

**European Space Agency (ESA)
Programs & Funding Opportunities**

Galileo & Copernicus Satellite Systems

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Concept of the paper (executive summary)

This document provides an in-depth overview of the European Space Agency's (ESA) funding opportunities related to the Galileo and Copernicus satellite systems. These systems are pivotal to Europe's space strategy, offering a range of services that benefit both commercial and public sectors.

Galileo Satellite System is operational since December 2016, being the European Union's Global Navigation Satellite System (GNSS), developed by ESA. It provides highly accurate global positioning services through a constellation of 28 satellites. Key services include the Open Service (OS) for public use, the Search and Rescue (SAR) service for emergency signal detection, the High-Accuracy Service (HAS) for applications needing precision positioning, and the Public Regulated Service (PRS) for governmental and security applications. Future developments include launching additional satellites to enhance system coverage and introducing new services such as the Emergency Warning Satellite Service (EWSS) and Open Service Navigation Message Authentication (OSNMA) to further bolster the system's capabilities.

Copernicus Program is the EU's Earth Observation (EO) program, developed in partnership with ESA. It operates a fleet of 30 satellites providing comprehensive data for environmental management, climate change monitoring, and civil security. Key features include detailed land use and agricultural monitoring, climate variable tracking, and real-

time disaster response data. Copernicus supports significant economic activity, generating substantial revenue and employment within the EU's EO sector.

Funding Opportunities ESA offers various funding mechanisms to foster innovation and the commercialization of space technologies:

- **Zero-Equity Funding:** Grants ranging from EUR 60,000 to EUR 2 million, providing project management support and access to ESA’s network.
- **Kick-Start Activities:** Feasibility studies to explore new service or product potentials integrating space technologies.
- **Competitive Calls:** Targeted calls for proposals addressing specific themes, such as autonomous drones for logistics or water management systems using EO data.
- **Non-Competitive Thematic Calls:** Broader calls encouraging innovation in specific sectors like sports car navigation systems or maritime decarbonization.
- **Grant Opportunities under Space Regulation:** Support for projects advancing GNSS and EO technologies.

Specific Programs

- **InCubed (ϕ-lab):** A co-funding program for innovative EO products and services.
- **Cassini Initiative:** Provides business development support, networking, and investment opportunities for space sector start-ups and SMEs.

Current Calls ESA’s current calls focus on areas such as climate action, urban innovation, agriculture, disaster management, and maritime applications. These calls support projects leveraging EO and GNSS data to address environmental sustainability, improve urban living, enhance agricultural practices, and boost maritime safety.

Application Process and Tips Applicants should ensure alignment with call requirements, register in the ESA-STAR system, and submit detailed proposals highlighting technical feasibility, market potential, and sustainability. Successful applications emphasize a clear value proposition, technical expertise, market understanding, and alignment with EU sustainability goals.

This document serves as a comprehensive guide for businesses and start-ups seeking to engage with ESA's funding opportunities, outlining the strategic importance of the Galileo and Copernicus systems and the diverse funding landscape designed to promote technological advancements and sustainable development.

Galileo Satellite System

The Galileo Satellite System, operational since December 2016, is a global navigation satellite system (GNSS) developed by the European Space Agency (ESA). This system is one of the four GNSS systems worldwide and is funded and owned by the European Union but remains under civilian control. Galileo's constellation consists of 28 satellites that orbit the Earth, providing highly accurate global positioning services to a wide range of users. These services include location tracking, navigation assistance, and precise timing, which are essential for various applications ranging from everyday smartphone use to complex scientific research.

Key Features:

1. Open Service (OS):

- **Function:** The Open Service is freely accessible to the public and provides accurate positioning, navigation, and timing services. It utilizes the signals from the Galileo satellites to deliver real-time information that can be integrated into various devices.
- **Applications:** Everyday applications include smartphones, GPS devices in vehicles, and wearable technology like fitness trackers. This service enhances the user experience by offering improved accuracy and reliability compared to other GNSS systems.
- **Benefits:** Users benefit from enhanced navigation accuracy, which is crucial for everyday activities such as driving, hiking, and urban navigation. The Open Service also supports developers in creating innovative applications that leverage precise location data.

