**EN**

**Annex 8**

**"…Annex 8**

**Horizon 2020**

**Work Programme 2016 – 2017**

*5. Leadership in enabling and industrial technologies*

*iii. Space"*

*DRAFT*

**Note:**

**This draft Work Programme text is for the sole use of the Commission services and the Horizon 2020 Space programme committee.**

**- Rev. 2 circulated on 19/03/2015.**

*(European Commission Decision C (2015)xxx of dd mm 2015)*

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## Introduction

Space research is supported in Horizon 2020 under the priority "Industrial Leadership", in line with the main objective and challenge to ensure that that space will remain accessible to Europe and safe to operate in the long run. This is a long-term challenge that requires a long-term approach that must encompass several areas such as security of supply of critical space technologies, including components, at cost effective and affordable conditions, industry capability and technology readiness as well as space situational awareness to cope with threats such as space orbital debris (including space surveillance and tracking). An important challenge and an opportunity for Europe is to reap the benefits of European investments in the space sector, primarily by carrying out research and innovation actions for preparing applications and downstream services exploiting the opportunities of data and signals available through the Galileo and Copernicus systems.

Needs expressed by main European space stakeholders, including industry and SMEs, have been reflected in this work programme. An increasing industrial participation is expected across the work programme with industry lead encouraged in particular for technology topics under the COMPET calls. The Horizon 2020 Space Work Programme 2014-2015 already covered the major strands of activities required to address these challenges. These major strands are foreseen to remain for the full 2014-2020 period. Thus, there is a strong element of continuity for the Horizon 2020 Space Work Programme 2016-2017.

Actions will be carried out in conjunction with research activities of the Member States and ESA, aiming at building up complementarity among different actors.

The Commission proposal for Horizon 2020 sets the following motto for EU Space R&D for 2014 to 2020 ‘Prepare for the increasing role of space in the future and reap the benefits of space now’.

The work programme has been structured to address these challenges by:

* Prioritising the existing two EU Space flagships of European Global Navigation Satellite System (EGNSS) and Earth Observation reaping the benefits they can generate in the coming years and ensuring their state-of-the-art also in the future;
* Ensuring support for the third programmatic priority of the EU space policy: the protection of space infrastructure and in particular the setting up of a Space Surveillance and Tracking system (SST) at European level;
* Ensuring support to EU industry to meet the objectives defined in the Commission communication on Space Industrial Policy, notably to maintain and enhance industry’s competitiveness and its value-chain in the global market;
* Ensuring that Europe’s investments made in space infrastructure are exploited to the benefit of citizens; as well as supporting European space science; and
* Enhancing Europe’s standing as attractive partner for international partnerships in space science and exploration.

A novelty in Horizon 2020 is the Open Research Data Pilot which aims to improve and maximise access to and re-use of research data generated by projects. While certain Work Programme parts and areas have been explicitly identified as participating in the Pilot on Open Research Data, individual actions funded under the other Horizon 2020 parts and areas can choose to participate in the Pilot on a voluntary basis. The use of a Data Management Plan is required for projects participating in the Open Research Data Pilot. Further guidance on the Open Research Data Pilot is made available on the Participant Portal. . Where appropriate, beneficiaries in projects participating in the Pilot on Open Research Data are invited to follow the GEOSS Data Sharing Principles and to register in GEOSS the geospatial data, metadata and information generated as foreground of the project. Further contact and information on GEOSS can be found from [www.earthobservations.org](http://www.earthobservations.org).

Initial efforts in stimulating space-based applications in the area of Earth observation are being made through the Leadership in Enabling and Industrial Technologies-Space part of Horizon 2020. However, the uptake of space data for the development of innovative applications addressing specific challenges is expected to primarily take place through the Horizon 2020 Societal Challenges to ensure full integration and direct uptake by the users.

# Call - Earth Observation – 2016/2017

***H2020-EO-2016******/2017***

Horizon 2020 Earth observation (EO) activities are considered an essential element to accompany the investments made by the Union in Copernicus, the Union Earth observation and monitoring programme and in the Global Earth Observation Systems of Systems (GEOSS).

In particular, activities under the societal challenge for climate action, environment, resource efficiency and raw materials focus on GEOSS, notably the development of comprehensive and sustained global environmental observation and information systems that stimulate the smart use of strategic resources, support the development of evidence-based policies, foster new environmental and climate services, and develop new opportunities in global markets. Activities under the Leadership in Industrial Technologies part focus on the evolution of Copernicus and the exploitation of existing European space infrastructure by promoting the development of innovative products and services based on remote sensing, geo-positioning or other types of satellite enabled data.

Moreover, the application and uptake of EO for the development of innovative applications addressing specific challenges is expected to primarily take place through the Horizon 2020 Societal Challenges. To that end, users can access Copernicus data and information (licensing conditions may apply)[[1]](#footnote-2).

To help optimise the coherence of Union action and use of resources, and to facilitate access to opportunities for applicants, the dedicated Earth observation activities will be implemented through a virtual work programme approach bringing together the following related calls and topics from societal challenge 5, LEIT/Space and research infrastructures as follows:

* Blue Growth – demonstrating an ocean of opportunities:
	+ Integrated Arctic Observing System.
	+ Impact of Arctic changes on weather/climate of northern hemisphere.
	+ Climate impacts on Arctic ecosystems, resources, new economic activities.
* Sustainable Food Security – resilient agri-food chains:
	+ EO services for the monitoring of agricultural production in Africa.
* SC5 - Earth Observation:
* Novel in-situ observation systems.
* Coordinate citizen observatories initiatives.
* European Hub of the GEOSS information system.
* LEIT/Space – Earth Observation:
* Downstream applications.
* Downstream applications for public sector users.
* Evolution of Copernicus services.
* EO Big Data Shift.
* LEIT/Space – COMPET:
* Earth observation technologies.
* SME Instrument (SC5 and LEIT/Space):
* Focus on applications.

### EO-1-2016/2017: Downstream applications

Specific challenge: Copernicus, the Union's Earth observation and monitoring programme entered into force in 2014 and produces a wealth of data and information regarding the Earth sub-systems (land, atmosphere, oceans) and cross-cutting processes (climate change, emergency and security). Copernicus data and information are mainly made available on a free open and full basis. This is expected to unleash unique market opportunities. It is important to foster market development across different sector through the development of applications, and encourage their insertion into the market.

For such applications and developments to succeed, the product needs to be shaped according to users’ demands, to be validated and proven. This needs to be achieved in an environment integrated at the level of the user, in order for users to accept the innovative potential which the product promises. This will require also specific attention to be given to the various processes in place in the users’ workflows which incorporate the EO information. Furthermore, the commercial providers will have to demonstrate that they can sustain their product operationally based on market revenues. To this end a credible planning for the 3 years after the end of public funding shall be part of the proposal.

Scope: Proposals may address a wide variety of applications stemming from the use of Earth observation and its smart integration with other related technologies.

The outcome of this innovation project should be a commercial service platform, sustained by a production process capable to deliver to the user a product which is validated and accepted as a marketable product. Transnational collaboration has a key role to play in this context, as it enhances access to markets beyond the national borders, notably by enabling space application providers to absorb market-related tacit knowledge and know-how of their partners. Corresponding validations and customisations are to be undertaken, and the business case for the application is to be demonstrated. Service level models are to be developed, with appropriate quality of service definitions for the application. Application products are expected to adopt open standards for data documentation, data models and services.

The choice of EO application is left to the proposer.

Preference will be given to proposals led by industry and SMEs, which are considered to be particularly important players in this European EO applications sector.

Proposers are advised to consult further information on availability of Copernicus Sentinel Data, access to Copernicus Contributing Mission data, as well as issues recommended to be detailed in the proposals at the Commission’s web <http://ec.europa.eu/growth/sectors/space/research/index_en.htm>.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 and 2 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: Proposals are expected to:

* Establish sustainable supply chains for innovative EO applications with demonstrated commercial value with targeted client communities. Complete integration into the customer’s existing business processes and processing chains, as well as the economic viability of the application is to be demonstrated;
* Enhance the European industry’s potential to take advantage of market opportunities and establish leadership in the field, and to boost business activity;
* Lead to new or improved products, processes or services on the market, which are capable of generating within 3 years after the end of public funding a significant turnover for the participants, and create new jobs.

Type of action: Innovation actions.

***The conditions related to this topic are provided at the end of this call and in the General Annexes.***

### EO-2-2016: Downstream services for public authorities

Specific challenge: Copernicus, the Union's Earth observation and monitoring programme entered into force in 2014 and produces a wealth of data and information regarding the Earth sub-systems (land, atmosphere, oceans) and cross-cutting processes (climate change, emergency and security). Such information can be very helpful for reporting obligations of Member States and can enable informed decision-making. At the same time such information needs either adaptation to local conditions and contexts, or adaptation to the specific needs of public authorities as part of workflow and procedures. The challenge is to deepen user integration and thus foster exploitation of Copernicus information to match the needs of public authorities at national, regional or local levels.

New and innovative solutions are needed to address the existing and emerging societal challenges faced among others by the public sector. Some of these societal challenges require public sector transformations for which no commercial stable solutions exist, and that require a more forward looking public procurement strategy either through incremental or radical innovation.

Scope: The objective is to launch demand-driven innovation actions by public authorities aiming at customising Copernicus information for their needs. Transnational collaboration has a key role to play in this context, as it can facilitate knowledge transfer and optimisation of resources for public authorities. It also fosters service providers who can benefit from an strengthened digital single market. Application products are expected to adopt open standards for data documentation, data models and services.

The choice of Copernicus service and associated downstream EO-based serviceis left to the proposer.

Proposers are advised to consult further information on availability of Copernicus Sentinel Data, access to Copernicus Contributing Mission data, as well as issues recommended to be detailed in the proposals at the Commission’s web http://ec.europa.eu/growth/sectors/space/research/index\_en.htm.

It should also be noted that coupling with ESIF[[2]](#footnote-3) actions could facilitate this process and can ensure continuity.

Expected impact: Actions are expected to lead to:

* the establishment of buyer groups for Earth observation services;
* Copernicus-enabled national, regional or local applications in support of public authorities;
* Fostering the emergence of similar EO-based actions in smart specialisation strategies.

Type of action: Pre-commercial procurement (PCP) – Co-fund actions.

***The conditions related to this topic are provided at the end of this call and in the General Annexes.***

### EO-3-2016: Evolution of Copernicus services

Specific challenge: Copernicus operational services are not static, but need to evolve with recognised and emerging user requirements and state of the art methodologies. While immediate service maintenance and enhancement in response to the Copernicus work programme is part of operational tasks, long-term evolutions will need input from R&D outside the programme. A process has been put in place in the Copernicus services by the Entrusted Entities to review service evolution and any emerging adaptation needs as to their urgency, closeness to the operational delivery process, and availability of capacities. R&D activities which are suitable for Horizon 2020 are identified to this end by the Commission and/or the Entrusted Entities for each service. The challenge is to have the results of R&D available in a sufficiently timely manner to support an informed discussion, if and under which conditions an evolution of the operational service portfolio of the Copernicus service is appropriate. The schedule of the activities should thus consider the overall planning of the Copernicus programme and its specific services concerned.

Scope: The research and innovation action should aim at demonstrating the technical operational feasibility of a specific service evolution proposal. The proposers are expected to demonstrate at the proposal stage an active link with the Copernicus service by suitable means. The output of these research and innovation project should aim at providing a proof-of-concept or a prototype for a proposed evolution of the Copernicus services, respecting the border between Copernicus services and downstream services. This proof-of-concept or prototype should allow to demonstrate the appropriateness to implement the proposed evolution later on at European level, i.e. potentially with operational Copernicus funding. To allow a discussion of such potential operational funding, the activitiy should as well result into one or more possible scenarios how this evolution could potentially be integrated into the existing service architecture and if it could be built on the existing observation data or if new observation requirements would be needed.

Proposers are advised to consult information on the Copernicus programme in general at <http://copernicus.eu>, the evolution topics identified there, as well as the availability of Copernicus Sentinel Data, access to Copernicus Contributing Mission data at the Commission’s web <http://ec.europa.eu/growth/sectors/space/research/index_en.htm>.

Preference will be given to proposals led by industry and SMEs, which are considered to be particularly important players in this European EO applications sector.

The proposal should indicate if and how the proposed evolution could be a candidate for the operational Copernicus service in terms of cost-benefits, calendar and operational feasibility as well as the conditions for making available the technical results (IPR) to the EU Copernicus programme, including its future contractors and service providers.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 and 2 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: Actions are expected to:

* Enhance the European industry’s potential to take advantage of market opportunities and establish leadership in the field,
* Boost business activities of the industrial actors in EU and national procurements;
* Establish a proof-of-concept or a prototype, which can act as reference for the independent assessment of Copernicus service evolution.

Type of action: Research and innovation actions.

***The conditions related to this topic are provided at the end of this call and in the General Annexes.***

### EO-4-2017: EO Big Data Shift

Specific challenge: Effective access to Copernicus dedicated mission data and Copernicus service information by public and private users is a sine qua non condition for the achievement of Copernicus' objectives.

In this context, Copernicus faces important challenges. First, the multiplicity of Copernicus partners (ESA, EUMETSAT, service operators) involved in Copernicus dissemination activities requires both flexible and effective coordination. At the moment Copernicus dissemination infrastructure is built around different dissemination platforms which are in the process of being made interoperable. Second, the sheer volume of data and information to be disseminated and used, puts Copernicus at the forefront of the big data challenges. This new paradigm requires a change of approach to data curation and dissemination, in the form of a technological leap to both ingest processing and make available the increased volume of Copernicus data and information. As a reward, the Big Data paradigm offers new perspectives for data intensive activities where Europe could still close its technological gap with the US with huge industrial implication.

The free, full and open data policy will support the development of a strong Earth observation downstream service industry if an effective and scalable dissemination system is implemented to meet the Big Data exploitation challenges and to address the full data cycle needs. Therefore, Europe needs to foster a Copernicus dissemination infrastructure spurred by a vibrant European downstream sector taking advantage of the timely availability of the Copernicus data and information to provide innovative Earth observation information products on a worldwide basis based on European Internet platforms using advanced big data technologies and serving a worldwide market.

