*** Please note that this document ***

- only has a draft status (do not communicate with the European Commission about the content)
- is confidential (only share selected paragraphs of the text and not the whole document)

COUNCIL DECISION ESTABLISHING THE SPECIFIC PROGRAMME IMPLEMENTING HORIZON 2020 - THE FRAMEWORK PROGRAMME FOR RESEARCH AND INNOVATION (2014-2020)

WORK PROGRAMME 2014 – 2015

5. Leadership in enabling and industrial technologies

iii. Space

INFORMAL DRAFT DISCUSSION DOCUMENT

Important notice:
The present document is meant to facilitate the discussions towards the preparation of the work programme 2014 – 2015. It does not at this stage cover all relevant aspects and it does not prejudge the outcome of the on-going interinstitutional negotiations on Horizon 2020 or internal work on cross-cutting aspects. Hence, it remains subject to change. Information, such as indicative budgets per call/area, will be provided at later stage.

Table of contents

Introduction to Space

Space research is supported in Horizon 2020 under the heading "Industrial Leadership", in line with the main objective and challenge to **foster a cost-effective competitive and innovative space industry (including SMEs) and research community to develop and exploit space infrastructure to meet future Union policy and societal needs.** Building on the successes of FP7, Horizon 2020 will enable the European space research community to develop innovative space technologies and operational concepts "from idea to demonstration in space", and to use space data for scientific, public, or commercial purposes. This will anchor and structure space research and innovation at the European level and address key aspects identified in the Commission Communication "EU Space Industrial Policy: Releasing the Potential for Growth in the Space Sector" (COM(2013) 108 final of 28 February 2013).

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 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.

In 2014-2015 around 60% of the budget is allocated to the three EU Space flagships initiatives: European Global Navigation Satellite System (EGNSS), Earth Observation and Protection of European assets in and from space.

Call "Applications in Satellite Navigation - Galileo" – 2014 & 2015

H2020-Galileo-2014/2015

The European Global Navigation Satellite System (EGNSS), operated under civilian control, encompasses satellite radio-navigation system established under the Galileo programme and European Geostationary Overlay System (EGNOS).

The Galileo programme will provide GNSS services and increase availability and reliability of other GNSS, while ensuring the European non-dependence from other GNSS systems. It will provide a strategic advantage for Europe and maximise the socio-economic benefits for the European citizens.

Horizon 2020 will accompany the infrastructure deployment by 1) fostering the further uptake of EGNSS in applications, 2) preparing the secure utilisation through the development of a PRS receiver and 3) foreseeing the future evolution of the EGNSS infrastructure.

To meet the overall objectives of the Galileo programme and to foster the uptake of EGNOS and Galileo, the development of applications is vital. New satellite navigation applications are being developed every day, covering numerous sectors of the world economy. The expected global market will reach EUR 240 billion by 2020.

These activities will give European industry the right opportunities to acquire the knowledge and expertise required to compete in the international environment. Small and Medium Enterprises are key players for innovation in this sector.

This call should result in the development of applications and implementation of pilot projects with a potential to contribute to the growth and strengthening of the European GNSS market and to have an impact on sectors where the EU's added value and cost effectiveness are the greatest.

The application of space technologies shall also be supported through the respective Societal Challenges, where appropriate.

GALILEO 1: EGNSS applications

Specific challenge:

European society and industry are facing new challenges, requiring more innovation, productivity and competitiveness, whilst using fewer resources and reducing environmental impact. GNSS offers various possibilities for the development of new space enabled applications, which will enhance Europe's capacity to address major societal challenges in focus areas such as health, citizen safety, smart cities, sustainable resources management, regional growth, low-carbon energy infrastructure planning and protection, disaster

management and climate action.

Satellite navigation provides continuous, real-time, reliable, accurate and globally available position, velocity and time. The technology fits important societal and market needs. Market uptake of Galileo is to a large extent determined by availability of Galileo-enabled receivers and applications, which are crucial to reap the socio-economic benefits and to ensure that the EU is not dependent on non-European GNSS.

Scope:

Proposals should aim at developing new innovative applications, with future commercial impact. Application development should be seen in a broad context - it includes the development, adaptation and/or integration of new software, hardware, services, datasets etc. The use of EGNOS and Galileo Early Services is a key priority for this topic.