2. Search and Rescue (SAR):

- **Function:** The SAR service is part of the international Cospas-Sarsat system, which aids in detecting and locating distress signals from emergency beacons. When a distress signal is detected, the information is relayed to the appropriate search and rescue authorities.
- **Impact:** This service significantly reduces response times in emergency situations, enhancing the efficiency and effectiveness of rescue operations. It has been instrumental in saving lives during maritime, aviation, and land-based emergencies.

- **Technological Aspects:** The SAR service provides global coverage and is designed to operate continuously, ensuring that distress signals are quickly detected and accurately located, even in remote areas.
- 3. High-Accuracy Service (HAS):**
- **Function:** HAS provides high-performance positioning services with accuracy levels down to a few centimeters. This is achieved through advanced algorithms and corrections that enhance the precision of the satellite signals.
 - **Applications:** HAS is particularly valuable for applications that require exact positioning, such as autonomous vehicles, precision agriculture, surveying, and advanced robotics. It ensures that these systems can operate safely and efficiently.
 - **Benefits:** By offering superior accuracy, HAS supports the development and deployment of cutting-edge technologies. For example, in agriculture, it enables farmers to optimize crop yields and reduce resource usage by applying precise amounts of water and fertilizers.
- 4. Public Regulated Service (PRS):**
- **Function:** PRS is an encrypted service designed for governmental and security-sensitive applications. It provides robust and continuous service, even in the presence of interference or signal jamming.
 - **Applications:** Essential for national security, emergency services, and critical infrastructure management, PRS ensures that governmental users have reliable access to navigation data during emergencies and crisis situations.
 - **Benefits:** The encrypted nature of PRS enhances the security and integrity of the navigation data, making it suitable for use in defense, police operations, and other critical sectors. It also ensures continuity of service in adverse conditions.

Future Developments:

1. Additional Satellites:

- **Objective:** The plan to launch 12 more satellites aims to enhance the coverage and flexibility of the Galileo system. These new satellites will allow reprogramming in orbit, adapting to changing market needs and new services.

- **Capability:** With the ability to update software while in orbit, the new satellites will be better equipped to handle evolving demands and provide more resilient services. This will ensure that Galileo remains at the forefront of GNSS technology.
2. **Emergency Warning Satellite Service (EWSS):**
 - **Launch Year:** Scheduled for 2025, EWSS aims to transmit critical information about hazards and natural disasters directly to users' devices.
 - **Function:** This service will provide timely warnings and safety instructions, complementing existing emergency alert systems. It will be particularly useful for disseminating information during earthquakes, tsunamis, and severe weather events.
 3. **Open Service Navigation Message Authentication (OSNMA):**
 - **Function:** OSNMA is designed to authenticate the integrity and authenticity of navigation messages. This service will help prevent the misuse of false signals and ensure the reliability of the information provided to users.
 - **Benefits:** By confirming the authenticity of navigation data, OSNMA enhances the security of applications that rely on Galileo signals, such as financial transactions, critical infrastructure management, and secure communications.
 4. **Commercial Authentication Service (CAS):**
 - **Function:** CAS supports civil applications that require high integrity and security. This service is aimed at commercial users who need assured navigation and timing data.
 - **Applications:** Industries such as finance, telecommunications, and logistics can benefit from CAS, ensuring that their operations run smoothly and securely.

Copernicus

Copernicus is the European Union's Earth Observation (EO) program, developed in partnership with the ESA. It comprises a fleet of 30 satellites that provide comprehensive observation data across multiple domains, including land, marine, and atmospheric monitoring. The program aims to deliver accurate and timely information for environmental management, climate change monitoring, and civil security.

