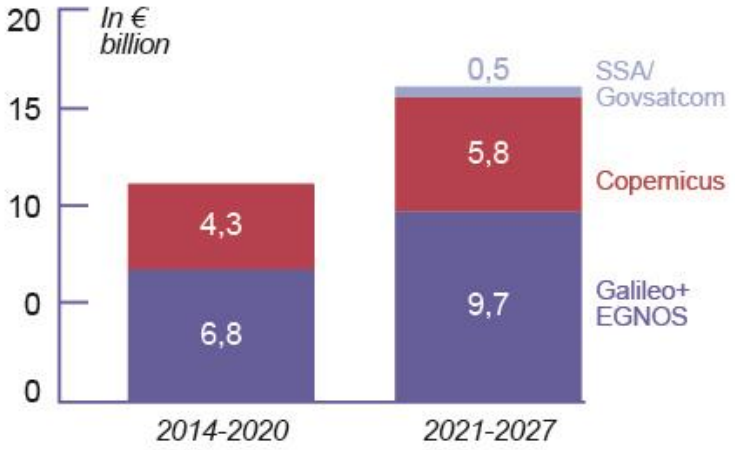
# The EC implements the EU Space Programme, covering Galileo, EGNOS, Copernicus, Space Situational Awareness (SSA) and EU Govsatcom

## THE EUROPEAN SPACE PROGRAMME

| **Copernicus** | **Galileo** | **EGNOS** | **SSA** | **EU GOVSATCOM** |
|---|---|---|---|---|
| Earth Observation (EO) and monitoring based on satellite and non-space data. **Nr.1** world provider of space data an information. | Global satellite navigation and positioning system (GNSS). **10%** of the EU GDP is enabled by satellite navigation. | Makes navigation signals more accurate and reliable. Operational in **300+** airports in 23 countries. | Space situational awareness, monitors and protects space assets. Providing surveillance and tracking services to **129** European satellites. | Secures satellite communications for EU security actors. |

**Cross cutting activities:**

- ❑ Access to space
- ❑ Foster uptake
- ❑ Governance
- ❑ Security and autonomy
- ❑ International Cooperation

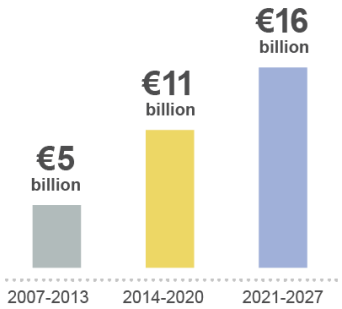


# The EU Space Programme boosts the EU economy

**30+ EU-ownded satellites** in orbit for **EO** and **GNSS**



**EU Investment in space**



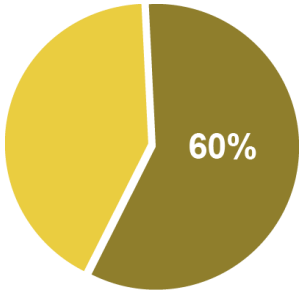

proposed budget for 2021-2027, commitment of **€14.6 billion**

**European space industry** supports **250.000+ jobs**

Global GNSS and EO enabled revenues **€200 billion** in 2021 - Set to reach almost **€500 billion** over the next decade

**3+ billion** Galileo-enabled Smartphones

**Copernicus** data is used by **60%** of the European EO companies




2021 gobal turnver for EO-derived data and services is **€2.8 billion**

# It also fosters a strong and innovative space-based industry

The EU Space Programme provides established space technology, data and services indispensable in the lives of Europeans today. **In the future, it will address an increasing range of EU ambitions and priorities:**

**Competitive edge:** Completion of current satellite constellation, development and launch of next-generation satellites

**Research & innovation:** the ambitious research and innovation programme Horizon Europe

**Fighting Climate Change:** Monitoring biodiversity, environmental compliance and CO2 emissions (Paris Agreement)

**EU as a global actor:** Support disaster relief, humanitorian assistance and security operations

# Some concrete areas of application

## Agriculture

**EU Space** enables precision agriculture and integrated farming solutions.

It helps farmers increase yields by 10%+ and save 20%+ on fertiliser, fuel and pesticides.

It enables safe landings and autonomous machines.

## Response to Natural Disasters

**EU Space** supports rescue operations during floods, fires, earthquakes and hurricanes as well as man-made disasters.

## Smart Cities

**EU Space** is crucial for urban mapping, planning and infrastructure monitoring, notably enabling better urban transport and smart waste management.