Scope: Activities are expected to address two main strands of activities: (i) the evolution needs of the Copernicus data dissemination platform; and (ii) the adaptation of big data technologies to Copernicus user scenarios.

The evolution of the Copernicus data infrastructure should foster innovative business models for data exploitation allowing for numerous new users. Projects should develop the platforms for EO data use (state-of-art and beyond). Cross-fertilisation with other big data domains is needed to ensure that EO data exploitation can benefit other domains/sectors (and that tools are in place), and that lessons learnt in other sectors can be benefitted from. The latter includes for instance experiences in strategies for co-locating or distributing processing to different levels, dissemination of data and archiving.

Regarding Big Data, activities shall bridge the gap between Earth observation and information technology sectors taking into account the user needs for Big Data and aiming at developing innovative solutions.

Activities are expected to address the any aspect of the data lifecycle which can solve EO big data challenges , in particular data management activities (e.g. collection, processing, quality control, documentation, dissemination, cataloguing, preservation, usage tracking) and usage activities (e.g. discovery, reception, analysis, product generation, user feedback, tagging).

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 and 2 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact:

* Make access to the Copernicus data and information easy and user friendly through scalable dissemination and exploitation platforms,
* Foster the establishment of interoperable access facilities to all EU Member States,
* Implement solutions to meet the Big Data challenges,
* Provide user community tools within the dissemination platforms,
* Ensure resilience of the overall dissemination and exploitation system.

Type of action: Research and innovation actions.

***The conditions related to this topic are provided at the end of this call and in the General Annexes.***

### *CONDITIONS FOR THIS CALL*

Publication date:

Opening dates[[3]](#footnote-4):

Deadline(s)[[4]](#footnote-5):

|  |  |
| --- | --- |
| EO-1-2016EO-2-2016EO-3-2016 | dd-mm-2016at 17.00.00 Brussels time  |
| EO-1-2017EO-4-2017 | dd-mm-2017at 17.00.00 Brussels time  |

Overall indicative budget: **EUR 22 million from the 2016 budget and EUR 17.5 million from the 2017 budget.**

| Topics | 2016EUR million  | 2017EUR million |
| --- | --- | --- |
| EO-1-2016/2017 | 10.0 | 10.0 |
| EO-2-2016 | 3.0 | 0.0 |
| EO-3-2016 | 9.0 | 0.0 |
| EO-4-2017 | 0.0 | 7.5 |

Eligibility and admissibility conditions: The conditions are described in parts B and C of the General Annexes to the work programme, with the following exceptions:

|  |  |
| --- | --- |
| EO-1-2016/2017EO-2-2016EO-3-2016EO-4-2017 | With the view of favouring wider competition and participation, the European Space Agency will not participate in consortia of proposals submitted under this call for proposals |

Evaluation criteria, scoring and threshold: The criteria, scoring and threshold are described in part H of the General Annexes to the work programme.

Evaluation procedure: The procedure for setting a priority order for proposals with the same score is given in part H of the General Annexes.

The full evaluation procedure is described in the relevant guide[[5]](#footnote-6) published on the Participant Portal.

Indicative timetable for evaluation and grant agreement:

|  |  |  |
| --- | --- | --- |
|  | Information on the outcome of the evaluation (*single stage*) | Indicative date for the signing of grant agreements |
| EO-1-2016/2017EO-2-2016EO-3-2016EO-4-2017 | Maximum 5 months from the final date for submission | Maximum 8 months from the final date for submission |

Consortium agreements: In line with the Rules for Participation, participants in Research and Innovation Actions, Innovation Actions and PCP—Co-fund actions are required to conclude a consortium agreement prior to grant agreement.

# Call – Competitiveness of the European Space Sector: Technology and Science – 2016

***H2020-COMPET-2016***

## Competitiveness of European Space Technology

Competitiveness, non-dependence and innovation of the European space sector (including SMEs) must be ensured by fostering the development of space technologies. The overarching objective is to contribute at European level, in conjunction with Member States and ESA, to the safeguarding and further development of a competitive and entrepreneurial space industry and the strengthening of European non-dependence in space systems. This implies enabling advances in space technologies and operational concepts from idea to demonstration in representative terrestrial environments and/or in space.

Competitiveness of European space industry is strongly dependent on performance in a global market, which has a high variability when compared to the institutional market. The ability to react to contract opportunities world-wide with recurring technologies for satellites is a critical success factor, and depends on ready access for integrators to subsystem and equipment capacities in Europe.

To ensure the competitive advantage, subsystems and/or equipment have to be technologically mature (i.e. at adequate technology readiness level –TRL[[6]](#footnote-7)– level, possibly flight proven) and be accompanied by adequate production rates. European focus in future space technologies, beyond the current state of the art, needs to be strengthened along the entire TRL chain: from low TRL Key technologies to in-orbit demonstration and validation. Concrete support for IOD/IOV opportunities is planned for later (2018-2020) work programmes.

Technologies for satellite communication will be supported in particular in topics COMPET-2-2016 "Bottom-up space technologies at low TRL" and in COMPET-3-2017 "High data rate chain". In addition, the topics COMPET-1-2016/2017 "Technologies for European non-dependence and competitiveness" and COMPET-3-2016 "In-space electrical propulsion and station keeping" addess important objectives for the satellite communication industry.

Technologies for Earth observation will supported in particular in topics COMPET-2-2017 "Bottom-up space technologies at low TRL", COMPET-3-2017 "High data rate chain". In addition, the topics COMPET-1-2016/2017 "Technologies for European non-dependence and competitiveness" also contribute to enabling technologies for Earth observation.

Technologies for satellite navigation are addressed in the Galileo part of the work programme.

Technologies enabling recurrence of use contribute to enhancing industrial competitiveness. Research on modular, reusable elements is therefore encouraged. Standardisation of such modular components by existing initiatives such as the European Space Components Coordination (ESCC) and the European Cooperation for Space Standardization (ECSS), and their interfaces across Europe will optimise the investments and will facilitate access to emerging commercial markets. Synergies with ongoing work with ESA and Member States in the area of technology standardisation will be sought.

Proposals are invited against the following topics:

### COMPET-1-2016: Technologies for European non-dependence and competitiveness

Specific challenge: The space sector is a strategic asset contributing to the independence, security and prosperity of Europe and its role in the world. Europe needs non-dependent access to critical space technologies, which is a conditio-sine-qua-non for achieving Europe’s strategic objectives. "Non-dependence" refers to the possibility for Europe to have free, unrestricted access to any required space technology. Whenever possible multiple (>1) sources for the critical technologies shall be promoted across Europe. Reaching non-dependence in certain technologies will open new markets to our industries and will increase the overall competitiveness of the European Space sector.

Scope: Research in technologies for European non-dependence and competitiveness has been undertaken within the frame of the Commission-ESA-EDA joint initiative on Critical Technologies for European non-Dependence, launched in 2008.

Activities to be proposed in this call will address technologies identified on the list of Actions for 2015/2017 as part of the Joint EC-ESA-EDA task force on Critical Technologies (in <http://ec.europa.eu/growth/sectors/space/research/horizon-2020>) focusing on those areas that have not so far benefitted from prior Framework Programme funding and representing the highest potential for being addressed through the co-funding instruments available in Horizon 2020. A number of priority technologies have been identified for H2020 support from which proposers can choose: .

* U14 - Active discrete power components.
* U18 - Enhanced performance and space qualified detectors.
* U20 - Very high performance microprocessors.
* U22 - ASICS: Deep Sub-Micron (DSM).
* U26 - Space qualified carbon fibre and pre-impregnated material sources for satellite subsystems.
* N27 - RF components.

In this context, technological spin in and/or bilateral collaborations should be enhanced between European non-space and space industries and proposals are expected to provide advanced critical technologies that are of common interest to different space application domains (e.g. telecom, Earth-observation, science, etc.), or even with applicability to terrestrial domains.

The Commission considers that proposals requesting a contribution from the EU of between EUR 3 and 5 million would allow this specific topic to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts. A maximum of one proposal per identified priority technology line will be selected for funding.

Expected impact: To reduce the dependence on critical technologies and capabilities from outside Europe for future space applications, as identified in the list of Actions for 2015/2017 as part of the Joint EC-ESA-EDA task force on Critical Technologies (in <http://ec.europa.eu/growth/sectors/space/research/horizon-2020>).

To develop or regain in the mid-term the European capacity to operate independently in space, e.g. by developing in a timely manner reliable and affordable space technologies that in some cases may already exist outside Europe or in European terrestrial applications. Nevertheless, proposals should strive to go beyond the present state of the art or, preferably, the expected state of the art at the time of completion if alternative technologies are being developed outside Europe.

To enhance the technical capabilities and overall competitiveness of European space industry satellite vendors on the worldwide market. The proposals are expected to open new competition opportunities for European manufacturers by reducing the dependency on export restricted technologies that are of strategic importance to future European space efforts. They should enable the European industry to get non-restricted access to high performance technologies that will allow increasing its competitiveness and expertise in the space domain.

Proposals should include a work package dedicated to the development of a commercial evaluation of the technology, and should address how to access the commercial market with a full range (preload) of recurring products.

Proposals should improve the overall European space technology landscape and complement the activities of European and national space programmes.

Type of action: Research and innovation actions.

***The conditions related to this topic are provided at the end of this call and in the General Annexes.***

### COMPET-2-2016: Bottom-up space technologies at low TRL

Specific challenge: In the mid- and long-term the competitiveness of the space sector depends on the continuous incorporation of brand-new and even disruptive technologies. The European RTD investment in the field of very low-TRL technologies is to be enhanced. A number of challenges in space technologies have parallels to terrestrial challenges, for example in the fields of aeronautics, energy, environment, telecommunications and ICTs, natural resource exploration, sensors, robotics, advanced materials, security, and health.

Scope: New ideas must be incorporated into the current state of the art. As many of the advances come traditionally also from non-space sectors, an active search must be done in non-Space areas of knowledge in addition to the identification of breakthrough technologies from the space sector. This should mobilise the traditional space actors, and non-space actors, to look for space technologies of the future. The aim of this topic is to attract new actors to space and demonstrate technologies that are potentially disruptive and not only incremental. As “push” technologies, these will promise radical improved performances, and will enable emerging missions. Drastical increments in miniaturisation, power reduction, efficiency, versatility, and increased functionality are as well expected.

Proposals based on low TRL[[7]](#footnote-8) (1-3) ideas and technologies which could have a final application in future Space systems are solicited. The target is to demonstrate them up to TRL (4-5). In this call for proposals space technologies for satellite telecommunications are foreseen, in which, for example, some of the Key Enabling Technologies (KETs) are playing a major role. In this context, proposals are sought with relevance in the domain of space for the fields of:

* Optical communication technologies for feeder or service links preparing satellite networking in the Terabit-throughput.
* Reconfigurable / flexible / spectrum efficient Satcom systems, with special emphasis in photonics components and sub-systems for optical communications, to allow more throughputs up to Terabits with lower latency everywhere for consumers.
* Antenna technologies and active antennas building blocks.
* Advanced on board data processing platforms.
* Reconfigurable coverages, flexible interbeam connectivity, antijamming and interference mitigation, on-board spectrum monitoring.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 and 2 million would allow this specific topic to be addressed appropriately Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: Spinning-in of new enabling technologies to space satellite telecommunications up to TRL 4-5 and clear indication of the ways in which these technologies can significantly improve performance and/or reduce costs if further developed.

Proposals should mobilise the participation of SMEs and research groups. Ideally proposals should result in developments affecting a range of sectors.

Type of action: Research and innovation actions.

***The conditions related to this topic are provided at the end of this call and in the General Annexes.***

## Strategic Research Clusters

Two strategic research clusters (SRC) have been initiated in 2014: *In-Space electrical propulsion and station keeping* and *Space Robotics Technologies*. Two coordination and support actions, so called Programme Support Actions, were launched and tasked with the preparation of European roadmaps for each cluster: EPIC (640199) and PERASPERA (640026). The following call texts are derived from information contained in these roadmaps. One or more calls for proposals for these SRCs are planned to follow in the years 2018-2020.

In-Space electrical propulsion and station keeping will address Electric Propulsion (EP) for in-space operations and transportation in line with the the Roadmap document [in <http://ec.europa.eu/growth/sectors/space/research/horizon-2020>].

Space Robotics Technologies will address generic building blocks for space robotics as defined in the document [in <http://ec.europa.eu/growth/sectors/space/research/horizon-2020>]. Applicants may also wish to refer to the ICT call on Robotics (WP reference to be added) where generic robotic technologies are adressed.

Applicants to both SRC topics are adviced to consult the refence documents for further technical details and information on project interdependencies.

Consortia awarded grants under these two topics will be required to sign collaboration agreements with complementary grants. These agreements will provide details on the working relationships between grants and will specify, where needed, issues related to IPR and the associated access rights.

### COMPET-3-2016: SRC – In-Space electrical propulsion and station keeping

Specific challenge. The challenge of this strategic research cluster (SRC) is to enable major advances in Electric Propulsion (EP) for in-space operations and transportation, in order to contribute to guarantee the leadership of European capabilities in electric propulsion at world level within the 2020-2030 timeframe, always in coherence with the existing and planned developments at National and ESA level.

Scope: The challenge above shall be tackled by addressing, from 2016 onwards, four different lines in the SRC: three incremental and one disruptive.

Incremental technologies are those considered mature enough at the moment to allow for incremental steps through this SRC aiming to enable capabilities like dual mode, higher/lower power, Electric Orbit Raising (EOR), required by a number of applications such as telecommunications, LEO / MEO missions, space science and exploration, space transportation which the current systems, some of them qualified and some with flight heritage, are not able to provide. The target of the proposals in the incremental line is to enable incremental advances in the already known technologies for **Electric Propulsion systems based on**:

1. **Hall Effect Thrusters (HET)**
2. **Gridded Ion Engines (GIE)**
3. **High Efficiency Multistage Plasma Thrusters (HEMPT)**

A ‘disruptive space technology’ is an emerging technology that disrupts the status quo of the space sector by replacing the dominant technology and provides a radical improvement in performance that is perceived as valuable by a customer or part of the market, or it opens up new opportunities not possible with the incumbent technology. If a disruptive technology can be identified early enough, accelerating the development of that technology would help sustain advances in performance. This topic is focused in promoting the RTD of very promising and potentially disruptive concepts in the field of Electric Propulsion, in order to allow the increase of the currently very low TRL of breakthrough concepts which in the long term could change the EP landscape. Emerging technologies that are potentially ‘disruptive’ often underperform compared to the dominant technology in early development phases – the underlying physics may not be fully understood for example and more R&D is required to properly ascertain performance attributes. Proposals on disruptive technologies are expected in the areas of:

1. **Disruptive technologies for Electric Propulsion and for EP thrusters**

that are currently at low TRL (≤ 4) and not part of the incremental lines of this SRC, as for example Helicon Plasma Thrusters (HPT), Electron Cyclotron Resonance plasma thrusters (ECR), Magneto Plasma Dynamic thrusters (MPD), pulsed plasma thrusters (PPT), micro-propulsion electric thrusters, other any other innovative electric thruster concepts and relevant technologies for disruptive electric propulsion systems not mentioned here.