Research and innovation activities within this topic should take into consideration possibility of:

1. Exploitation of synergies with other space-based services and systems in order to enable multi-use character of EGNOS and Galileo-enabled applications in all market segments,
2. Validation of early services, ensuring a greater precision and availability of signals,
3. Implementation of pilot projects for further development of EGNSS based applications,
4. Standardisation, certification, legal and societal acceptance, which will foster EGNSS adoption, and
5. Awareness campaigns for the development of EGNSS usage and their promotion worldwide.

Expected Impact:

Activities should promote innovation in order to maximise the potential of the European GNSS and its adoption. They should include synergies with other GNSS, definition and implementation of pilot projects and development of the EGNSS-enabled applications that are close to the market with a high societal benefit and a potential to eventually set common standards in the field of GNSS applications. The project should have a clear intention to commercialise the products and services developed.

Release of practical tools to the GNSS developer community, ideally with free open source license, is of particular interest.

Instrument(s): Innovation Actions (70%).

GALILEO 2: Small and Medium Enterprise (SME) based EGNSS applications

Specific challenge:

European society and industry are facing new societal challenges, requiring more innovation,

productivity and competitiveness, whilst using fewer resources and reducing environmental impact. GNSS offers various possibilities for the development of new space enabled applications, which will enhance Europe's capacity to address major societal challenges in focus areas such as health, citizen safety, smart cities, sustainable resources management, regional growth, low-carbon energy infrastructure planning and protection, disaster management and climate action.

Satellite navigation provides continuous, real-time, reliable, accurate and globally available position, velocity and time. The technology fits important societal and market needs. Market uptake of Galileo is to a large extent determined by availability of Galileo-enabled receivers and applications, which are crucial to reap the socio-economic benefits and to ensure that the EU is not dependent on other GNSS.

Scope:

This topic will explore new applications in niche market sectors and business models in any application domain. Proposals should aim at developing sophisticated, innovative applications, products, feasibility studies, market tests etc. They should address emerging user needs and taking specifically advantage of the Galileo and EGNOS capabilities. A specific emphasis will be given to support development of technological breakthrough into viable products with real commercial potential, where SMEs, which are considered as the key players for innovation in this domain, play a pivotal role, given their flexibility and adaptability.

Expected Impact:

Activities should aim at developing highly innovative and adaptive applications taking advantage of the Galileo and EGNOS. The project should be led by an SME and have a clear intention to commercialise the products and services developed. Additional partners, within the consortium, should contribute directly to the needs identified by the SME, in the lead, in order to fulfil the above objective of commercialisation.

Release of practical tools to the GNSS developer community, ideally with free open source license, is of particular interest.

Instrument(s): Innovation Actions (70%). *The Commission considers that projects requesting a contribution from the EU of around € 300.000 would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.*

GALILEO 3: Releasing the potential of EGNSS applications through international cooperation

Specific challenge:

Although Galileo is a European programme, it has a strong international dimension. International cooperation in the field of Galileo-enabled applications is therefore an essential element facilitating its breakthrough to new and emerging markets and strengthening Europe's position as a major space player.

Scope:

Activities under this topic will enable the development of innovative applications within international context and related standards with high international impact, ensuring that the EGNSS services are well known and can be used throughout the world. The objective is to support new projects consisting of demonstrators of applications, adaptations of applications to a specific and local context outside of the European Union and the implementation of applications benefiting from multiple constellations, including Galileo. GNSS should be used as the primary positioning technology in the application and positioning should be a key enabler of the application. Non-EU countries will be guided and supported in adapting services and developing applications corresponding to local needs and ensure that no unnecessary restriction to the use of the EGNSS is applied. Focus will be on regions of the world, which represent an attractive market for the European industry.

Expected Impact:

Projects are expected to foster application development through international cooperation and create a broad acceptance of EGNSS in non-European countries. The consortium should aim to transform the research results into innovation in third countries (outside of the EU), through the networking of relevant technology developers with local academia, incubators, SMEs, representatives from civil society as well as local authorities, notably for the provision of public services, best practices and technology through the establishment of self-sustainable partnerships and collaborative initiatives.

Release of practical tools to the GNSS developer community, ideally with free open source license, is of particular interest.

Instrument(s): Innovations Actions (70% rate).

GALILEO 4: EGNSS awareness raising, capacity building and/or promotion activities, inside or outside of the European Union

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 support to prizes 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. Proposal for support for prizes shall include details about the intended conditions for participation, award criteria and amount of prizes[1].

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 for prizes scheme should foster the emergence of new downstream applications based on both Galileo and EGNOS and therefore to support the EU GNSS industry.

Instrument(s): Coordination and Support Action (100% rate).