## Renewable Energies

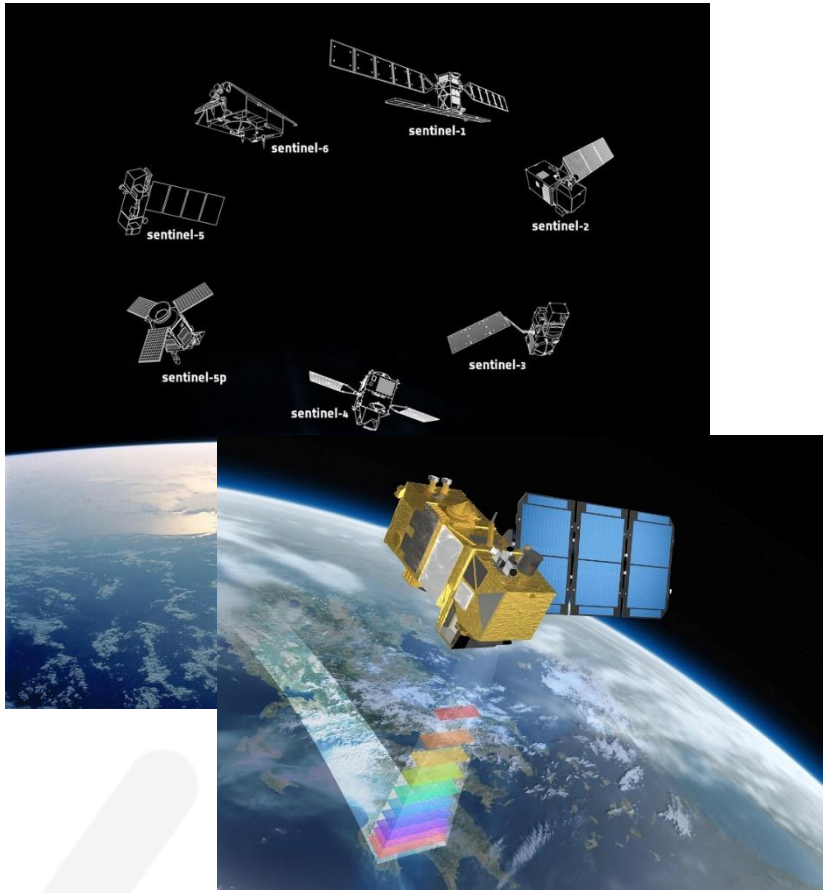
**EU Space** supports the siting of renewable energy facilities assessing potential energy generation and environmental impacts.

## Health


**EU Space** helps to forecast air quality and UV radiation having an impact on our health.

# Copernicus

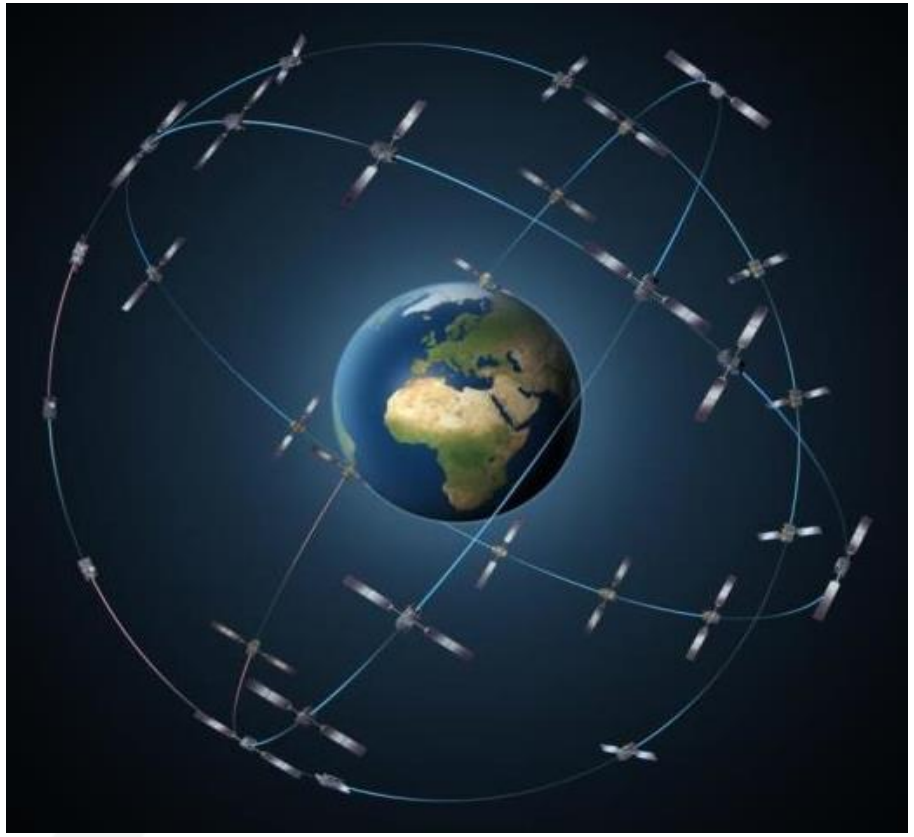
Copernicus‘ Satellites: the Sentinels




- Land Monitoring Service
- Marine Environment Monitoring Service
- Atmosphere Monitoring Service
- Climate Change Service
- Security Service
- Emergency Management Service