Key Features:

1. Environmental Management:

- **Applications:** Copernicus provides detailed data on land use, forest cover, water quality, and agricultural practices. This information is crucial for planning and managing natural resources effectively.
- **Function:** High-resolution optical imagery and meteorological data are used to monitor changes in the environment, assess the impact of human activities, and support sustainable development initiatives.
- **Benefits:** Policymakers and environmental agencies can use this data to make informed decisions, implement conservation measures, and promote sustainable land management practices.

2. Climate Monitoring:

- **Applications:** The program tracks key climate variables, such as sea surface temperature, ice cover, greenhouse gas concentrations, and weather patterns. This data is essential for understanding and mitigating the impacts of climate change.
- **Function:** Copernicus provides continuous monitoring and long-term data sets that help scientists and researchers analyze climate trends and predict future changes.
- **Benefits:** By providing reliable climate data, Copernicus supports global efforts to combat climate change, develop adaptation strategies, and enhance resilience to climate-related disasters.

3. Civil Security:

- **Applications:** Copernicus aids in emergency response and disaster management by providing real-time data on natural disasters, such as floods, earthquakes, and wildfires. This information helps authorities coordinate relief efforts and minimize the impact of disasters.

- **Function:** The program's satellites offer high-resolution images and timely updates, enabling quick assessment of affected areas and efficient allocation of resources.
- **Benefits:** Enhanced situational awareness and timely information allow emergency services to respond more effectively, saving lives and reducing economic losses.

Economic Impact:

- **Revenue:** The EO sector in the EU generates approximately EUR 1.8 billion annually, reflecting the growing demand for Earth observation data and services.
- **Employment:** The sector supports around 13,800 jobs, with significant growth potential as the industry continues to expand.
- **Market Share:** The EO industry in the EU comprises 33% of the global data processing market, driven by a dynamic ecosystem of start-ups and SMEs. These companies are at the forefront of developing innovative applications and solutions that leverage EO data.

Funding Opportunities

The ESA provides various funding opportunities for businesses and start-ups integrating space technology into their operations. These include grants, competitive calls, and co-funding programs aimed at fostering innovation and commercialization of space technologies.

Types of Funding Opportunities

Zero-Equity Funding:

- **Range:** Funding ranges from EUR 60,000 to EUR 2 million, depending on the scope and potential impact of the project.
- **Benefits:** Recipients receive tailored project management support, access to the ESA's extensive network, and the right to use the ESA brand for product credibility. This support helps businesses navigate the challenges of developing and commercializing new technologies.
- **Eligibility:** Start-ups and businesses with innovative, commercially viable, and technically feasible projects can apply. The ESA particularly looks for entities with sector experience and industry domain expertise.

Kick-Start Activities:

- **Focus:** These activities focus on feasibility studies to explore the potential of new services or products that integrate space technologies. They are designed to help businesses test their ideas before committing to full-scale development.
- **Eligibility:** Start-ups and businesses from all sectors, including non-space sectors that can benefit from space technology, are encouraged to apply. The goal is to identify and nurture projects with strong market potential.
- **Examples:** Past projects include developing mobile applications for urban planning that use Galileo's precise location data and agricultural monitoring systems that leverage Copernicus EO data.

Competitive Calls:

- **Description:** Competitive calls are issued for specific themes or sectors, encouraging the development of innovative applications of space technology.

These calls are open to businesses that propose solutions addressing predefined challenges.

- **Examples:**
 - **Transport & Logistics:** Developing autonomous drone delivery services using Galileo’s high-accuracy positioning.
 - **Water Management:** Creating systems for efficient water use in agriculture by integrating EO data from Copernicus.
- **Benefits:** Successful applicants receive funding, project management support, and access to ESA’s resources and networks. This helps accelerate the development and deployment of new technologies.