A detailed description of the specific scope on the former lines is described in (Ref.xxx).

The Commission considers that proposals for the incremental technologies (lines a, b and c) implemented in around 36 and 48 months and requesting a contribution from the EU in the range of EUR 7.5 to 11 million (line a / HET), EUR 5.5 to 7.5 , million (line b / GIE), EUR 4.5 to 5.5 million (line c / HEMPT), and proposals for the disruptive technologies line (d) implemented in around 24 and 36 months and in the range of EUR 1 to 1.5 million, would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts. A maximum of 1 proposal per each incremental technology (lines a, b, and c) will be financed. A maximum of four proposals on disruptive technologies (d) will be financed.

Expected impact: To develop in the mid-term the European capacity to compete in the worldwide arena of electric propulsion satellites with competitive products. Nevertheless, proposals should strive to go beyond the present state of the art or, preferably, at the time of completion if alternative technologies are being developed outside Europe.

Proposals should seek to cover developments suited for more than one application domain, in order to widen the achievable capabilities.

Proposals on incremental technologies should demonstrate the readiness and interest to carry the developments further on through future calls of this SRC, by including a long-term plan for the developments to reach the higher TRLs in 2023-2024 and a business plan on how to access the selected market with a full range of competitive products. These plans should be analysed in depth through a dedicated work package within the project.

Proposals on disruptive technologies should explain and be ready to demonstrate how the proposed concept meets the disruptive definition proposed in this call topic and what is the expected impact of the proposed development in the EP landscape including the timeframe. The proposals should also include a validation plan, including one or more validation methods to apply through the course of the project, which would allow to verify how the development targets are being met and how the landscape disruption shall take place in the future. These plans should be analysed in depth through a dedicated work package within the project.

Type of action: Research and innovation actions (disruptive technologies) and Innovation actions (incremental technologies).

***The conditions related to this topic are provided at the end of this call and in the General Annexes. All participants funded in the context of this SRC will be required to establish complementary agreements with participants that are awarded grants under different actions, as actions will be complementary to each other.***

### COMPET-4-2016: SRC – Space Robotics Technologies

Specific challenge: The challenge of this strategic research cluster (SRC) is to enable major advances in space robotic technologies for future on-orbit satellite servicing (robotics and rendezvous), and the exploration of the surfaces of the other bodies in our solar system. This first call for "operational grants" will focus on the challenge of designing, manufacturing and testing of reliable and high performance common robotic building blocks for operation in space environments (orbital and/or planetary). These blocks shall be:

* Designed to be used in the multiple end goals of the SRC (demonstrations of on-orbit satellite servicing and planetary surface exploration).
* Also be usable to the wide European space robotics goals
* Account for spinning-off and spill over effects to other areas of robotic activity on Earth (such as automotive or underwater).

The final target of this topic is to increase the competitiveness of the European Space Industry in sectors demanding space robotics solutions. The competiveness will be enabled by the development of mature technologies that have wide applicability. Through the mastering of common building blocks, which allow inexpensive re-use across multiple applications, European actors will have a competitive advantage and industrial partnering will be facilitated. For the common building blocks to be successful, particular effort must be made in rigorous systems engineering, system performance analysis, reliability, availability, maintainability and safety improvement, rather than an approach based on pure technology development.

Scope: Proposals shall address one of the following six specific robotic building blocks:

**a) Space Robot Control Operating System**: an open source space robot control operating system (RCOS) that can provide adequate features and performance with space-grade Reliability, Availability, Maintainability and Safety (RAMS) properties. RCOS control any robot/spacecraft systems whether for orbital or planetary applications, for all phases and modes of the mission.

**b) Autonomy framework Time/Space/Resources planning and scheduling**: a software framework for the development of highly autonomous space robotics missions. In these a robot system, given a high level goal, will (re)plan, schedule and oversee the execution of elementary actions to attain the goal, considering Time/Space/Resources constraints. The activities will comprise planning/scheduling capabilities to decompose high level commands into sub-tasks; resource management to fulfil in a dynamic way the high level mission/goals; Fault management with reconfiguration capability; Interaction management with other robotic systems to allow cooperation and tasks sharing, guidance, navigation and control to attain execution.

**c) Common data fusion framework**: a software framework implementing data fusion techniques for various sensors such as LIDAR, Imagers, radar, sonar, IMUs, and sun sensors capable of localising robots in natural and man-made environments, geometrical/topological reconstruction of environment, map making. Robots need to perceive their environment and to understand where they are with respect to their operational goals. No single sensor can convey reliably localisation and mapping information in all conditions of space.

**d) Inspection Sensor Suite**: a suite of perception sensors that allow localisation and map making for robotic inspection of orbital assets (under space representative conditions) and for planetary surface exploration. The activities comprise the identification of suitable sensors which may include imaging sensors for inspection operations, stereo imaging sensors, zoom cameras for inspection and proximity operations, infrared sensors, imaging radar and LIDAR as well as illumination integrated solution considering data processing.

**e) Modular interfaces for Robotic handling of Payloads**: a set of interfaces (mechanical, data, electrical, thermal) that allow coupling of payload to robot manipulators and payload to other payload (or to a platform) enabling manipulation of payload by robots in orbital and planetary environment.

**f) Validation Platforms and Field Tests:** test vehicles (platforms or facilities) and validation environment for common testing of building blocks reference implementations. Relying upon existing assets, this would include the provision of test means (e.g. rovers, robots, RVD facilities), the support for integration in these of common building blocks, instrumentation and the execution of tests in realistic or analogue environments.

The Commission considers that proposals implemented in around 24 months and requesting a contribution from the EU in the range of EUR 3-4 million for specific building blocks (a)-(e) and in the range of EUR 1 million for the specific building block (f) would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts. A maximum of 1 proposal per robotic building block (a)-(f) will be financed.

Expected impact: The results shall deliver designs, and manufactured/coded prototypes of common building blocks (Software and Hardware). Each common building block shall be validated in a test scenario by means of a reference implementation (the specific prototype). The designs and prototypes of the building blocks shall be available, without restrictions, for SRC follow-on activities and the IPR of the building blocks shall be available without restriction for institutional European (EU, ESA and multi agency) space development activities. For each specific building block, the expectid impacts are:

1. The results of this action are expected to be used in all grants under this SRC. The very high standards of RAMS sought by this topic will also make the results usable in future space robotics missions.
2. Space robots (especially the planetary ones) require autonomy to cope with the potential inability to communicate to the Earth. The result of this action will be used in the planetary track of the SRC, to some extent in the Orbital track, and potentially in terrestrial applications needing autonomy.
3. The expected data fusion framework will allow navigation/localisation and map making applications for robots whether in space or on planetary surfaces while coping with the performance and reliability issues of sensors.
4. The output will be used in all grants under this SRC. The availability of a standard reliable sensor suite will be an enabler for space robotics missions in general.
5. The standard interfaces will be used to develop the SRC end goals (such as FLEXSAT) but also for the experimentation on deployment of very large structures (e.g. antenna reflectors and active telescope mirrors)
6. Validation of common building block in the most relevant environment with minimal duplication of means and activities.

Type of action: Research and Innovation actions.

***The conditions related to this topic are provided at the end of this call and in the General Annexes. All participants funded in the context of this SRC will be required to establish complementary agreements with participants that are awarded grants under different actions, as actions will be complementary to each other.***

## Space exploration and science

Europe has, over the years, established a leading position in space exploration and space sciences, with missions to various destinations in the Solar System. The proposed approach is to enable European communities to make a concerted effort to capitalise on current European space sciences and space exploration infrastructures, and to achieve the highest possible science return from operational and future space missions. Activities which further science in the context of space missions, i.e. supporting scientific instrumentation in support of future or operational missions, will be supported.

Proposals are invited against the following topic:

### COMPET-5-2016: Scientific instrumentation

Specific challenge: Support the development of scientific instrumentation for science and exploration missions enabling increased cooperation between scientists, engineering teams and industry across Europe.

Scope: Scientific instrumentation is understood in this context as mission payloads that perform scientific tasks. Proposals may cover different stages of development of scientific instrumentation from concepts, to breadboarding and prototype demonstration. Proposals may also cover the development of advanced technologies, such as new sensors and other sub-systems, that may be used in scientific instrumentation. Projects supported through this call should address planned and future European scientific and exploration missions.

The Commission considers that proposals requesting a contribution from the EU in the range of EUR 4 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: The integration of scientific teams with engineering and industrial teams will stimulate new and improved instrumentation designs and lead to potential spin-in/spin-off effects between space and non-space technology fields. This research topic should attract also active participation of researchers in academia and SMEs.

Type of action: Research and innovation actions.

***The conditions related to this topic are provided at the end of this call and in the General Annexes.***

### *CONDITIONS FOR THIS CALL*

Publication date:

Opening dates[[8]](#footnote-9):

Deadline(s)[[9]](#footnote-10):

|  |  |
| --- | --- |
| COMPET-1-2016COMPET-2-2016COMPET-3-2016COMPET-4-2016COMPET-5-2016 | dd-mm-2016at 17.00.00 Brussels time  |

Overall indicative budget: **EUR 66 million from the 2016 budget.**

|  |  |
| --- | --- |
| Topics | 2016EUR million  |
| COMPET-1-2016 | 16.0 |
| COMPET-2-2016 | 5.0 |
| COMPET-3-2016 | 23.0 |
| COMPET-4-2016 | 18.0 |
| COMPET-5-2016 | 4.0 |

Eligibility and admissibility conditions: The conditions are described in parts B and C of the General Annexes to the work programme, with the following exceptions:

|  |  |
| --- | --- |
| COMPET-1-2016COMPET-2-2016COMPET-3-2016COMPET-4-2016COMPET-5-2016  | With the view of favouring wider competition and participation, the European Space Agency will not participate in consortia of proposals submitted under this call for proposals |
| COMPET-1-2016 | A maximum of 1 proposal per identified Urgent Action line will be selected for funding. |
| COMPET-3-2016 | No beneficiaries of grant agreement EPIC (640199) except DLR research institutes will participate in consortia of proposals submitted under this call for proposals.A maximum of 1 proposal per technology (a)-(c) and up to 4 proposals per technology (d) will be selected for funding. |
| COMPET-4-2016 | No beneficiaries of grant agreement PERASPERA (640026) except DLR (research institutes) will participate in consortia of proposals submitted under this call for proposals.A maximum of 1 proposal per building block (a)-(f) will be selected for funding. |
| COMPET-3-2016COMPET-4-2016 | Beneficiaries will be required to sign a collaboration agreement between projects funded under this topic.  |

Evaluation criteria, scoring and threshold: The criteria, scoring and threshold are described in part H of the General Annexes to the work programme.

Evaluation procedure: The procedure for setting a priority order for proposals with the same score is given in part H of the General Annexes.

The full evaluation procedure is described in the relevant guide[[10]](#footnote-11) published on the Participant Portal.

Indicative timetable for evaluation and grant agreement:

|  |  |  |
| --- | --- | --- |
|  | Information on the outcome of the evaluation (*single stage*) | Indicative date for the signing of grant agreements |
| COMPET-1-2016COMPET-2-2016COMPET-3-2016COMPET-4-2016COMPET-5-2016 | Maximum 5 months from the final date for submission | Maximum 8 months from the final date for submission |

Consortium agreements: In line with the Rules for Participation, participants in Research and Innovation Actions or in Innovation Actions are required to conclude a consortium agreement prior to grant agreement.

# Call – Applications in Satellite Navigation – Galileo – 2017[[11]](#footnote-12)

***H2020-GALILEO-GSA-2017***

The European Global Navigation Satellite System (EGNSS) encompasses the satellite navigation system established under the Galileo programme and the European Geostationary Overlay System (EGNOS). The Galileo system will provide position, navigation and timing services and increase availability and reliability of other GNSS, while ensuring the European non-dependence from other GNSS. The EGNOS system improves the accuracy and provides information on the reliability of the GPS system, and in the future also of the Galileo system.

Satellite navigation technology is an increasingly common component of innovative applications in different market segment. Over the years satellite navigation has become more affordable and more reliable. GNSS is used all around the globe, with 2.8 billion GNSS devices in use in 2013. By 2019, this is forecasted to increase to over 7 billion – on average one device per person. This large base of satellite navigation powered devices opens a huge opportunity for innovation in terms of applications in transport, consumer and professional markets. In addition, the new generation of GNSS, such as Galileo, brings new specific features and increased performance that can trigger innovation and enable more accurate and robust applications.

Development of downstream applications is key to maximise adoption of Galileo and EGNOS and also to stimulate the EU GNSS downstream industry competitiveness, while capturing public benefits. Small and Medium Enterprises (SMEs) are key players for innovation in the sector of GNSS applications for their capacity of innovating quickly, adapting to this fast growing and changing domain.