**free, full and open data policy**

# **Galileo:** EU's positioning, navigation and timing capability

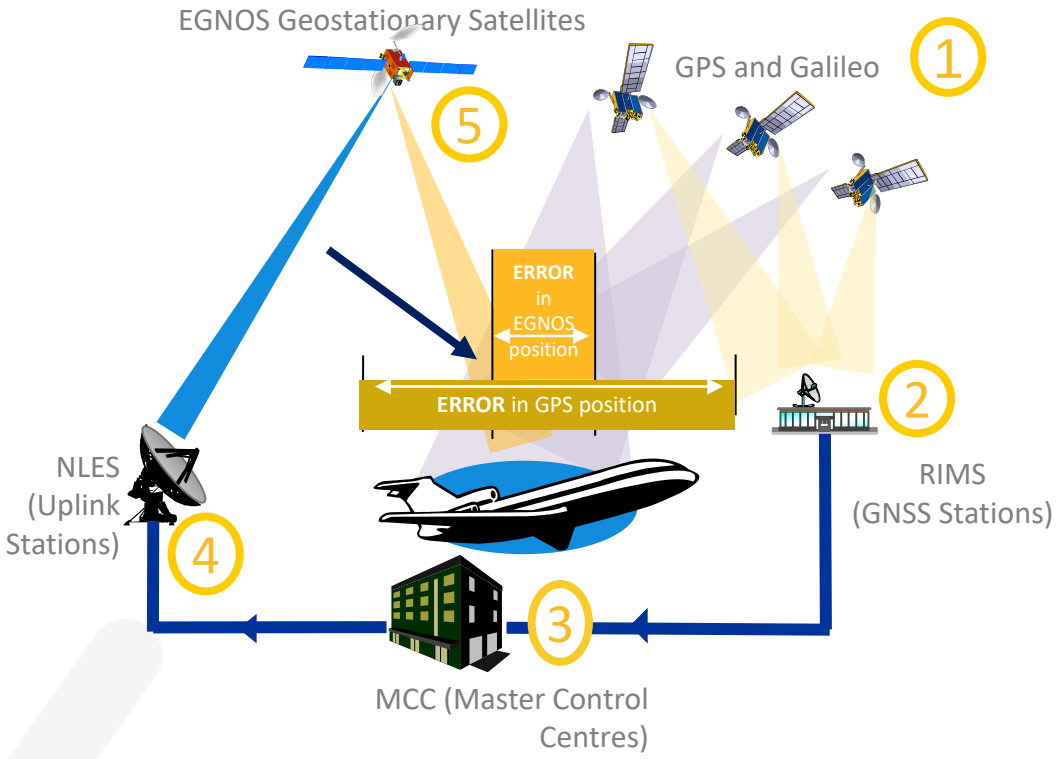


- **Open Service**
- **High-accuracy service**
- Signal authentication service
- **Public regulated service (PRS)**
- Emergency service
- **Timing service**
- **Search and rescue support service (SAR)**
- Integrity – monitoring services
- Space weather information

**(Available - In development)**

# **EGNOS** enhances GPS and Galileo in Europe

## EGNOS improves position accuracy and provides integrity




## Fields of application

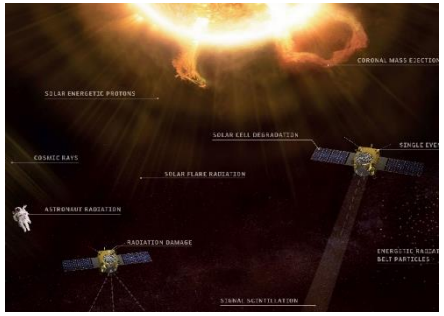
- Landing approaches of aircraft
- Precision agriculture
- Toll systems (e.g. Slovakia)
- Aviation and maritime (incl. ports)
- Tracking the transport of hazardous materials
- Surveying

# **SSA:** An autonomous capability to monitors and protects space assets

## Space Surveillance and Tracking (SST) Services

- Risk assessment of collision, collision avoidance
- Detection and characterisation of in-orbit fragmentations, break-ups or collisions
- Risk assessment of the uncontrolled re-entry of space objects and space debris
- Space debris mitigation and remediation

## Space Weather Activities




- Space Weather services for civil protection and protection of various sectors (e.g. transport)

## Near Earth Objects Activities

- Mapping and pooling Member States capacities
- Development of a routine rapid response service
- Creation an European catalogue

# **Govsatcom:** EU's secure access to space communication for public service

- Will provide government-authorised users a reliable and secure access to space communication with emphasis on emergency and security related activities
- Ensuring long-term **secure, reliable and cost-effective** SATCOM services to EU and Member State authorities
- … through **pooling and sharing** of governmental and commercial SATCOM capacities, assembling users and by seeking civil-military synergies
- … enhancing the EU's **strategic autonomy** and its non-dependence on third parties

# IRIS2

# IRIS2 : EU space-based secure connectivity system

**Ensure reliable, secure and cost-effective communications services for the protection of critical  infrastructures, surveillance, external actions and crisis management**


- Innovative **multi-orbital** space-based connectivity system
- Governmental infrastructure: for **reliable, secure and cost-effective communications** services
- Commercial infrastructure: high-speed broadband and  seamless connectivity throughout Europe, **removing dead zones**