[1] In-line with the requirement of Regulation No 966/2012 of the European Parliament and of the Council of 25 October 20012 and Commission Delegated Regulation No 1268/2012 of 29 October 2012

Call "Earth Observation" – 2014

H2020-EO-2014

Space enabled Applications

Over the last decade, Europe has established the autonomous capacity for space-borne observations and operational services in the field of environment, civil protection and security. Operational satellites are providing data on a free and open data policy basis as well as commercially, and are complemented by first-of-a-kind research satellites. Scientific exploitation of this existing and emergent European space infrastructure needs to be enhanced, by stimulating the emergence of novel ideas on what can be observed from space, and what information might still be hidden in existing Earth Observation (EO) data of various kinds. Research to promote such new ideas will ensure Europe's leadership in space-enabled applications in the future, and enable Europe to effectively address its research challenges, as well as the focus areas of the Commission's strategic programme for Horizon 2020, in innovative ways within the societal challenge pillar.

EO 1 - 2014: New ideas for Earth-relevant space applications

Specific challenge:

Space systems produce information which often cannot be acquired in any other way. Specifically, the Copernicus data are expected to provide improved data quality, coverage and revisit times, and increase the value of Earth Observation data for scientific work and future emerging applications. Equally, space data obtained for specific purposes can subsequently reveal novel scientific insights which were not specifically intended or expected at the time of space sensor launch. In order to fuel this scientific cycle of discovery, and further enhance scientific exploitation of collected space data related to Earth (now or in the near future), new upstream data products and analysis methods suitable for subsequent scientific integration into applications (such as for instance conducted in the calls of the Horizon 2020 societal challenges) should be generated. Data could include a wide variety of Earth-relevant space-based data (e.g. remote-sensing data, gravity data, magnetic data, GNSS signals), thereby widening the data scope beyond conventional EO images.

Scope:

New and hitherto immature uses of Earth-relevant space-based data should be investigated to enable integration into scientific investigations related to Earth system sciences, or forecasting models at regional or wider geographical extent. It is expected that proposals address also how the insights proposed to be obtained from space based data can be validated, e.g. in combination with ground based observations, with appropriate attention also being given to calibration of space data. Research into specification of the uncertainties associated with the derived results should also be included. To enhance the use of intermediate and final products, due attention is also to be given to standardisation of data, best practices, dissemination

mechanisms and reference frames.

Preference shall be given to the usage of data from space-borne European instruments. In case such European data exists, the primary use of non-European data shall be justified by the bidder. Proposers may thus find it helpful to consult information on availability of Copernicus Sentinel Data, access to Copernicus Contributing Mission data, at the Commission's web http://xxxx.

Expected impact:

Projects are expected to prepare the ground for further innovative exploitation of European space data in scientific activities and/or future and emerging applications.

Projects are expected to have a significant impact in stimulating wide and further exploitation of the used data. The application potential of these new data products and concepts will have to be demonstrated through selected examples and demonstration cases. The results shall be actively disseminated in the relevant scientific publications, as well as towards potential user communities as appropriate. The research may deliver as well input for drawing up user requirements for enhanced processing tools or future observation instruments.

An important impact is also the applicability of the results for further systematic research usage, either in the context of the societal challenges addressed by Horizon 2020 calls, or research conducted in domains not covered in the scope of other Horizon 2020 funding areas. Results will therefore have to attain the necessary maturity to fulfil this promise. Specific commercial or scientific agreements for usage of results will be positively considered.

Instrument: Research and Innovation Actions (100%). *The Commission considers that projects requesting a contribution from the EU of 2.5 million Euro would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.*

Tools for access to space data

Efficient and widespread exploitation of the existing and planned operational European space infrastructure is only possible if further efforts are made for the processing, archiving, standardised access and dissemination of satellite data. Sustainable availability has also to be coupled with generic search, data-mining and visualisation techniques inviting wide data use, also allowing for standardised and automated approaches. Wide use has to be achieved at European and global levels, and coordination with mechanisms promoted in the context of the Global Earth Observation System of Systems (GEOSS) is to be achieved.

For successful exploitation of space borne sensors to take place, it is furthermore necessary to provide access to easy-to-use, calibrated and validated data products, taking into account the

latest and emerging remote sensing capabilities. Validation efforts have to provide researchers and users with well-defined uncertainty ranges of space data to make the subsequent usage verifiable and to allow for cross-sensor or cross-satellite use of data.