GNSS technology is advancing fast. Current trends that will influence innovation in the field of GNSS applications should be taken into account by applicants. These trends concern for example the appearance of a multi-constellation environment, leading to new multi-frequency devices that are becoming accessible also for mass market applications, as well as the increased combination of GNSS with other sensors and positioning techniques (e.g. Bluetooth beacons, localisation through Wi-Fi base stations, etc.). GNSS receivers itself are undergoing miniaturisation and are more and more "always connected". Proposals are invited against the following topics:

Galileo 1 – 2017 – EGNSS Transport Applications

Galileo 2 – 2017 – EGNSS Mass Market Applications

Galileo 3 – 2017 – EGNSS Professional Applications

Galileo 4 – 2017 – EGNSS Awareness raising and capacity building

### GALILEO-1-2017: EGNSS Transport applications

Specific challenge: Transport is fundamental to our economy and society. An efficient and suistainable mobility is vital for the internal market and for the quality of life of the citizens. Transport enables economic growth and job creation. Satellite navigation application technology is an increasingly common component of modern transport systems. It contributes to a competitive and resource efficient transport system and to enables new challenging solutions in terms of positioning and navigation performances in aviation, road, maritime and rail, as well as in multi-modal applications. The use of EGNSS is also a key factor in many EU transport related policies, such as Intelligent Transport System, emergency call (eCall), enhanced digital tacograph, European Single Sky, European contribution to the Worldwide Maritime Radionavigation System.

The specific challenge of this topic is to develop innovative EGNSS based applications in aviation, road, maritime and rail that will make EGNOS and Galileo more available to transport users and enable new end-to-end solutions that require accurate and resilient positioning and navigation.

Scope: Proposals should aim at developing new innovative applications, with commercial impact. Research and innovation activities within this topic should build on:

* Exploitation of the distinguishing features of EGNOS and Galileo signals and operational advantages in downstream applications;
* Implementation of EGNSS based pilot projects and end-to-end solutions, ready for use by the private or public sector;
* Standards, certification, legal and societal acceptance, which will foster EGNSS adoption; and
* Exploitation of synergies with other positioning and navigation systems and techniques, with focus in valorising EGNOS and Galileo in the frame of multi-constellation and multi-frequency environment.

Proposals may be submitted in any of the following four transport domains:

**Aviation:** The development of EGNSS solutions for navigation, surveillance and communication in all phases of flight should be addressed. In particular, GNSS based PBN (Performance Based Operations), advanced operations for approach and landing benefitting from robust vertical guidance and LPV-200/CAT1 services[[12]](#footnote-13). Furthermore, surveillance applications, such as ADS-B (Automatic Dependent surveillance Broadcast) and use of reliable PVT for precise positioning and orientation of remotely piloted aerial systems (RPAS) might be addressed. Synergy and complementarity with the Sesar Joint Undertaking and other initiatives shall be clearly identified. Proposals should in particular build on multi-constellation/multi-frequency, current and future EGNOS integrity features and service levels, as well as integration of multi-constellation enabling capabilities such as Advanced RAIM

**Road:** Development of EGNSS solutions in emerging innovative domains, such as autonomous vehicles, that are safety critical and require a specific accurate and resilient positioning, timing and navigation should be addressed. Development of EGNSS solutions in policy driven applications, such as new generation of eCall, enhanced digital tacograph, dangerous goods transport, etc. might also be addressed. Proposals should in particular build on Galileo specific signal features and differentiators and new services such as authentication and high precision, as well as current and future EGNOS integrity features.

**Maritime:** Development of EGNSS based solutions in the different maritime and inland waterways (including the Arctic), such as vessels navigation, traffic management and surveillance, search and rescue, port operations, fisheries monitoring should be addressed. Proposals should in particular build on the use of current and future EGNOS dedicated services for maritime, and the Search and Rescue service of Galileo, other Galileo differentiating features and services, such as authentication and high precision.

**Rail:** Development of EGNSS based solutions in train signalling and control, contributing to the evolution and cost competitiveness of the European Rail Traffic Management System, and in non-safety-critical applications, such as passenger information system, asset management, etc. should be addressed. Synergy and complementarity with the Shift 2 Rail Joint Undertaking and other initiatives shall be clearly identified. Proposals should in particular build on the current and future EGNOS integrity services and multi-constellation, multi-frequency, and specific signal features of Galileo that improves position performances in the challenging railway environment (e.g. urban parts).

The Commission considers that proposals requesting a contribution from the EU of between EUR 1.5 and 3 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: Activities should promote innovation in order to maximise the potential of the EGNSS and its adoption in transport. They should build on specific features and differentiators of Galileo and EGNOS, demonstrating the advantage of their use in transport. The applications shall contribute to the modern, efficient and user-friendly transport system. The activities should be complemented with a systems’ approach, taking care of infrastructure and regulatory requirements, coordination of multiple actors and pilot projects to encourage market take-up.

The proposals shall have a clear intention and rationale to commercialise the products and services developed, including a business plan.

Type of Action: Innovation Action

***The conditions related to this topic are provided at the end of this call and in the General Annexes.***

### GALILEO-2-2017: EGNSS mass market applications

Specific challenge: The past 10 years have seen a wider and wider uptake of GNSS based user technology, initially with the Personal Navigation Devices in our cars and then with smartphones in our pockets. Nowadays this also includes tablets, laptops, cameras, fitness gears and wearable devices, etc. In addition, recent trends are showing that not only “every person” but in the future also “everything” will be connected and equipped with a GNSS device (e.g. connected vehicles and internet of things). This is opening a new generation of Location Based Services (LBS). The development of this new generation of LBS is driven by different needs, depending on the application: mobility, productivity, safety, etc. To satisfy these needs, the key requirements for GNSS are Time-To-First-Fix (TTFF), accuracy and availability. Galileo satellites will further improve signal availability, thus enhancing continuity of service for LBS in urban or challenging environments. By contributing to multi-constellation solutions, Galileo can satisfy the need for higher accuracy and fast TTFF of demanding applications.

The specific challenge of this topic is to exploit the availability of GNSS enabled mass market devices, developing innovative EGNSS applications that will:

* Foster the adoption of EGNOS and Galileo in mass markets and ensure that the benefits will be captured by the users.
* Create applications that will make best use of EGNSS innovative features such as better multipath resistance, authentication etc.
* Contribute to the competitiveness of the European GNSS industry in the area of mobile applications, with special focus on the innovative role of SMEs
* Maximise public benefits by supporting the development of applications that will address major societal challenges in focus areas such as health, citizen safety, mobility, smart cities, sustainable resources monitoring and management, regional growth, low-carbon energy infrastructure planning and protection, climate action.

Scope: Proposals should aim at developing new innovative applications, with commercial impact. Below are some areas which are identified as especially promising for further EGNSS applications development:

**Mobility as a service and Smart Cities:** Development of EGNSS solutions for cross-modal mobility and new emerging “mobility as a service” approach should be addressed, in which the user does not buy a vehicle or a public transport ticket, but a service to comply with her/his mobility needs. This area may include innovative telematics applications in which the positioning, timing and navigation are used both to deliver the mobility service and to calculate a fair price based on the actual use of it. Development of EGNSS solutions for other areas of future Smart Cities are also included in the scope.

**Internet of things:** Development of EGNSS solutions for “internet of things” should be addressed, exploiting the interconnectivity of uniquely identifiable devices and the availability of their location. Proposals should duly reflect the fact that the internet of things is not only improving productivity and efficiency of organisations (with applications in almost every sector of the economy, from automotive to consumer electronics, healthcare or manufacturing and logistics), but that the internet of things technology is also changing our daily lives.

**Commercial and social LBS:** Proposals should address one of the two following application areas. 1) Applications for commercial LBS, such as: secure financial transactions; mobile workforce management, tracking solutions; augmented reality; social networking and sport. 2) Applications for social LBS, such as: safety and emergency (E112), e-health (health services more and more connected), and solutions supporting visual and mobility impaired people

For all the mass market areas, the development and innovation should build on:

* Galileo features that improve performances in urban environment ;
* Multi-constellation, fusion with other positioning techniques, including sensor fusion and innovative network fusion techniques;
* Authentication services that will be provided by Galileo; and
* Techniques to optimise power consumption.

The Commission considers that one proposal requesting a contribution from the EU in the range of EUR 1.5 and 3 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: Activities should aim at developing highly innovative and adaptive applications taking advantage of the Galileo and EGNOS added value. The proposal shall have a clear intention to commercialise the products and services developed, including a business plan. The consumer chipset and devices manufacturers (e.g. for smartphones and tablets) are mainly produced in non-European countries and the expected impact of this topic is to foster the competitiveness of European GNSS application providers that build innovation on these chipsets and devices, contributing to increase the overall EU competitiveness in the mass market. In addition, considering that the EU has a good market share of machine to machine chipset and module providers, the expected impact is also to foster applications building on this capacity.

Type of Action: Innovation Actions

 ***The conditions related to this topic are provided at the end of this call and in the General Annexes.***

### GALILEO-3-2017: EGNSS professional applications

Specific challenge: Professional applications are covering different market segments. Precision agriculture, mapping and surveying have been the pioneers in the use of GNSS since the early years. The challenge is to make these applications more affordable, easy to use and integrated with other solutions and technologies, including for example earth observation, e.g. Copernicus services, in order to enable new targeted innovative solutions. EGNSS is offering additional accuracy and features, such as multiple frequencies and the high precision service in the frame of the future commercial service, contributing to enabling these innovative solutions, including in challenging environments. Power networks, telecommunication networks and financial transactions[[13]](#footnote-14) are today synchronised, many of them using GNSS. These networks are becoming more and more distributed (e.g. distributed power generation of renewable energies), interconnected and more demanding in terms of synchronisation performances (e.g. in 4G-LTE and future internet), or requiring authenticated solutions as for the financial transaction time stamping. The specific challenge is in this case to build on the enhanced capabilities offered by Galileo that will provide high accurate timing information and authentication services, to develop a new generation of high performing, reliable and EU independent timing and synchronisation applications that can cope with these emerging and demanding needs.

Scope: Proposals should aim at developing new innovative applications, building also on the combination of EGNSS with earth observation and Copernicus services, with commercial impact. Below are some areas which are identified as especially promising for further EGNSS application development:

**Agriculture:** Automated machine guidance, precision farming and machine control and field boundary measurements are possible areas to be addressed.

**Surveying and Mapping:** Land survey, marine survey, cadastral and geodesy, and construction are possible areas to be addressed.

**Timing and Synchronisation:** Telecommunications, power generation and finance are possible areas to be addressed.

**Other professional applications:** clearly demonstrating amongst others the contribution of EGNSS differentiators, the potential of integration with earth observation data, and the future commercial potential are also invited.

For all the professional areas, the development and innovation should build on:

* Multiple-frequencies E1, E5 and E6;
* Galileo specific signal modulation, e.g. AltBOC;
* High precision and authentication services that will be provided by Galileo, i.e. in the frame of the commercial service;
* Fusion with other data, such as from earth observation satellites or other in-situ sensors.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1.5 and 3 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: Activities should aim at developing highly innovative applications taking advantage of Galileo and EGNOS. In agriculture, mapping and surveying the expected impact is to decrease the barriers to access such professional applications, in term of price of the solution and easiness to use, increasing the number of users and explore new innovative use of GNSS. Specifically for agriculture the expected impact is also to improve the productivity and decrease the environmental impact. For timing and synchronisation applications, the expected impact is to contribute to cope with emerging network synchronisation needs in terms of accuracy and robustness, while contributing to improve EU dependency from other GNSS. The proposal shall have a clear intention to commercialise the products and services developed, including a business plan.

Type of Action: Innovation Actions

***The conditions related to this topic are provided at the end of this call and in the General Annexes.***

### GALILEO-4-2017: EGNSS awareness raising and capacity building

Specific challenge: Awareness raising and capacity building in the field of EGNSS are essential elements in facilitating the breakthrough of EGNOS and Galileo inside and outside Europe and in increasing the number of opportunities for future collaboration between European and non-European GNSS entities. Promotion activities should take a more active role in generating new ideas ready to spin-off and/or to go into market introduction, in providing crucial seed financing and in increasing the visibility of the EGNSS.

Scope: The proposals should aim at capacity building, increasing awareness of EGNSS solutions, providing networking opportunities of centres of excellence and other relevant actors and achieving a critical mass of EGNSS applications success stories, making it an attractive option for private investors in Europe and also globally. Activities under this topic may also contribute to the cooperation schemes, which have been established with partner countries worldwide.

Technology promotion activities can include incentive schemes in the form of financial support to third parties for innovative applications developed by companies and entrepreneurs and based on the EGNSS that will promote the uptake of satellite navigation downstream applications across Europe and beyond.

The Commission considers that proposals requesting a contribution from the EU of between EUR 0.5 and 1 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: The main aim of this topic is to support building of industrial relationships by gathering private and public institutions around services offered by EGNSS and related applications. This topic should support the competitiveness of EU industry by identifying strategic partners and by developing market opportunities.

The support to incentive schemes should foster the emergence of new downstream applications based on either Galileo and/or EGNOS and therefore to support the EU GNSS industry.

Type of action: Coordination and support actions.

***The conditions related to this topic are provided at the end of this call and in the General Annexes.***

### *CONDITIONS FOR THIS CALL*

Publication date:

Opening dates[[14]](#footnote-15):

Deadline(s)[[15]](#footnote-16):

|  |  |
| --- | --- |
| GALILEO-1-2017GALILEO-2-2017GALILEO-3-2017GALILEO-4-2017 | dd-mm-2017at 17.00.00 Brussels time  |

Overall indicative budget: **33.0 million from the 2017 budget.**

|  |  |
| --- | --- |
| Topics | 2017EUR million  |
| GALILEO-1-2017 | 14.5 |
| GALILEO-2-2017 | 9.0 |
| GALILEO-3-2017 | 8.0 |
| GALILEO-4-2017 | 1.5 |

Eligibility and admissibility conditions: The conditions are described in parts B and C of the General Annexes to the work programme, with the following exceptions:

|  |  |
| --- | --- |
| GALILEO-1-2017GALILEO-2-2017GALILEO-3-2017GALILEO-4-2017 | With the view of favouring wider competition and participation, the European Space Agency will not participate in consortia of proposals submitted under this call for proposals. |
| GALILEO-1-2017GALILEO-3-2017 | Participation of SMEs is mandatory. Projects will only be selected for funding on the condition that the estimated EU contribution going to SME(s) is 10% or more of the total estimated EU contribution for the project as a whole. |
| GALILEO-2-2017 | Participation of SMEs is mandatory. Projects will only be selected for funding on the condition that the estimated EU contribution going to SME(s) is 20% or more of the total estimated EU contribution for the project as a whole. |
| GALILEO-3-2017 | Proposals addressing PRS related applications will not be admissible. |

Evaluation criteria, scoring and threshold: The criteria, scoring and threshold are described in part H of the General Annexes to the work programme.