# IRIS² missions & use cases

## A RELIABLE, SECURE AND COST EFFECTIVE GOVERNMENTAL COMMUNICATION SERVICE

### Connecting key infrastructures

- Command and control of smart grids (energy, finance, health, data centres…)
- Management of Infrastructures (air, rail, road, traffic management)
- Galileo (signal augmentation), Copernicus (data relayer)
- Institutional communications (Embassies, EUROPOL,…)
- Telemedicine

### Crisis Management and external actions

- Civil protection
- Common Foreign & Security Policy - Common Security & Defence Policy
- Humanitarian aid
- Maritime emergencies (search and rescue)

### Surveillance

- Border and remote areas surveillance
- Remote Piloted Aircraft systems
- Maritime surveil-lance
- Arctic region coverage
- Complement to military missions

## SECURE CONNECTIVITY INITIATIVE: MULTI-ORBITAL SPACE-BASED STATE-OF-THE-ART CONNECTIVITY SYSTEM

### Allow Mass-market service

- Mobile Broadband
- Fixed Broadband
- Satellite Trunking for B2B services
- Satellite access for transportation – for ships, airplanes, drones, connected cars
- Reinforcement of terrestrial networks (resilience) – as an alternative in cases of disruptive events
- Cloud based services

## EUROQCI

### Encryption capability

- Government and institutional users
- Data centres
- Satellite communi-cation networks
- Terrestrial communication networks
- Banking industry
- Other industries

# Space R&I under Horizon Europe

Horizon Europe,
a programme of the
European Union

# Space in Horizon Europe

## EU Space R&I

### Horizon Europe • Pillar 1

**Frontier Research, Science & Basic Technologies**

**ERC**

- Systems and communications engineering (PE7)
- Products and processes engineering (PE8)
- Universe sciences (PE9)
- Earth system science (PE10)
- Materials Engineering (PE11)
- Computer Science and Informatics (PE6)
- Medical and bio-technologies (LS7, LS9)
- ERC Synergy Grants

**MSCA**

- Doctoral Networks
- Postdoctoral Fellowships

### Horizon Europe • Pillar 2

**EU Space Programmes R&I**

- EGNSS Evolution
- EGNSS Market uptake
- GOVSATCOM Infrastructure evolution
- GOVSATCOM Applications & data services
- Copernicus Evolution
- Copernicus Market uptake
- SSA Infrastructure evolution
- SSA Applications & data services
- IRIS² Infrastructure evolution
- IRIS² Applications & data services

**Space Technologies, Capabilities, Applications & Pathfinder Missions**

- Launch Systems & Services
- In-Space Operations & Services
- Enabling Technologies
- Critical Space Technologies for EU non-dependence
- Science & Exploration
- Pathfinder Missions

**R&I Booster**

- Education and Skills
- CASSINI & Space Entrepreneurship
- IOD/V Service
- International Cooperation

### Horizon Europe • Pillar 3

**Game-changing Innovations & Market Uptake**

**Pathfinder · Transition · Accelerator**

- Innovative In-Space Applications & Sustainability
- Innovative Space Technologies & Systems
- Exploration

- Prizes
- EIC Business Accelerator

### EDF

**Space**

- Earth Observation for ISR applications
- Space Situational Awareness and early warning
- Space data processing
- Positioning, navigation, timing, navigation warfare
- Secure and robust communication
- Responsive space systems

# Pillar I – ERC grants

## Life Sciences

- LS1 Molecules of Life: Biological Mechanisms, Structures and Functions
- LS2 Integrative Biology: From Genes and Genomes to Systems
- LS3 Cell Biology, Development, Stem Cells and Regeneration
- LS4 Physiology in Health, Disease and Ageing
- LS5 Neuroscience and Disorders of the Nervous System
- LS6 Immunity, Infection and Immunotherapy
- LS7 Prevention, Diagnosis and Treatment of Human Diseases
- LS8 Environmental Biology, Ecology and Evolution
- LS9 Biotechnology and Biosystems Engineering

## Physical Sciences & Engineering

- PE1 Mathematics
- **PE2 Fundamental Constituents of Matter**
- PE3 Condensed Matter Physics
- PE4 Physical and Analytical Chemical Sciences
- PE5 Synthetic Chemistry and Materials
- **PE6 Computer Science and Informatics**
- PE7 Systems and Communication Engineering
- PE8 Products and Processes Engineering
- **PE9 Universe Sciences**
- **PE10 Earth System Science**
- PE11 Materials Engineering