Non-Competitive Thematic Calls:

- **Description:** These calls focus on broader themes and are less competitive, providing opportunities for businesses to propose innovative solutions within a specific domain.
- **Examples:**
 - **Space for the Sports Car Sector:** Developing advanced navigation systems for enhancing vehicle efficiency and safety.
 - **Maritime Decarbonization:** Implementing digital solutions to reduce carbon emissions in the maritime industry.
- **Benefits:** These calls aim to foster innovation in specific sectors, encouraging collaboration and the development of solutions that address industry-wide challenges.

Grant Opportunities under Space Regulation:

- **Description:** These grants support the development and implementation of technologies that enhance the capabilities and applications of the Galileo and Copernicus systems.
- **Examples:**
 - **Galileo HAS enabled Maritime Receiver:** Developing high-accuracy maritime receivers for safer navigation.
 - **Galileo HAS and OSNMA Implementation:** Integrating high-accuracy and authentication services into automated mobility solutions.
- **Benefits:** These grants provide funding for projects that advance GNSS and EO technologies, supporting the broader goals of the Galileo and Copernicus programs.

Specific Programs

InCubed (φ-lab):

- **Description:** InCubed is a co-funding program supporting the development of innovative EO products and services. Managed by ESA's φ-lab, it focuses on innovation in EO.
- **Eligibility:** Open to start-ups, SMEs, universities, and research institutes with promising EO projects.
- **Benefits:** InCubed provides zero-equity funding, enhancing credibility with ESA's support. Participants gain access to ESA's EO facilities and community.
- **Examples:** Projects include satellite constellations for environmental monitoring, data analytics platforms, and EO applications for disaster response.

Cassini Initiative:

- **Description:** Cassini provides business development support, networking opportunities, and investment for space sector start-ups and SMEs.
- **Benefits:** The initiative offers coaching, training programs, networking events, and investment opportunities.
- **Upcoming Events:**
 - **European Rover Challenge:** Focuses on space exploration and sustainability.
 - **High-Tech Venture Days:** In Dresden, Germany, focuses on high-tech sectors.
 - **International Astronautical Congress:** In Milan, Italy, emphasizes responsible space activities and sustainability.

Current calls

Space for Climate Action

- **Objective:** To support projects that leverage Earth Observation (EO) data to address climate change and promote environmental sustainability.
- **Key Areas:**
 - **Carbon Monitoring:** Developing tools for tracking carbon emissions and sequestration.
 - **Climate Adaptation:** Creating models and tools to help communities adapt to climate change.
 - **Biodiversity:** Monitoring ecosystems and biodiversity to support conservation efforts.
- **Projects:**
 - **Carbon Footprint Tracking:** Using Copernicus data to create a platform that helps companies and municipalities monitor and reduce their carbon footprints. The platform could integrate data on greenhouse gas emissions from various sources and provide actionable insights for reduction strategies.
 - **Flood Prediction Systems:** Developing an early warning system for floods using real-time satellite data. This could integrate historical data, weather forecasts, and satellite imagery to predict flood events and help local authorities prepare and respond more effectively.

Smart Cities and Urban Innovation

- **Objective:** To support projects that enhance urban living through innovative use of GNSS and EO data.
- **Key Areas:**
 - **Traffic Management:** Using real-time positioning data to optimize traffic flow and reduce congestion.
 - **Urban Planning:** Integrating high-resolution satellite imagery with GIS systems for better city planning.
 - **Air Quality Monitoring:** Deploying satellite-based air quality sensors to monitor pollution levels in urban areas.
- **Projects:**

- **Intelligent Traffic Systems:** Developing a traffic management platform that uses Galileo’s high-accuracy positioning to provide real-time traffic updates and optimize traffic signals. This could help reduce congestion and improve air quality in cities.
- **Green Infrastructure Mapping:** Creating a tool for urban planners that uses Copernicus data to identify areas for green infrastructure development, such as parks and green roofs, to mitigate urban heat islands and enhance city resilience.