Evaluation procedure: The procedure for setting a priority order for proposals with the same score is given in part H of the General Annexes.

The full evaluation procedure is described in the relevant guide[[16]](#footnote-17) published on the Participant Portal.

Indicative timetable for evaluation and grant agreement:

|  |  |  |
| --- | --- | --- |
|  | Information on the outcome of the evaluation (*single stage*) | Indicative date for the signing of grant agreements |
| GALILEO-1-2017GALILEO-2-2017GALILEO-3-2017GALILEO-4-2017 | Maximum 5 months from the final date for submission | Maximum 8 months from the final date for submission |

Consortium agreements: In line with the Rules for Participation, participants in Research and Innovation Actions or in Innovation Actions are required to conclude a consortium agreement prior to grant agreement.

Implementation: Indirect management by the European GNSS Agency under a delegation agreement with the European Commission.

# Call – Competitiveness of the European Space Sector: Technology and Science – 2017

***H2020-COMPET-2017***

Competitiveness, non-dependence and innovation of the European space sector (including SMEs) must be ensured by fostering the development of space technologies. The overarching objective is to contribute at European level, in conjunction with Member States and ESA, to the safeguarding and further development of a competitive and entrepreneurial space industry and the strengthening of European non-dependence in space systems. This implies enabling advances in space technologies and operational concepts from idea to demonstration in representative terrestrial environments and/or in space.

Competitiveness of European space industry is strongly dependent on performance in a global market, which has a high variability when compared to the institutional market. The ability to react to contract opportunities world-wide with recurring technologies for satellites is a critical success factor, and depends on ready access for integrators to subsystem and equipment capacities in Europe.

To ensure the competitive advantage, subsystems and/or equipment have to be technologically mature (i.e. at adequate technology readiness level –TRL[[17]](#footnote-18)– level, possibly flight proven) and be accompanied by adequate production rates. European focus in future space technologies, beyond the current state of the art, needs to be strengthened along the entire TRL chain: from low TRL Key technologies to in-orbit demonstration and validation. Concrete support for IOD/IOV opportunities is planned for later (2018-2020) work programmes.

Technologies for satellite communication will be supported in particular in topics COMPET-2-2016 "Bottom-up space technologies at low TRL" and in COMPET-3-2017 "High data rate chain". In addition, the topics COMPET-1-2016/2017 "Technologies for European non-dependence and competitiveness" and COMPET-3-2016 "In-space electrical propulsion and station keeping" addess important objectives for the satellite communication industry.

Technologies for Earth observation will supported in particular in topics COMPET-2-2017 "Bottom-up space technologies at low TRL", COMPET-3-2017 "High data rate chain". In addition, the topics COMPET-1-2016/2017 "Technologies for European non-dependence and competitiveness" also contribute to enabling technologies for Earth observation.

Technologies for satellite navigation are addressed in the Galileo part of the work programme.

Technologies enabling recurrence of use contribute to enhancing industrial competitiveness. Research on modular, reusable elements is therefore encouraged. Standardisation of such modular components by existing initiatives such as the European Space Components Coordination (ESCC) and the European Cooperation for Space Standardization (ECSS), and their interfaces across Europe will optimise the investments and will facilitate access to emerging commercial markets. Synergies with ongoing work with ESA and Member States in the area of technology standardisation will be sought.

Proposals are invited against the following topics:

## Competitiveness of European Space Technology

### COMPET-1-2017: Technologies for European non-dependence and competitiveness

Specific challenge: The space sector is a strategic asset contributing to the independence, security and prosperity of Europe and its role in the world. Europe needs non-dependent access to critical space technologies, which is a conditio-sine-qua-non for achieving Europe’s strategic objectives. "Non-dependence" refers to the possibility for Europe to have free, unrestricted access to any required space technology. Whenever possible multiple (>1) sources for the critical technologies shall be promoted across Europe. Reaching non-dependence in certain technologies will open new markets to our industries and will increase the overall competitiveness of the European Space sector.

Scope: Research in technologies for European non-dependence and competitiveness has been undertaken within the frame of the Commission-ESA-EDA joint initiative on Critical Technologies for European non-Dependence, launched in 2008.

Activities to be proposed in this call will address technologies identified on the list of Actions for 2015/2017 as part of the Joint EC-ESA-EDA task force on Critical Technologies (in <http://ec.europa.eu/growth/sectors/space/research/horizon-2020>) focusing on those areas that have not so far benefitted from prior Framework Programme funding and representing the highest potential for being addressed through the co-funding instruments available in Horizon 2020. A number of priority technologies have been identified for H2020 support from which proposers can choose:

* U09 - Cost-effective high quality Ge-substrates and high performance, cost effective multi - junction solar cells for space applications.
* U16 - Space qualified GaN components and demonstrators.
* U17 - High density (up to 1000 pins and beyond) assemblies on PCB and PCBs.
* U19 - High speed DAC-ADC based on European Technology.
* U21 - Very high speed serial interfaces.
* U23 – Development of large deployable structures for antennas.

In this context, technological spin in and/or bilateral collaborations should be enhanced between European non-space and space industries and proposals are expected to provide advanced critical technologies that are of common interest to different space application domains (e.g. telecom, Earth-observation, science, etc.), or even with applicability to terrestrial domains.

The Commission considers that proposals requesting a contribution from the EU of between EUR 3 and 5 million would allow this specific topic to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts. A maximum of one proposal per identified priority technology line will be selected for funding.

Expected impact: To reduce the dependence on critical technologies and capabilities from outside Europe for future space applications, as identified in the list of Actions for 2015/2017 as part of the Joint EC-ESA-EDA task force on Critical Technologies (in <http://ec.europa.eu/growth/sectors/space/research/horizon-2020>).

To develop or regain in the mid-term the European capacity to operate independently in space, e.g. by developing in a timely manner reliable and affordable space technologies that in some cases may already exist outside Europe or in European terrestrial applications. Nevertheless, proposals should strive to go beyond the present state of the art or, preferably, the expected state of the art at the time of completion if alternative technologies are being developed outside Europe.

To enhance the technical capabilities and overall competitiveness of European space industry satellite vendors on the worldwide market. The proposals are expected to open new competition opportunities for European manufacturers by reducing the dependency on export restricted technologies that are of strategic importance to future European space efforts. They should enable the European industry to get non-restricted access to high performance technologies that will allow increasing its competitiveness and expertise in the space domain.

Proposals should include a work package dedicated to the development of a commercial evaluation of the technology, and should address how to access the commercial market with a full range (preload) of recurring products.

Proposals should improve the overall European space technology landscape and complement the activities of European and national space programmes.

Type of action: Research and innovation actions.

***The conditions related to this topic are provided at the end of this call and in the General Annexes.***

### COMPET-2-2017: Bottom-up space technologies at low TRL

Specific challenge: In the mid- and long-term the competitiveness of the space sector depends on the continuous incorporation of brand-new and even disruptive technologies. The European RTD investment in the field of very low-TRL technologies is to be enhanced. A number of challenges in space technologies have parallels to terrestrial challenges, for example in the fields of aeronautics, energy, environment, telecommunications and ICTs, natural resource exploration, sensors, robotics, advanced materials, security, and health.

Scope: New ideas must be incorporated into the current state of the art. As many of the advances come traditionally also from non-space sectors, an active search must be done in non-Space areas of knowledge in addition to the identification of breakthrough technologies from the space sector. This should mobilise the traditional space actors, and non-space actors, to look for space technologies of the future. The aim of this topic is to attract new actors to space and demonstrate technologies that are potentially disruptive and not only incremental. As “push” technologies, these will promise radical improved performances, and will enable emerging missions. Drastical increments in miniaturisation, power reduction, efficiency, versatility, and increased functionality are as well expected.

Proposals based on low TRL[[18]](#footnote-19) (1-3) ideas and technologies which could have a final application in future Space systems are solicited. The target is to demonstrate them up to TRL (4-5). In this second call proposals for space technologies in the context of small satellites for Earth Observation from the Low Earth Orbit (LEO) are foreseen, in which, for example, some of the Key Enabling Technologies (KETs) are playing a major role.

In recent years small satellites have become more attractive due to lower development costs and shorter lead times. There is a natural trade-off to be made between spacecraft size and functionality, but advances in both miniaturization and integration technologies have diminished the scope of that trade-off. Small satellite missions play a key and compelling role in space-based scientific and engineering programs. They have been responsible for greatly reducing the time to obtain science and technology results. Small spacecraft missions tend to be flexible and can thereby be extremely responsive to new opportunities or technological needs. The shorter development times for smaller missions can reduce overall costs and can thus provide welcome budgetary options for highly constrained space programs. Small satellites are currently being proposed for Earth Observation constellations in the Low Earth Orbit.

In the context of Earth Observation with small satellites in LEO, proposals are sought with relevance in the domain of technology development for space in the fields of:

* Optical technologies for precision sensing and communications, and adaptive spacecraft optics for tessellating satellites
* Space sensors and mission concepts for high resolution emission measurements, particularly of climate change determining Greenhouse gases such as CO2 and methane
* High performance and miniaturized optical and SAR sensors (1 kg class)
* Sensor, actuators and control technologies for high precision Attitude and Orbital Control Systems (AOCS) and Guidance, Navigation and Control (GNC)
* Technologies to advance in fractionated systems and formation flying
* Technologies for on board real-time video processing

R&D activities for small satellites, miniaturisation and cost reduction constitute the main drivers. In this context, small satellites are consider to be micro-/nano-satellites (1-100 kg), and mini-satellites up to 500 kg.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 and 2 million would allow this specific topic to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: Spinning-in of new enabling technologies to small satellites for Earth Observation up to TRL 4-5 and clear indication of the ways in which these technologies can significantly improve performance and/or reduce costs if further developed. Proposals should mobilise the participation of SMEs and research groups and ideally proposals should result in developments affecting a range of sectors.

Type of action: Research and innovation actions.

***The conditions related to this topic are provided at the end of this call and in the General Annexes.***

### COMPET-3-2017: Focus on space technologies: High data rate chain

Specific challenge: High data rate is an increasing demand in space systems in diverse fields such as Earth observation, Science and Exploration, telecommunications, etc. The full data chain perspective is evolving and new challenges emerge from these trends. The next generation of Earth observation sensors pose new requirements for higher data rate for inter-satellite communications links (LEO to LEO or LEO to GEO in the range of 2 to 4 Gbps).

Faster processing, larger storage, and high bandwidth transmissions to users will be needed. As well, smart on board data compression and optimisation will become a growing necessity. All these improvements will be required to efficiently support next the generation of data intensive missions. To support this future scenario, innovations must be brought to the payload data management system, including data optimisation processes and inter-satellite links and to the ground segment data system.

Scope: This call will cover activities aiming at providing advanced on-board data processing for Earth observation missions. These activities will address the future challenge of high data rates transmission, including inter-satellite links, within LEO, MEO and GEO orbits, and orbit to ground data links.

Will be of particular relevance to the call those proposals considering a the full data chain (processing and compression, storage, transmission), considering among others, several of the following activities:

* On-board data optimisation and on-board data quality assessment
* On-board implementation of complex data algorithms
* On-board data compression systems
* High data rate image and video processing, such as lossless compression, image enhancement techniques, etc.
* Improved on-board data storage (management of memory modules for new memory devices)
* High data rate links: inter-satellite links (beyond the specifications of the European Data Relay System – EDRS)
* Anticipate how the ground segment will cope with higher data rates, and to address the required evolution of technologies, architectures, products and end-user expectations.

The Commission considers that proposals requesting a contribution from the EU of in the range of EUR 6.5 million would allow this specific topic to be addressed appropriately Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: to provide elements for the high data chain management (including processing and , storage and transmission) and support technologies to data intensive next generation Earth observation missions

Type of action: Research and innovation actions.

***The conditions related to this topic are provided at the end of this call and in the General Annexes.***

## Space exploration and science

In 2017 support for space sciences and space exploration will address the exploitation of space data, in the area of science and the Union will support initiatives for the exploitation of on exoplanets, heliophysics and Moon data. Cooperation with international partners is encouraged (third countries could benefit from EU funding under this topic).

Proposals are invited against the following topics:

### **COMPET-4-2017: Scientific d**ata exploitation

Specific challenge: Support the data exploitation of European missions and instruments, in cunjunction when relevant with international missions. Scientific areas will cover exoplanets and heliophysics.

Scope: This call will cover the exploitation of data provided by missions focusing on exoplanets, heliophysics and the study of the Sun-Earth system and on the Moon. Resulting analyses will also help preparing future European and international missions. Projects selected under this call should rely on the data available through the ESA Planetary Science Archive when possible or other means (e.g. instrumentation teams). Combination and correlation of this data with international scientific mission data, as well as with relevant data produced by ground-based infrastructures all over the world, is encouraged to further increase the scientific return and to enable new investigations with existing data sets. These activities shall add scientific value through analysis of the data, leading to scientific publications and higher level data products. Enhanced data products should be suitable for feeding back into the ESA archives.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 and 2 million would allow this specific challenge to be addressed appropriately, including through proposals from small teams. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: A higher number of scientific publications based on Europe’s space data, high-level data products made available through appropriate archives, and tools developed for the advanced processing of data. Proposals are expected also to add value to existing activities on European and international levels, and enhance and broaden research partnerships.

Type of action: Research and innovation actions.

***The conditions related to this topic are provided at the end of this call and in the General Annexes.***

## Outreach and Communication

Proposals are invited against the following topics:

### COMPET-5-2017: Space portal

Specific Challenge: Provide a one stop-shop user-friendly and visually appealing knowledge oriented project (single space web portal) for space research in Europe to act as archive and outreach tool of research institutionally funded and promote European results and publications.

Scope:  The aim is for this space web portal to become the main reference and entry point for European citizens and professionals interested in space research activities. The call has two main incremental goals:

1. Implementation of an effective space web portal for Europe, able to point to relevant resources as required and depending on the type of queries.
2. Provide a repository of all information regarding FP6, FP7, Horizon 2020 space funded projects.

Additional resources from Member States could be added later on. The space portal should act as a platform to access appropriate information on research projects leading to personalised networks of projects with common interests. It should be complementary to initiatives of NCP networks. The project needs to remain sustainable throughout the duration of Horizon 2020.