## Social Sciences and Humanities

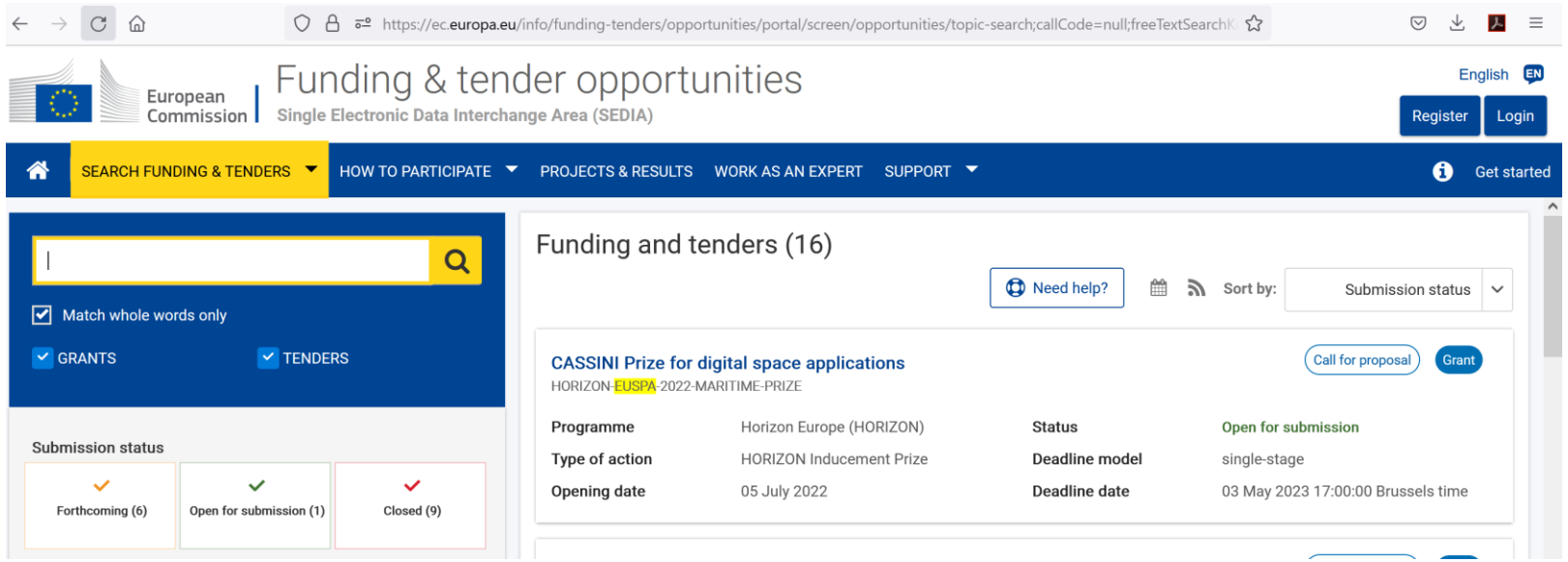
- SH1 Individuals, Markets and Organisations
- SH2 Institutions, Governance and Legal Systems
- SH3 The Social World and Its Interactions
- SH4 The Human Mind and Its Complexity
- SH5 Texts and Concepts
- SH6 The Study of the Human Past
- SH7 Human Mobility, Environment, and Space
- SH8 Studies of Cultures and Arts

European Research Council
Established by the European Commission

European Commission

# Pillar II

- Publication (HaDEA & EUSPA calls) on the EU Funding & Tender Portal at https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/home




- Funding rates
  - Research and Innovation Actions (RIA): 100%
  - Innovation Actions (IA): up to 70%
  - Coordination and Support Actions (CSA): 100%

- Consortia: must include min 3 entities from min 3 countries (countries: see https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/common/guidance/list-3rd-country-participation_horizon-euratom_en.pdf)

# WP 2023-2024 – Cluster Digital, Industry, Space – Destination 5 Space

"Strategic autonomy in developing, deploying and using global space-based infrastructures, services, applications and data"

Implemented through:

1. Calls from HaDEA
   - ~~Call HORIZON-CL4-2023-SPACE-01: will open on 22 Dec 2022, with deadline 28 March 2023~~
   - **Call HORIZON-CL4-2024-SPACE-01**: will open on **21 Nov 2023**, with deadline 21 March 2024
2. Calls from EUSPA
   - **Call HORIZON-EUSPA-2023-SPACE**: will open on **24 Oct 2023**, with deadline 14 Feb 2024
3. Tenders from ESA
4. Tenders from the European Commission

Published at: https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/wp-call/2023-2024/wp-7-digital-industry-and-space_horizon-2023-2024_en.pdf

# 1- Competitiveness

The **Future EU Space Ecosystem** is a highly automated, flexible, sustainable and economically viable space infrastructure enabling growth of innovative applications and competitive services

## Resilience of space assets

- ✓ Establishment of services for maintenance & upgrade
- ✓ Enhanced flexibility, security and scalability

## Non-dependence on technology & capability

- ✓ Key technology maturation
- ✓ Support to game-changing approaches and solutions
- ✓ Contribution to standardisation activities

## Sustainability & protection of the space environment

- ✓ Reduction of space debris and use of resources
- ✓ Active debris removal
- ✓ Promotion of re-usability

## Competitiveness

- ✓ Support to customer-drive ideas and NewSpace actors
- ✓ Creation of confidence in & visibility for EU actors
- ✓ Fostering of new commercial and value-added services