Agriculture and Food Security

- **Objective:** To promote the use of satellite data in improving agricultural practices and ensuring food security.
- **Key Areas:**
 - **Precision Farming:** Using GNSS and EO data to optimize crop management and increase yields.
 - **Soil Health Monitoring:** Assessing soil health and fertility using satellite imagery and data analytics.
 - **Pest and Disease Management:** Detecting early signs of crop diseases and pest infestations through satellite monitoring.
- **Projects:**
 - **Smart Irrigation Systems:** Developing an irrigation management system that uses Copernicus data to monitor soil moisture levels and optimize water use. This can help farmers conserve water and improve crop yields.
 - **Crop Health Monitoring:** Creating a service that uses EO data to provide farmers with real-time information on crop health, enabling timely interventions to prevent diseases and improve productivity.

Disaster Management and Emergency Response

- **Objective:** To enhance disaster preparedness and response capabilities through advanced use of satellite data.
- **Key Areas:**
 - **Rapid Damage Assessment:** Using satellite imagery to quickly assess damage after natural disasters.
 - **Evacuation Planning:** Developing tools for efficient evacuation planning and management using GNSS data.
 - **Resource Allocation:** Optimizing the distribution of resources and aid during emergencies.
- **Projects:**

- **Disaster Response Dashboard:** Creating a real-time dashboard for disaster response teams that integrates Copernicus data to provide situational awareness and coordinate relief efforts. This could include mapping affected areas, identifying safe routes, and monitoring ongoing recovery activities.
- **Early Warning Systems:** Developing an early warning system that uses satellite data to predict natural disasters like earthquakes, tsunamis, and volcanic eruptions, providing crucial time for evacuation and preparation.

Marine and Maritime Applications

- **Objective:** To improve maritime safety, efficiency, and environmental monitoring through satellite technology.
- **Key Areas:**
 - **Ship Tracking:** Enhancing ship tracking systems using GNSS for better navigation and collision avoidance.
 - **Marine Environment Monitoring:** Monitoring marine pollution and ecosystem health using EO data.
 - **Fisheries Management:** Supporting sustainable fisheries through satellite-based monitoring of fish stocks and habitats.
- **Projects:**
 - **Enhanced AIS Systems:** Developing an Automatic Identification System (AIS) that integrates Galileo's positioning data to improve maritime safety and navigation accuracy. This could help prevent accidents and optimize shipping routes.
 - **Marine Pollution Monitoring:** Creating a platform that uses Copernicus data to monitor marine pollution levels, track sources of contamination, and support cleanup efforts. This tool could be vital for protecting marine ecosystems and ensuring compliance with environmental regulations.

How to Apply

General Steps:

1. Eligibility Check:

- Ensure alignment with the specific call's requirements and thematic focus. Review the call documentation to understand eligibility criteria, objectives, and expected outcomes.

2. Registration:

- Register under the ESA-STAR system, ESA's electronic tendering platform. Ensure all required information and documentation are up-to-date.

3. Proposal Submission:

- Prepare a detailed proposal outlining the technical feasibility, market potential, and commercial viability. Include a description of objectives, methodology, expected outcomes, and impact.

4. Review and Selection:

- Proposals are evaluated based on innovation, impact, and technical robustness. Feedback may be provided, offering insights into the proposal's strengths and weaknesses.

5. Funding Agreement:

- Successful applicants enter into a funding agreement with ESA, detailing support and expectations, including reporting requirements and compliance with ESA standards.

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Tips for Successful Application

- 1. Clear Value Proposition:**
 - Highlight the unique benefits and market need for your solution. Demonstrate the value it brings to potential users or customers.
- 2. Technical Feasibility:**
 - Provide evidence of technical capabilities and experience. Include details of previous projects and relevant expertise.
- 3. Market Analysis:**
 - Demonstrate understanding of market dynamics and potential customer base. Include market research and competitor analysis.
- 4. Sustainability:**
 - Emphasize alignment with the EU's Green Deal and sustainability goals. Highlight environmental benefits and contribution to sustainable development.