The Commission considers that one proposal requesting a contribution from the EU in the range of EUR 0.5 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: The centralisation of projects will allow the easy search for projects that fall under a particular domain, cluster or theme and serve as archive from a scientific and technological angle. It will also allow to identify potential partners and showcase European results and publications. It would also provide European citizens and professionals with a single entry point for space research activities related information.

Type of action: Coordination and support actions.

***The conditions related to this topic are provided at the end of this call and in the General Annexes.***

### COMPET-6-2017: Technology transfer and business generators

Specific Challenge: The number of space-related Business Incubation Centres (BICs) is growing in Europe, lead by national and ESA technology transfer initiatives. There is a need to continue to inspire entrepreneurs to turn space-related business ideas into commercial endeavors and to promote opportunities for new and existing start-ups coming from space and non-space sectors.

Scope: BICs work to inspire entrepreneurs to turn space-connected business ideas into commercial companies, and provide technical expertise and business-development support. BICs should be supported in order to give entrepreneurs comprehensive commercial and technical assistance to help them start-up businesses that apply space technology to non-space industrial, scientific and commercial fields, and vice-versa. Activities should be linked to helping entrepreneurs overcome financial, administrative and networking barriers to innovation. In particular, it should contribute to identifying and attracting appropriate public funding opportunities from the European Union such as the SME instrument, Member States, ESA and regional authorities. The take up of applications developed in the context of Galileo, EGNOS and Copernicus is encouraged. This action should be complementary to the ESA BICs and the European Enterprise Network (EEN) approach.

The Commission considers that one proposal requesting a contribution from the EU in the range of EUR 1.0 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: Creating opportunities for new and existing start-up coming from space and non-space sectors to access finance including SME instrument to develop viable business cases.

Type of action: Coordination and support actions.

***The conditions related to this topic are provided at the end of this call and in the General Annexes.***

### *CONDITIONS FOR THIS CALL*

Publication date:

Opening dates[[19]](#footnote-20):

Deadline(s)[[20]](#footnote-21):

|  |  |
| --- | --- |
| COMPET-1-2017COMPET-2-2017COMPET-3-2017COMPET-4-2017COMPET-5-2017COMPET-6-2017 | dd-mm-2017at 17.00.00 Brussels time  |

Overall indicative budget: **EUR 32 million from the 2017 budget.**

|  |  |
| --- | --- |
| Topics | 2017EUR million  |
| COMPET-1-2017 | 15.0 |
| COMPET-2-2017 | 5.0 |
| COMPET-3-2017 | 6.5 |
| COMPET-4-2017 | 4.0 |
| COMPET-5-2017 | 0.5 |
| COMPET-6-2017 | 1.0 |

Eligibility and admissibility conditions: The conditions are described in parts B and C of the General Annexes to the work programme, with the following exceptions:

|  |  |
| --- | --- |
| COMPET-1-2017COMPET-2-2017COMPET-3-2017COMPET-4-2017COMPET-5-2017 COMPET-6-2017 | With the view of favouring wider competition and participation, the European Space Agency will not participate in consortia of proposals submitted under this call for proposals |
| COMPET-1-2017 | A maximum of 1 proposal per identified Urgent Action line will be selected for funding. |

Evaluation criteria, scoring and threshold: The criteria, scoring and threshold are described in part H of the General Annexes to the work programme.

Evaluation procedure: The procedure for setting a priority order for proposals with the same score is given in part H of the General Annexes.

The full evaluation procedure is described in the relevant guide[[21]](#footnote-22) published on the Participant Portal.

Indicative timetable for evaluation and grant agreement:

|  |  |  |
| --- | --- | --- |
|  | Information on the outcome of the evaluation (*single stage*) | Indicative date for the signing of grant agreements |
| COMPET-1-2017COMPET-2-2017COMPET-3-2017COMPET-4-2017COMPET-5-2017 COMPET-6-2017 | Maximum 5 months from the final date for submission | Maximum 8 months from the final date for submission |

Consortium agreements: In line with the Rules for Participation, participants in Research and Innovation Actions or in Innovation Actions are required to conclude a consortium agreement prior to grant agreement.

###

# Call – Protection of European Assets in and from Space – 2017

***H2020-PROTEC-2017***

The present call concerns space weather. The support to the emergence of a Space Surveillance and Tracking (SST) capacity at European level is addressed through ‘Other actions’.

Proposals are invited against the following topic:

### PROTEC-1-2017: Space Weather

Specific Challenge: Space weather services exist already today in Europe and in several countries outside the EU. New services are also being developed (e.g. in ESA’s SSA programme and in EU Seventh Framework Programme projects). Their goal is to observe and to predict a range of solar events that may impact the near Earth environment including orbiting satellites and ground based systems. However there is a lack of understanding of the effects of space weather on space systems including space crafts, payloads and living organisms in space.

This activity shall address space weather effects/impacts/mitigation with application to space systems.

Scope: Exploratory work studying space weather with a view to enhancing the understanding of space weather and its impact. Proposals can cover the full range of space weather phenomena from the solar cycle, flares and coronal mass ejections to the effects of the solar wind in the near-earth environment and the evolution in between. There is scope for cooperation with international partners with relevant expertise (entities from third countries could benefit from EU funding under this topic).

The Commission considers that proposals requesting a contribution from the EU of between EUR 2 and 3 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: Proposals are expected to improve the understanding of Space Weather phenomena and their impact on space systems (such as space crafts, payloads and living organisms in space) and to propose viable mitigation strategies.

Type of action: Research and innovation actions.

***The conditions related to this topic are provided at the end of this call and in the General Annexes.***

### *CONDITIONS FOR THIS CALL*

Publication date:

Opening dates[[22]](#footnote-23):

Deadline(s)[[23]](#footnote-24):

|  |  |
| --- | --- |
| PROTEC-1-2017 | dd-mm-2017at 17.00.00 Brussels time  |

Overall indicative budget: **EUR 3.0 million from the 2017 budget.**

|  |  |
| --- | --- |
| Topics | 2017EUR million  |
| PROTEC-1-2017 | 3.0 |

Eligibility and admissibility conditions: The conditions are described in parts B and C of the General Annexes to the work programme, with the following exceptions:

|  |  |
| --- | --- |
| PROTEC-1-2017 | With the view of favouring wider competition and participation, the European Space Agency will not participate in consortia of proposals submitted under this call for proposals |

Evaluation criteria, scoring and threshold: The criteria, scoring and threshold are described in part H of the General Annexes to the work programme.

Evaluation procedure: The procedure for setting a priority order for proposals with the same score is given in part H of the General Annexes.

The full evaluation procedure is described in the relevant guide[[24]](#footnote-25) published on the Participant Portal.

Indicative timetable for evaluation and grant agreement:

|  |  |  |
| --- | --- | --- |
|  | Information on the outcome of the evaluation (*single stage*) | Indicative date for the signing of grant agreements |
| PROTEC-1-2017 | Maximum 5 months from the final date for submission | Maximum 8 months from the final date for submission |

Consortium agreements: In line with the Rules for Participation, participants in Research and Innovation Actions or in Innovation Actions are required to conclude a consortium agreement prior to grant agreement.

# SME instrument

***H2020-*** ***SMEInst-04 -2016-2017***

Full details on the continuously open SME instrument call (*H2020-SMEInst-2016-2017*) are provided under the Horizon 2020 Work Programme Part – Innovation in SMEs (Part 7 of this Work Programme).

This Work Programme part contributes the following challenge of the SME instrument call:

### SMEInst*-*04 -2016-2017: Engaging SMEs in space research and development

Specific challenge: To engage small and medium enterprises in space research and development, especially those not traditionally involved in it and reduce as much as possible the entry barriers to SMEs for Horizon 2020 funding. The actions under this topic could cover any aspect of the Specific Programme for Space (Horizon 2020 Framework programme and Specific programme). However, it is considered that actions in the areas of applications, especially in connection to the flagship programmes Galileo and Copernicus, spinning-in (i.e. application of terrestrial solutions to challenges in space) and the development of certain critical technologies could be adequately suited for this call.

# Fast track to innovation - Pilot

Full details on this pilot are provided in the separate call for proposals under the Horizon 2020 Work Programme Part - Fast Track to Innovation Pilot (Part 18 of this Work Programme).

# Other actions

# **In 2016**[[25]](#footnote-26)

### 1. Galileo Evolution, Mission and Service related R&D activities

While the first generation of Galileo is being deployed, it is basic to guarantee that Galileo will remain competitive in the long term. Therefore, new and innovative mission concepts are to be developed in order to ensure that the second generation fulfils the evolving needs of users.

Actions under this area will serve to study and develop concepts for new Galileo services as well as for the evolution of the currently defined services. In particular, for 2016 the Actions will cover the following topics:

 - Innovative concepts.

 - Public Regulated Service.

 - Search and Rescue.

Type of actions: Public procurements.

Indicative Timetable: second quarter 2016.

Indicative budget: **EUR 3.3 from the 2016 budget.**

### 2. EGNOS, Mission and Service related R&D activities

EGNOS is a fully operational System since 2011. Evolution of the currently provided services, namely the Open Service, Safety of Life and EGNOS Data Access Service (EDAS) are already being considered, such as the extension of the Safety of Life service to other user communities than civil aviation. Furthermore, innovative concepts for new services are to be developed, for example looking into the exploitation of existing band-width, so that additional messages can be broadcast (in L1 and in the future in L5).

Finally, providing that EGNOS is a System developed in accordance to the international SBAS standards, it is necessary to make provisions for analyses of mission or service adaptations which may be needed due to changes on those international standards.

Type of actions: Public procurements.

Indicative Timetable: second quarter 2016.

Indicative budget: **EUR 0.9 from the 2016 budget.**

### 3. Horizon 2020: preparation, evaluation and project monitoring

This action will support the use of independent experts for the preparation of procurement topics and actions under Activity 1 “Galileo Evolution, Mission and Services related R&D activities” and under Activity 2 “EGNOS, Mission and Services related R&D activities” and for the evaluation of tenders and monitoring of projects.

Type of action: Expert contracts.

Indicative timeline: 2016.

Indicative budget: **EUR 0.2 from the 2016 budget.**

### 4. GNSS evolution, infrastructure-related R&D activities

The GNSS infrastructure-related R&D activities under Horizon 2020 will be implemented by ESA in indirect management in accordance with Article 58(1)(c) of the Regulation (EU, Euratom) No 966/2012 on the financial rules applicable to the general budget of the Union and repealing Council Regulation (EC, Euratom) No 1605/2002 (the "Financial Regulation").

Consistency of the R&D actions implemented by ESA with the Galileo/EGNOS work programmes and the mission evolution targets is ensured by the Long Term Plan for Infrastructure related R&D activities.

The activities in 2016 will be implemented by ESA under the Delegation Agreement xxxxx.

The following activities will be supported through funding by the Space theme in 2016:

1) EGNOS further evolution Phase B activities [TBD].

2) Galileo 2nd generation phase A/B (system, satellite, payload and ground).

3) GNSS general research and technology.

4) GNSS System Studies and Validation Activities.

5) EGNSS R&T Technical Management.

Type of action: Indirect management by ESA.

Indicative timeline: First quarter 2016.

Maximum Union contribution: **EUR 48.0 million from the 2016 budget, including ESA remuneration costs.**

Implementation: Indirect management by the European Space Agency under delegation agreement with the Commission.

### 5. Space surveillance and tracking (SST): contribution to the support Framework

In line with the Decision No 541/2014/EU of the European Parliament and of the Council of 16 April 2014 establishing a Framework for Space Surveillance and Tracking Support (OJ L 158 of 27 May 2014, p. 227–234, at recital 24) Horizon 2020 will contribute to the funding of the SST support programme, since R&D activities for improved space surveillance are part of the Horizon 2020 Specific programme. This contribution for the year 2016 to the SST support framework will be realised through a grant to an identified beneficiary resulting from the implementation of the support framework for the emergence of an SST capacity at European level[[26]](#footnote-27). This action specifically aims (1) at supporting the pooling of national resources on the SST objectives outlined in COM (2013) 107 and coinciding with objectives and challenges of H2020 related to protecting Europe’s investment made in space infrastructure; and (2) at achieving significant economies of scales by adding related H2020 resources to this joint effort, instead for the Commission to implement its own specific activities.

A grant agreement is to be concluded in 2016 in the context of the SST support framework, in which the designated beneficiary will be the consortium resulting from the implementation of the support framework for the emergence of a SST capacity. This consortium will comprise the Member States participating in the consortium of Article 7(3) of the Decision No 541/2014/EU, the European Union Satellite Centre under the provisions of Article 8 and 10(c) of Decision No 541/2014/EU and entities designated under their responsibility for the implementation of the actions[[27]](#footnote-28) supported by the SST support framework.

Expected impact: To analyse, assess and undertake the necessary research, development and innovation activities for:

* 1. The establishment and operation of a sensor function consisting of a network of ground-based or space-based existing national sensors to survey and track space objects;
	2. The establishment and operation of a processing function to process and analyse the SST data captured by the sensors, including the capacity to detect and identify space objects and to build and maintain a catalogue thereof;
	3. The setting up and operation of a service function to provide SST services to spacecraft operators and public authorities.

Legal entity: Consortium resulting from the implementation of the support framework for the emergence of a SST capacity comprising Member States participating in the consortium of Article 7(3) of the Decision No 541/2014/EU, the European Union Satellite Centre under the provisions of Article 8 and 10(c) of Decision No 541/2014/EU and entities designated under their responsibility for the implementation of the actions[[28]](#footnote-29) supported by the SST support framework.

Type of action: Grant to identified beneficiary – Research and Innovation action.

The standard evaluation criteria, thresholds, weighting for award criteria and the maximum rate of co-financing for this type of action are provided in parts D and H of the General Annexes.

Indicative timeline: First quarter 2016.

Indicative budget: **EUR 1.2 million from the 2016 budget.**

### 6. Improving the Performances of the SST at European Level

The EU is ready to support the emergence of a European SST service built on a network of existing SST assets, notably sensors (radars and telescopes) owned by Member States. This will require the commitment of Member States owning relevant assets to cooperate and provide an anti-collision service at European level.