# 2 – Access to Space

- Access to space is **strategic for Europe**
- (Micro-) Launcher are a globally **ultra-competitive environment**
- Necessity to support a cost-efficient, responsive and **flexible access to space**
- Horizon Europe programme has **four R&I priorities**:
  - **Innovation for launcher competitiveness** – targeting initial operational capability by 2030
  - **Disruptive concepts for access to space** – starting at low technological readiness levels
  - Fostering and enabling **new commercial space transportation** solutions
  - Modern, flexible and efficient European **test, production and launch facilities**, means and tools

**Rapidly improve launch competitiveness,** in terms of cost and increased flexibility

**Stimulate the development of new space transportation solutions,** including through the emergence of new launch systems

# 3 – Quantum

- Quantum theory explains the nature and behaviour of matter and energy **on the atomic and subatomic levels**
- **"Atom interferometry"** can be used to make highly sensitive gravity detectors, accelerometers and gyroscopes
- A whole **range of applications has emerged** in science but also for our daily life like laser, electronics and medical imagery
- The EU must seize this opportunity and **make the best and most strategic use of quantum technologies for space**
- Promotion of developments for
  - Secure communication, time and frequency services
  - Earth sensing and observation
  - Use of quantum computing for space data processing and mission planning

**Support the EU space policy and the EU Space Programme**


**Reinforce EU non-dependence for the development of EuroQCI** (the EU Quantum Comm. Infrastructure)

**Build a dynamic and innovative industrial ecosystem in Europe**

*"Europe should invest massively in quantum technologies. This is a matter of technological sovereignty. Quantum could have important applications in the space domain like in encryption or in the mapping from space of the underground landscape."*

*Commissioner T. Breton, 22 January 2020*

# 3 – Quantum

## Quantum Space Gravimetry

- Satellite gravity missions provide **unique observations** not yet covered by other Earth observation missions
- Quantum technology is a **game-changer to monitor the Earth** and predict climate change and future disasters
- HE project CARIOQA develops an engineering model of the **atomic accelerometer** for a future mission

## Quantum Key Distribution

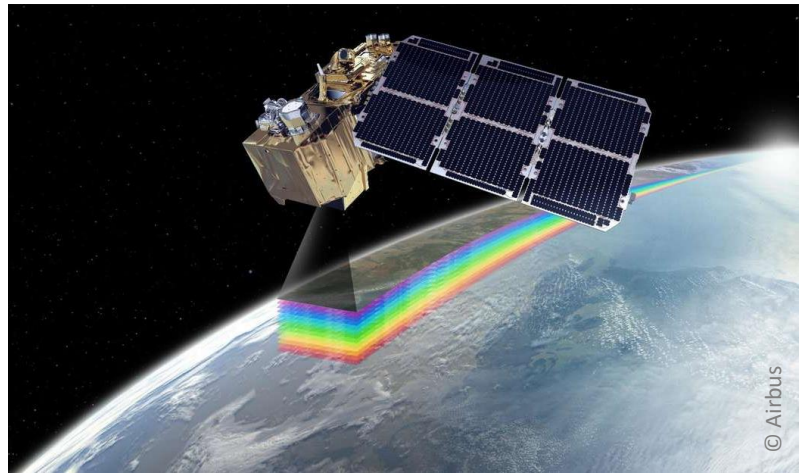
- European Quantum Communication Infrastructure (QCI) develops a terrestrial and space segment
- The **space segment based on satellites** to overcome the limitations of ground-based segments
- Objective is to mature the new technologies and perform the qualification for space and ground

# 4 – Copernicus Services

- Through Earth Observation (EO) satellites the **status of and changes in Earth's systems** can be monitored and assessed
- Copernicus serves as an independent and powerful European EO solution with services to **benefit all European citizens**
- Its own fleet of Earth observation satellites (Sentinels) **provides global data free of charge**
- Additionally, the commercial market demand for EO products is expected to grow quickly in the next years with a focus on
  - Advanced, very high-resolution satellite imagery and
  - Affordable, high-resolution, high-revisit products

**Preparing the evolution and expansion of Copernicus** to address EU policy and user needs

**Underpin competitiveness** and contribute to the integration of space into society and the economy



# 5 – Space science & technological non-dependence

- Space increasingly represents an **invaluable asset in many sensitive and high-stakes matters**
- COVID-19 pandemic has shown the necessity to **strengthen Europe's industrial base**
- Space-grade electronic devices and other space systems are **often subject to restrictive trade rules**
- To be non-dependent with a resilient and flexible supply chain, Europe has to develop its **own domestic production of critical technologies**

*Achieving strategic autonomy while preserving an open economy is a key objective of the EU and calls for developing EU autonomy in the space sector.*

*(EU Council conclusions, EUCO 13/20 Oct 2020)*

**Reduce the dependence on critical technologies and capabilities**

Develop or regain in the medium term the EU capacity to **operate independently** in space