Once a consortium of Member States cooperating with the European Union Satellite Centre has been set up to provide a SST service, Horizon 2020 can provide support to the upgrading and development of additional assets, in particular radars and telescopes, necessary to ensure, in the long-term, a high level of performance of this European service.

This activity will support for the year 2016 the priority upgrading and development of assets operated by Member States participating in the SST support Framework to improve the overall performances of the SST services.

This activity may involve the use of classified background information (EU or national) or the production of security sensitive foreground information. As such, certain proposal deliverables may require security classification. The final decision on the classification of proposals is subject to the security evaluation.

Legal entity: Consortium resulting from the implementation of the support framework for the emergence of a SST capacity comprising Member States participating in the consortium of Article 7(3) of the Decision No 541/2014/EU and entities designated under their responsibility to implement this action.

Type of action: Grant to identified beneficiary – Research and Innovation action.

The standard evaluation criteria, thresholds, weighting for award criteria and the maximum rate of co-financing for this type of action are provided in parts D and H of the General Annexes.

Indicative timeline: First quarter 2016.

Indicative budget: **EUR 8.0 million from the 2016 budget.**

### 7. Engineering support by ESA

In order to implement the call COMPET-7-2014: Space exploration – Life support and initiate the first preparation for the call COMPET-4-2015: Space exploration – Habitat management, dedicated support by the European Space Agency will be needed to prepare the most suitable projects for research on-board ISS and the Columbus laboratory.

ESA is responsible for the preparation, integration and operation of all payloads using European resources for ISS operations. ESA will, during the ISS demonstrator development phase, contribute to the definition of the operational and interface requirements to ensure that the most suitable project from COMPET-7-2014: Space exploration – Life support is efficiently prepared to be operable on-board the ISS. ESA will assess the resources required for the performance of the experiment as crew time, up-, down-mass, cold stowage. In particular ESA, supported as needed by the IOT and the USOC that has the responsibility of preparing the operations and the necessary operational products (e.g. procedures), will participate to the major project reviews (e.g. requirements review (before development), design review (during development), final readiness review, crew review (for payloads operated by astronauts)). ESA will also monitor that the project is fulfilling all interface requirements, develop all products required for payload operations of the experiment on-board ISS to ensure that it is safe to operate. ESA will also initiate the first preparations for the call COMPET-4-2015: Space exploration – Habitat management.

Type of action: Procurement.

Indicative timetable: First quarter 2016.

Indicative budget: **EUR 1.0 million from the 2016 budget**.

### 8. Studies & Communication

During 2016 it is envisaged to conduct public procurement activities for the organisation of events (conferences, workshops or seminars) related to the implementation of the European Space Policy, European R&D research agendas related to Horizon 2020.

Support may be given to the organisation of conferences and information events to strengthen wider participation in the programme (including that of third countries), and to disseminate results of European research in the Space sector. Cooperation with the presidencies of the Council of the European Union in 2016 is envisaged.

Furthermore, procurement will be necessary of actions such as studies, preparation of roadmaps to underpin planning or actions to evaluate the outcomes of R&D actions.

Activities may include surveys as appropriate implemented through public procurement, and/or appointing (groups of) independent experts. This limited number of contracts may be implemented on the basis of framework contracts, in order to further ensure that the Commission is provided with appropriate and timely analyses, which in turn will facilitate the proper integration of policy studies into the preparation of new policy initiatives.

Type of action: Public procurement - framework contracts and/or calls for tender

Indicative timetable: Several procurements in 2016.

Indicative budget: **EUR 0.3 from the 2016 budget.**

### 9. Horizon 2020 proposal evaluation and project monitoring

This action will support the use of appointed independent experts for the evaluation of proposals and, where appropriate, for the monitoring of running projects.

Type of action: Expert contracts.

Indicative timetable: Second quarter 2016.

Indicative budget: **EUR 1.0 million from the 2016 budget.**

# **In 2017**[[29]](#footnote-30)

### 10. Inducement prizes for low cost access to space for small satellites

*Objectives pursued:*

The objective of this inducement prize is to provide innovative yet implementable, affordable and financially sustainable solutions enabling the delivery of small satellites to Low Earth orbit (LEO). The prize aims at unlocking the expected capacity crunch of access to space for these payloads with the demises of several existing launchers and the prospective mandatory application of the Inter-Agency Space Debris Coordination Committee (IADC) guidance for debris mitigation (limiting the LEO orbit belt permitted for small satellites with no-de-orbiting systems) that could further restrict the range of available launchers for piggy-back small satellites launches. The prize will reward a solution which presents one or several innovative development of a launch system dedicated to small satellites to provide cost-effectiveness and launch flexibility.

*Expected results:*

Affordable, sustainable and innovative design-to-cost solutions towards complete launch systems dedicated to the delivery of small satellites in the range of 50 to 500 kg to LEO orbit, operational as soon as possible and economically viable when considering mid-term (i.e. the year 2025) commercial small satellite launch market predictions.

*Essential award criteria:*

The prize will be awarded, after closure of the contest, to the contestants who in the opinion of the jury demonstrate a solution (which is at least a subsystem prototype demonstrated in an operational environment) that best addresses the following cumulative criteria:

* Technical achievements: demonstrated applicability of the proposed solution in relevant environment (in a scale that includes subsystem ground testing, significant system demonstrator testing, suborbital launch and orbital LEO launch up to 600 km Sun-synchronous orbit (SSO), with higher achievements scoring higher), expected/demonstrated performances and flexibility in terms of addressable satellite class (in terms of mass) and available target orbits.
* Economic viability: recurring launch costs, capability to launch repeatedly with the lowest idle time, business plan for sustained operations.

The specific award criteria will be detailed in the rules of the contest to be published on the participant portal.

*Eligibility criteria:*

The contest will be open to any legal entity (including single persons) or groups of legal entities from Member States and countries associated to Horizon 2020.

Exclusion criteria foreseen in the provisions of articles 106(1), 107, 108 and 109 of the Financial Regulation (regulation 966/2012) will apply. The common Rules of Contest for Prizes are provided in part F of the General Annexes.

Type of action: Inducement prizes.

Indicative timeline: The contest will be launched in 2017. The deadline for submission will be in 2021.

Indicative budget: **EUR 2.0 million from the 2017 budget**.

### 11. Galileo Evolution, Mission and Services related R&D activities

While the first generation of Galileo is being deployed, it is basic to guarantee that Galileo will remain competitive in the long term. Therefore, new and innovative mission concepts are to be developed in order to ensure that the second generation fulfils the evolving needs of users.

Actions under this area will serve to study and develop concepts for new Galileo services as well as for the evolution of the currently defined services. In particular, for 2017 the Actions will cover the following topics:

* Innovative Concepts.
* Commercial Service.
* Signals evolutions.

Type of actions: Public procurements.

Indicative Timetable: Second quarter 2017.

Indicative budget: **EUR 3.4 from the 2017 budget.**

### 12. EGNOS, Mission and Service related R&D activities

EGNOS is a fully operational System since 2011. Evolution of the currently provided services, namely the Open Service, Safety of Life and EGNOS Data Access Service (EDAS) are already being considered, such as the extension of the Safety of Life service to other user communities than civil aviation. Furthermore, innovative concepts for new services are to be developed, for example looking into the exploitation of existing band-width, so that additional messages can be broadcast (in L1 and in the future in L5).

Finally, providing that EGNOS is a System developed in accordance to the international SBAS standards, it is necessary to make provisions for analyses of mission or service adaptations which may be needed due to changes on those international standards.

Type of actions: Public procurements.

Indicative Timetable: Second quarter 2017.

Indicative budget: **EUR 0.5 from the 2017 budget.**

### 13. Horizon 2020: preparation, evaluation and project monitoring

This action will support the use of independent experts for the preparation of procurement topics and actions under Activity “Galileo Evolution, Mission and Services related R&D activities” and actions under Activity “EGNOS, Mission and Services related R&D activities” and for the evaluation of tenders and monitoring of projects.

Type of action: Expert contracts.

Indicative timeline: 2017.

Indicative budget: **EUR 0.2 from the 2017 budget.**

### 14. Horizon 2020 proposal monitoring and audits (EGNSS)

During 2017 it is envisaged to support the implementation of Horizon 2020 through appointment of independent experts for the monitoring of projects. In addition, the European GNSS Agency may organise conferences and workshops (information days) related to GNSS Applications, as well as conduct audits of proposals under Horizon 2020 funding.

Type of action: Expert contracts or procurement.

Indicative timetable: Second quarter 2017.

Indicative budget: **EUR 1.2 from the 2017 budget.** This amount will be entrusted to the European GNSS Agency in addition to the budget entrusted to the Agency for the implementation of the Galileo Applications Call for Proposals.

### 15. GNSS evolution, infrastructure-related R&D activities

The GNSS infrastructure-related R&D activities under Horizon 2020 will be implemented by ESA in indirect management in accordance with Article 58(1)(c) of the Regulation (EU, Euratom) No 966/2012 on the financial rules applicable to the general budget of the Union and repealing Council Regulation (EC, Euratom) No 1605/2002 (the "Financial Regulation").

Consistency of the R&D actions implemented by ESA with the Galileo/EGNOS work programmes and the mission evolution targets is ensured by the Long Term Plan for Infrastructure related R&D activities.

The activities in 2017 will be implemented by ESA under the Delegation Agreement xxxxx.

The following activities will be supported through funding by the Space theme in 2016:

1. Galileo 2nd generation phase A/B (system, satellite, payload and ground).
2. GNSS general research and technology.
3. GNSS System Studies and Validation Activities.
4. EGNSS R&T Technical Management.

Type of action: Indirect management by ESA.

Indicative timeline: First quarter 2017.

Maximum Union contribution: **EUR 48.5 million from the 2017 budget.**

Implementation: Indirect management by the European Space Agency under delegation agreement with the Commission.

### 16. Space surveillance and tracking (SST): contribution to the support Framework

In line with the Decision No 541/2014/EU of the European Parliament and of the Council of 16 April 2014 establishing a Framework for Space Surveillance and Tracking Support (OJ L 158 of 27 May 2014, p. 227–234, at recital 24) Horizon 2020 will contribute to the funding of the SST support programme, since R&D activities for improved space surveillance are part of the Horizon 2020 Specific programme. This contribution for the year 2017 to the SST support framework will be realised through a grant to an identified beneficiary resulting from the implementation of the support framework for the emergence of an SST capacity at European level[[30]](#footnote-31). This action specifically aims (1) at supporting the pooling of national resources on the SST objectives outlined in COM (2013) 107 and coinciding with objectives and challenges of H2020 related to protecting Europe’s investment made in space infrastructure; and (2) at achieving significant economies of scales by adding related H2020 resources to this joint effort, instead for the Commission to implement its own specific activities.

A grant agreement is to be concluded in 2017 in the context of the SST support framework, in which the designated beneficiary will be the consortium resulting from the implementation of the support framework for the emergence of a SST capacity. This consortium will comprise the Member States participating in the consortium of Article 7(3) of the Decision No 541/2014/EU, the European Union Satellite Centre under the provisions of Article 8 and 10(c) of Decision No 541/2014/EU and entities designated under their responsibility for the implementation of the actions[[31]](#footnote-32) supported by the SST support framework.

Expected impact: To analyse, assess and undertake the necessary research, development and innovation activities for:

* 1. The establishment and operation of a sensor function consisting of a network of ground-based or space-based existing national sensors to survey and track space objects;
	2. The establishment and operation of a processing function to process and analyse the SST data captured by the sensors, including the capacity to detect and identify space objects and to build and maintain a catalogue thereof;
	3. The setting up and operation of a service function to provide SST services to spacecraft operators and public authorities.

Legal entity: Consortium resulting from the implementation of the support framework for the emergence of a SST capacity comprising Member States participating in the consortium of Article 7(3) of the Decision No 541/2014/EU, the European Union Satellite Centre under the provisions of Article 8 and 10(c) of Decision No 541/2014/EU and entities designated under their responsibility for the implementation of the actions[[32]](#footnote-33) supported by the SST support framework.

Type of action: Grant to identified beneficiary – Research and Innovation action.

The standard evaluation criteria, thresholds, weighting for award criteria and the maximum rate of co-financing for this type of action are provided in parts D and H of the General Annexes.

Indicative timeline: First quarter 2017.

Indicative budget: **EUR 1.6 million from the 2017 budget.**

### 17. Improving the Performances of the SST at European Level

The EU is ready to support the emergence of a European SST service built on a network of existing SST assets, notably sensors (radars and telescopes) owned by Member States. This will require the commitment of Member States owning relevant assets to cooperate and provide an anti-collision service at European level.

Once a consortium of Member States cooperating with the European Union Satellite Centre has been set up to provide a SST service, Horizon 2020 can provide support to the upgrading and development of additional assets, in particular radars and telescopes, necessary to ensure, in the long-term, a high level of performance of this European service.

This activity will support for the year 2017 the priority upgrading and development of assets operated by Member States participating in the SST support framework to improve the overall performances of the SST services.

This activity may involve the use of classified background information (EU or national) or the production of security sensitive foreground information. As such, certain proposal deliverables may require security classification. The final decision on the classification of proposals is subject to the security evaluation.

Legal entity: Consortium resulting from the implementation of the support framework for the emergence of a SST capacity comprising Member States participating in the consortium of Article 7(3) of the Decision No 541/2014/EU and entities designated under their responsibility to implement this action.

Type of action: Grant to identified beneficiary – Research and Innovation action.

The standard evaluation criteria, thresholds, weighting for award criteria and the maximum rate of co-financing for this type of action are provided in parts D and H of the General Annexes.

.Indicative timeline: First quarter 2017.

Indicative budget: **EUR 15.5 million from the 2017 budget**.

### 18. Implementation of ISS experiments

The International Space Station (ISS) plays a key role as a platform for the preparation of next human exploration missions. It is the current cornerstone of European activities in human spaceflight to prepare for demonstrating technologies, and operations techniques and process, critical for future human missions as well as advancing knowledge related to human spaceflight and terrestrial applications for the benefits of citizens. ESA is the gateway to the Station from Europe. Payloads and activities sponsored by non-ESA agencies foreseen for use on ISS and requiring use of ESA resources rely on the services and processes established by ESA.