**Enhance the technical capabilities and overall competitiveness** of European space industry

**Open new competition opportunities** for European manufacturers

**Improve the overall European space technology landscape** and complement and create synergies

# 6 – Space Situational Awareness (SSA)

- SSA is a component of the **EU Space Programme** (Regulation (EU) 2021/696)
- SSA means a **holistic approach**, including comprehensive **knowledge** and **understanding**, of the **main space hazards**, encompassing:
  - collisions between space objects
  - fragmentation and re-entry of space objects into the atmosphere
  - space weather events
  - near-Earth objects


Space Situational Awareness (europa.eu)

# 6 – Space Situational Awareness (SSA)

- Constituting National Entities (CNEs) of **15 EU Member States** have **networked their national assets** (radars, telescopes and lasers) into the **EU SST system**
- These 15 CNEs form the **EU SST Partnership**: Austria, Czech Republic, Denmark, Finland, France, Germany, Greece, Italy, Latvia, the Netherlands, Poland, Portugal, Romania, Spain and Sweden

EU SST
Space Surveillance and Tracking
Ensuring space safety and sustainability

EU SST – EU Space Surveillance and Tracking

# 7 – Applications for Galileo, EGNOS and Copernicus, including Galileo PRS & GOVSATCOM

- R&I is necessary to **strengthen and evolve** European space assets and value-added services using their synergies
- Activities target **innovative applications** in

**Agriculture:** Optimisation of fertiliser, fuel, pesticide and water use, assurance of food security and traceability

**Security and emergency:** Provision of crucial information and assistance in disaster mitigation, prepardness & recovery,

**Digital innovation:** Applications supporting smart cities, urban planning, smart waste management

**Climate change:** Monitoring Earth's changes and support the supply of clean, affordable and secure renewable energy

**Health:** Forecasting UV radiation or air pollution levels enable the use of autonomous robots in support of humans

**Provide Europe with cutting-edge space-based services**

**Evolve and improve** to continue responding to today's evolving challenges and market needs

**Build a dynamic and innovative downstream ecosystem in Europe**

# 8 – Cassini (see https://www.cassini.eu/cassini-initiative and www.cassini.eu)

The **CASSINI Actions** covers the whole entrepreneurship cycle:

- **Cassini Facility** deploys a 1€ B investment for Venture Capital funds interested in investing in EU-based companies in the space sector (up- and downstream)
- **CASSINI Matchmaking** supports start-ups, scale-ups and SMEs by connecting them with potential investors and/or corporate partners
- The **IOD/IOV** service enables new technologies to be tested in orbit
- **CASSINI Business Accelerator** seeds grant and six months of business acceleration for space-based start ups
- **CASSINI Prizes** trigger entrepreneurs to develop close-to-market digital applications based on EU space data
- EU-wide **CASSINI Hackathons**: an opportunity to stimulate entrepreneurship and to develop ideas for digital applications building on space data

The **EIC Actions** identifies & develops breakthrough technologies:

- The EIC Pathfinder & Transition programmes support **research teams exploring bold ideas at low TRLs** for radically new & emerging breakthrough technologies, with grants of up to 4€ M
- Providing **grant funding and equity investments** for individual start-ups and small companies with TRLs above 5 to develop and scale up innovations

# 9 – EGNSS Upstream

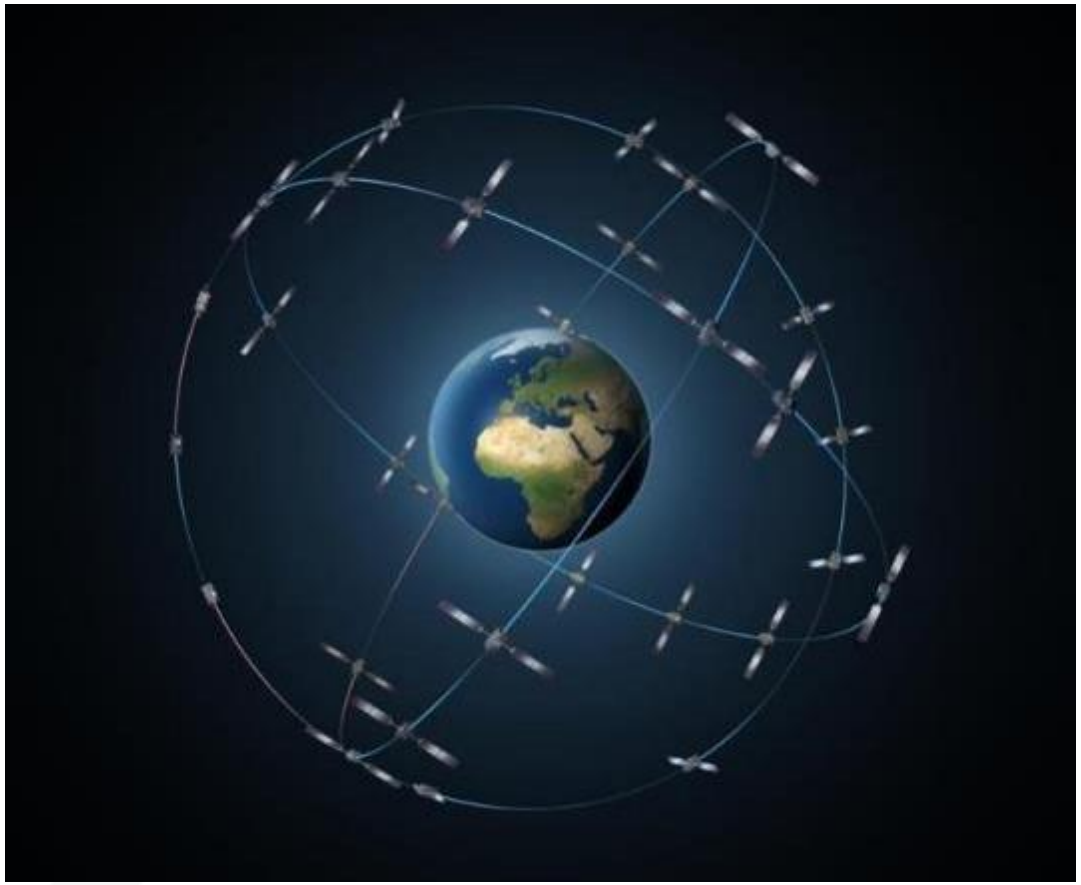
- Today, the use of a Global Navigation Satellite System (GNSS) **is deeply ingrained in our everyday lives**
- The European GNSS encompasses
  - **Galileo**, a state-of-the-art global satellite navigation system
  - **EGNOS**, a regional satellite-based augmentation system
- Both services create **extensive socio-economic benefits** through a range of applications spanning numerous markets
- The Galileo infrastructure evolves with the arrival of the second generation of Galileo (G2G) satellites
  - **Enabling diversification** of downstream applications
  - **Strengthening the robustness** with frequency diversity, increased power, signal encryption & authentication features
  - **Increasing the accuracy** in time and position

**Preparing the new generations** on a user-driven basis, considering the technological progress

**Addressing the vulnerability of the European supply chain** by supporting the R&I of critical space components and technologies

# 9 – EGNSS Upstream

## GALILEO TODAY



– 28 satellites in orbit

– Remarkable performance

– Strong link with users, market and industry

– Modernization on-going

# 9 – EGNSS Upstream

## EGNSS UPSTREAM R&D IN SUPPORT OF EGNSS PROGRAMMES

- The modernization of the Galileo mission and infrastructure (G2G) has been supported by a strong and efficient R&D activity funded by the Horizon 2020 / Horizon Europe programmes.
- Activities covers the full spectrum of EGNSS Upstream:
  1. **Assessment of viability for new mission concepts or new services**
     - direct management by EC
  2. **Technology and architecture**
     - delegated to ESA
  3. **Improvement of operations and service provision**
     - delegated to EUSPA

# 10 – Secure Connectivity – IRIS²

## Why IRIS²?
## New satcom needs cannot be fulfilled by current EU assets

Increased level of threats of hybrid nature, incl. cyber

growing governmental satcom needs for secure, reliable and diverse services

need for EU based available solutions

# 11 – IOD/IOV

See https://defence-industry-space.ec.europa.eu/eu-space-policy/eu-space-research/orbit-demonstration-and-validation-iodiov_en

- Validating concepts and testing innovative technologies in real conditions **accelerates their entry into the market**
- In-orbit testing is a costly and complex endeavour resulting in the infamous "**valley of death**" for many innovatiors
- This is why the EU started the **IOD/IOV initiative** enabling new technologies to be tested in orbit
- **1st call 2018, 2nd call 2020**
  - 100+ proposals from various European entities
  - Technology innovation for EO, PNT, SatCom, STM and more
  - The first selected IOD/IOV experiment **UPMSat-2** was launched incl. six innovative payloads

**Ensure the global competitiveness by allowing technologies to be effectively tested in orbit**

**Provide cost-effective services based on EU solutions**

**Prepare a generation of European engineers with hands-on experience**

UPMSat-2

# Pillar III - EIC

**Pathfinder** (TRL1-4)
- **For consortia**
- Early stage research on breakthrough technologies
- **Grants up to €3/4 million**

**Transition** (TRL 4-6)
- **For consortia and single entities**
- Technology maturation from proof of concept to validation
- Business & market readiness
- **Grants up to €2.5 million**

**Accelerator** (TRL 6-9)
- **For individual SMEs**
- Development & scale up of deep-tech/ disruptive innovations by startups/ SMEs
- Blended finance (**grants up to €2.5 million; equity investment up to €15 million or above**)

- Focus on **breakthrough, game-changing, market-creating, deep-tech**
- **Mainly bottom up** complemented by targeted funding on strategic technologies/ challenges
- Steered by **EIC Board** of leading innovators (entrepreneurs, investors, researchers, ecosystem)
- **Business Acceleration Services** (coaches/ mentors, corporates, investors, ecosystem)
- **Pro-active management** (roadmaps, reviews, re-orientations, etc) with EIC Programme Managers
- **Fast track access** to Accelerator for results from EIT, EIC Pathfinder


Thank you for
your attention!
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