This activity will provide for the most suitable project for research from COMPET-7-2014 support from ESA to the testing on-ground, operations on-board ISS in the Columbus laboratory by European astronauts with the provision of resources to install, operate (e.g. power, data) and uninstall the experiment, ground operation. ESA resources will cover among others engineering integration, safety verification, implement the Experiment Sequence Test, ensure the payload training for European Astronauts, full operational integration, cargo integration, planning (strategic, tactical, operational) done in full coordination with ISS partner Agencies, allocate upload (and possibly down) mass resources to send the experiment to ISS (cargo logistics), install it, possible troubleshooting, recovery of data etc..

For the above-mentioned tasks ESA with be supported, for the management of processes to achieve operational readiness and science operations, by of the Industrial Operation Team (IOT) and the Users Support and Operation Centres (USOCs) (e.g. on-orbit operation during experiment execution).

Legal entity: European Space Agency

Type of action: Procurement.

Indicative timetable: First quarter 2017.

Indicative budget: **EUR 7.5 million from the 2017 budget.**

### 19. Engineering support by ESA

In order to implement the call COMPET-4-2015: Space exploration – Habitat management, dedicated support by the European Space Agency will be needed to prepare the most suitable project for research on-board ISS and the Columbus laboratory.

ESA is responsible for the preparation, integration and operation of all payloads using European resources for ISS operations. ESA will, during the ISS demonstrator development phase, contribute to the definition of the operational and interface requirements to ensure that the most suitable project selected from COMPET-4-2015: Space exploration – Habitat management is efficiently prepared to be operable on-board the ISS. It will assess the resources required for the performance of the experiment as crew time, up-, down-mass, cold stowage. In particular ESA, supported as needed by the IOT and the USOC that has the responsibility of preparing the operations and the necessary operational products (e.g. procedures), will participate to the major project reviews (e.g. requirements review (before development), design review (during development), final readiness review, crew review (for payloads operated by astronauts)). ESA will also monitor that the project is fulfilling all interface requirements, develop all products required for payload operations of the experiment on-board ISS to ensure that it is safe to operate.

Type of action: Procurement.

Indicative timetable: First quarter 2017.

Indicative budget: **EUR 1.0 million from the 2017 budget.**

### 20. Studies & Communication

During 2017 it is envisaged to support the preparation of communication material, dissemination of material, or conduct public procurement activities to enable communication of Horizon Space activities, and for the organisation of events (conferences, workshops or seminars) related to the implementation of the European Space Policy, European R&D research agendas related to Horizon 2020.

Support may be given to the organisation of conferences and information events to strengthen wider participation in the programme (including that of third countries), and to disseminate results of European research in the Space sector. Co-operation with the presidencies of the Council of the European Union in 2017 is envisaged.

Furthermore, procurement will be necessary of actions such as studies, preparation of roadmaps to underpin planning or actions to evaluate the outcomes of R&D actions.

Activities may include surveys as appropriate implemented through public procurement, and/or appointing (groups of) independent experts. This limited number of contracts may be implemented on the basis of framework contracts, in order to further ensure that the Commission is provided with appropriate and timely analyses, which in turn will facilitate the proper integration of policy studies into the preparation of new policy initiatives.

Type of action: Public procurement – framework contracts and/or calls for tender.

Indicative timetable: Several procurements in 2017.

Indicative budget: **EUR 0.9 million from the 2017 budget.**

### 21. Horizon 2020 proposal evaluation and project monitoring

This action will support the use of appointed independent experts for the evaluation of proposals and, where appropriate, for the monitoring of running projects.

Type of action: Expert contracts.

Indicative timeline: Second quarter 2017.

Indicative budget: **EUR 1.2 million from the 2017 budget**.

# Budget

|  |  |  |
| --- | --- | --- |
|  | **2016 Budget EUR million****[[33]](#footnote-34)** | **2017**[[34]](#footnote-35) **Budget EUR million54** |
| **Calls** |
| Call H2020-EO-2016/2017Earth Observation | 22.00*from 02.040201* | 17.50*from 02.040201* |
| Call H2020-COMPET-2016 Competitiveness of the European Space Sector: Technology and Science | 66.00*from 02.040201* | 0.00 |
| Call H2020-GALILEO-2017 Applications in Satellite Navigation – Galileo | 0.00 | 33.00*from 02.040201* |
| Call H2020-COMPET-2017Competitiveness of the European Space Sector: Technology and Science | 0.00  | 32.00*from 02.040201* |
| Call H2020-PROTEC-2017Protection of European assets in and from space | 0.00  | 3.00*from 02.040201* |
| **Contribution** from this part to call ‘H2020-SMEInst-2016-2017’ (under Part 7 of the work programme) | 11.37*from 02.040201* | 12.60*from 02.040201* |
| **Contribution** from this part to call ‘H2020-FTI Pilot-2016’ (under Part 18 of the work programme) | 2.88*from 02.040201* | 0.00 |
| **Other Actions**  |
| 2016 Activity 1 – Galileo Evolution, Mission and Service related R&D activities | 3.30*from 02.040201* | 0.00 |
| 2016 Activity 2 – EGNOS, Mission and Service related R&D activities | 0.90*from 02.040201* | 0.00 |
| 2016 Activity 3 – Horizon 2020: preparation, evaluation and project monitoring | 0.20*from 02.040201* | 0.00 |
| 2016 Activity 4 – GNSS evolution, infrastructure-related R&D activities | 48.00*from 02.040201* | 0.00 |
| 2016 Activity 5 – Space surveillance and tracking (SST): contribution to the support Framework | 1.20*from 02.040201* | 0.00 |
| 2016 Activity 6 – Improving the Performances of the SST at European Level | 8.00*from 02.040201* | 0.00 |
| 2016 Activity 7 – Engineering support by ESA | 1.00*from 02.040201* | 0.00 |
| 2016 Activity 8 – Studies & Communication | 0.30*from 02.040201* | 0.00 |
| 2016 Activity 9 – Horizon 2020 proposal evaluation and project monitoring | 1.00*from 02.040201* | 0.00 |
| 2017 Activity 10 – Inducement prizes for access to space for small satellites | 0.00 | 2.00*from 02.040201* |
| 2017 Activity 11 – GNSS Evolution, Mission and Services related R&D activities | 0.00 | 3.40*from 02.040201* |
| 2017 Activity 12 – EGNOS, Mission and Service related R&D activities | 0.00 | 0.50*from 02.040201* |
| 2017 Activity 13 – Horizon 2020: preparation, evaluation and project monitoring | 0.00 | 0.20*from 02.040201* |
| 2017 Activity 14 – Horizon 2020 proposal monitoring and audits (EGNSS) | 0.00 | 1.20*from 02.040201* |
| 2017 Activity 15 – GNSS evolution, infrastructure-related R&D activities | 0.00 | 48.50*from 02.040201* |
| 2017 Activity 16 – Space surveillance and tracking (SST): contribution to the support Framework | 0.00 | 1.60*from 02.040201* |
| 2017 Activity 17 – Improving the Performances of the SST at European Level | 0.00 | 15.50*from 02.040201* |
| 2017 Activity 18 – Implementation of ISS experiments | 0.00 | 7.50*from 02.040201* |
| 2017 Activity 19 – Engineering support by ESA | 0.00 | 1.00*from 02.040201* |
| 2017 Activity 20 – Studies & Communication | 0.00 | 0.90*from 02.040201* |
| 2017 Activity 21 – Horizon 2020 proposal evaluation and project monitoring | 0.00 | 1.20*from 02.040201* |
| **Estimated total budget** | **165.85** | **181.60** |

1. Access to Copernicus Sentinel data and service information is provided to users on a free, full and open basis. For other satellites data, the DataWareHouse document 2.0 is available at <http://www.copernicus.eu/main/library/technical-documents/> and licensing details can be consulted at <http://gmesdata.esa.int/web/gsc/dap_document> as well as <http://gmesdata.esa.int/web/gsc/terms_and_conditions>. [↑](#footnote-ref-2)
2. European Structural and Investment Fund. [↑](#footnote-ref-3)
3. The Director-General responsible may decide to open the call up to one month prior to or after the envisaged date of opening. [↑](#footnote-ref-4)
4. The Director-General responsible may delay this deadline by up to two months. [↑](#footnote-ref-5)
5. See: http://ec.europa.eu/research/participants/data/ref/h2020/grants\_manual/pse/h2020-guide-pse\_en.pdf [↑](#footnote-ref-6)
6. Technology Readiness Levels are defined in part G of the General Annexes. In the specific area of space, further details can be found in the European Space Agency website ["Strategic Readiness Level - The ESA Science Technology Development Route"](http://sci.esa.int/science-e/www/object/index.cfm?fobjectid=37710). [European Space Agency](http://en.wikipedia.org/wiki/European_Space_Agency), Advanced Studies and Technology Preparation Division, http://sci.esa.int/sre-ft/50124-technology-readiness-level/05 [↑](#footnote-ref-7)
7. Technology Readiness Levels are defined in part G of the General Annexes. In the specific area of space, further details can be found in the European Space Agency website ["Strategic Readiness Level - The ESA Science Technology Development Route"](http://sci.esa.int/science-e/www/object/index.cfm?fobjectid=37710). [European Space Agency](http://en.wikipedia.org/wiki/European_Space_Agency), Advanced Studies and Technology Preparation Division, http://sci.esa.int/sre-ft/50124-technology-readiness-level/05 [↑](#footnote-ref-8)
8. The Director-General responsible may decide to open the call up to one month prior to or after the envisaged date of opening. [↑](#footnote-ref-9)
9. The Director-General responsible may delay this deadline by up to two months. [↑](#footnote-ref-10)
10. See: http://ec.europa.eu/research/participants/data/ref/h2020/grants\_manual/pse/h2020-guide-pse\_en.pdf [↑](#footnote-ref-11)
11. In accordance with the Commission decision C(2014)4995 these tasks will be implemented by the European GNSS Agency in indirect management and maximum annual Commission contribution will be decided annual in the Horizon 2020 work programme. [↑](#footnote-ref-12)
12. The recent EASA Notice of Proposed Amendment 2015-01 should be taken into account. [↑](#footnote-ref-13)
13. Cf. also Article 50 of Directive 2014/65/EU on Markets in Financial Instruments. [↑](#footnote-ref-14)
14. The Director-General responsible may decide to open the call up to one month prior to or after the envisaged date of opening. [↑](#footnote-ref-15)
15. The Director-General responsible may delay this deadline by up to two months. [↑](#footnote-ref-16)
16. See: http://ec.europa.eu/research/participants/data/ref/h2020/grants\_manual/pse/h2020-guide-pse\_en.pdf [↑](#footnote-ref-17)
17. Technology Readiness Levels are defined in part G of the General Annexes. In the specific area of space, further details can be found in the European Space Agency website ["Strategic Readiness Level - The ESA Science Technology Development Route"](http://sci.esa.int/science-e/www/object/index.cfm?fobjectid=37710). [European Space Agency](http://en.wikipedia.org/wiki/European_Space_Agency), Advanced Studies and Technology Preparation Division, http://sci.esa.int/sre-ft/50124-technology-readiness-level/05 [↑](#footnote-ref-18)
18. Technology Readiness Levels are defined in part G of the General Annexes. In the specific area of space, further details can be found in the European Space Agency website ["Strategic Readiness Level - The ESA Science Technology Development Route"](http://sci.esa.int/science-e/www/object/index.cfm?fobjectid=37710). [European Space Agency](http://en.wikipedia.org/wiki/European_Space_Agency), Advanced Studies and Technology Preparation Division, http://sci.esa.int/sre-ft/50124-technology-readiness-level/05 [↑](#footnote-ref-19)
19. The Director-General responsible may decide to open the call up to one month prior to or after the envisaged date of opening. [↑](#footnote-ref-20)
20. The Director-General responsible may delay this deadline by up to two months. [↑](#footnote-ref-21)
21. See: http://ec.europa.eu/research/participants/data/ref/h2020/grants\_manual/pse/h2020-guide-pse\_en.pdf [↑](#footnote-ref-22)
22. The Director-General responsible may decide to open the call up to one month prior to or after the envisaged date of opening. [↑](#footnote-ref-23)
23. The Director-General responsible may delay this deadline by up to two months. [↑](#footnote-ref-24)
24. See: http://ec.europa.eu/research/participants/data/ref/h2020/grants\_manual/pse/h2020-guide-pse\_en.pdf [↑](#footnote-ref-25)
25. The budget amounts for 2016 are subject to the availability of the appropriations provided for in the draft budget for 2016 after the adoption of the budget for 2016 by the budgetary authority or if the budget is not adopted as provided for in the system of provisional twelfths. [↑](#footnote-ref-26)
26. In line with recital 24 of the Decision and articles 129 of the Financial regulation and 193 of its Rules of Application (Commission Delegated Regulation (EU) No 1268/2012 of 29 October 2012 on the rules of application of Regulation (EU, Euratom) No 966/2012 of the European Parliament and of the Council on the financial rules applicable to the general budget of the Union) this action may be financed jointly from separate source programmes. [↑](#footnote-ref-27)
27. Article 4 of Decision No 541/2014/EU. [↑](#footnote-ref-28)
28. Article 4 of Decision No 541/2014/EU. [↑](#footnote-ref-29)
29. The budget amounts for 2017 are indicative and will be subject to a separate financing decision to cover the amounts to be allocated for 2017. [↑](#footnote-ref-30)
30. In line with recital 24 of the Decision and articles 129 of the Financial regulation and 193 of its Rules of Application (Commission Delegated Regulation (EU) No 1268/2012 of 29 October 2012 on the rules of application of Regulation (EU, Euratom) No 966/2012 of the European Parliament and of the Council on the financial rules applicable to the general budget of the Union) this action may be financed jointly from separate source programmes. [↑](#footnote-ref-31)
31. Article 4 of Decision No 541/2014/EU. [↑](#footnote-ref-32)
32. Article 4 of Decision No 541/2014/EU. [↑](#footnote-ref-33)
33. The budget figures given in this table are rounded to two decimal places. [↑](#footnote-ref-34)
34. The budget amounts for 2017 are subject to the availability of the appropriations provided for in the draft budget for 2017 after the adoption of the budget for 2017 by the budgetary authority or if the budget is not adopted as provided for in the system of provisional twelfths. [↑](#footnote-ref-35)