EO 2 - 2014: Stimulating wider research use of Copernicus Sentinel Data

Specific challenge:

Europe's investment in the Copernicus Sentinel satellites will provide Europe with an unprecedented source of operational satellite data. The first and largest streams of data will become available from Sentinel 1 (SAR data) during 2014, to be followed shortly thereafter with data from Sentinels 2 and 3 (optical imaging data). Data streams are expected to amount to several terabyte per satellite orbit, thereby delivering unprecedented temporal and spatial resolution and data continuity, calling for new data handling and processing paradigms. While this data is ingested into the operational Copernicus services, wide use by the scientific community and industry researchers for developing products is still limited and needs to be stimulated with easy-to-use interfaces for performing R&D.

Scope:

To utilise the high scientific potential of the Sentinel data, stable and predictable access methods need to be developed, such as

- research into efficient information retrieval from satellite data repositories and dissemination;
- developing software to read and transform data for access by scientific users, including data mining techniques;
- developing data fusion methods (data from several sentinels and /or other contributing satellite missions);
- advanced visualisation techniques (allowing also for sensory exploration of data beyond visual experience).

A particular aspect of interest is also the international use of Sentinel data, as acceptance of Copernicus data in a global context will be a key to success of Europe's contribution of Copernicus to GEOSS.

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://xxxx.

Expected impact:

Significantly wider use of Copernicus Sentinel data should be achieved, in Europe as well as internationally. Further opportunities for new uptake of satellite data should be created. Possible models for operational supply of data to users, especially for further scientific exploitation should be demonstrated. The work should contribute to the definition of best

practices and their adoption in scientific and commercial user communities, and in a GEOSS context if possible.

This research topic should attract active participation of researchers in academia, specialising on the use of sentinel data and their integration and/or comparison with other sensor data (from space or in-situ). It should actively involve students performing research with satellite data.

Instrument(s): Research and Innovation Actions (100%).*The Commission considers that projects requesting a contribution from the EU of 2.5 million Euro would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.*

EO 3 - 2014: Land Use/Land Use Change Space-based Data reprocessing and calibration

Specific Challenge:

Research areas such as Land use and Land use Change (LULUC) address long time periods, where data acquired in the past are essential. The data from past EO missions, either from European or non-European satellites, must be made accessible in a way to reconstruct seamless time series of similar observations across sensors and technologies over two decades and more. At the same time, parameters derived from space data need to be adapted to be more relevant to current policy issues, such as for example bio-fuel production impacts or shifts to a low carbon economy.

Scope:

The data contained and maintained in archives of the relevant data holding agencies will require to be reprocessed to ensure consistent time series and data formats, to be updated to latest algorithms, and land use classifications. Manipulation of historical data at the relevant source will be required to enable quick analyses, bulk reprocessing and wide access to different science and application communities. Interoperability of diverse observation collections and sensor-to-sensor inter-calibration will have to be included, as well as establishing of the associated uncertainties and limits. In order to be of value to LULUC research, the results will have to take reference also to existing classification schemes and classes.

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://xxxx.

Expected Impact:

The project is expected to significantly contribute to the availability of validated space-based observational data on Land Use and Land Use Changes as a long time series, providing consistency of land use data records over a time period corresponding to the satellite era.

Activities should thereby lead to a better uncertainty characterisation of available data records, particularly when it comes to change detection, and automated processes to derive these.

The project should also have an impact on promotion of best practices in the derivation of land use information from satellite data, particularly as regards the validation and calibration of satellite data.

Instrument(s): Research and Innovation Actions (100%). *The Commission considers that projects requesting a contribution from the EU of 5 million Euro would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.*

EO 4 – 2014: Land Surface changes at Global Scale

Specific Challenge:

Land surfaces are experiencing dramatic changes due to climate variability and increasing anthropogenic pressure. These changes occur in the form of long term trends as in the case for surface temperature and/or via the occurrence of extreme events such as fires and floods. In either case, different land surfaces respond differently to these low and high frequency perturbations, which in turn alters the exchange of mass, energy and water between the surfaces and the atmosphere. In that context, the vegetation layer acts as a fragile but important buffer or a transfer medium, which is very sensitive to a series of environmental conditions such as droughts and temperature extremes (to name but a few). The relationships between current and future climate and the state of the land surfaces are established in some cases, but the understanding of key processes, including feedbacks, and the attribution of observed changes remain incomplete. To better understand these aspects, research will inevitably have to take reference to long term space-based data and derived products characterising the land surface. A key question is to which extent current land surface characterisation from space is up to this task, to which extent uncertainties in remote sensing data limit our ability to research such land-atmosphere dynamics. Coordinated European efforts and approaches are required to address this issue which involves key players across Europe in various observational and modelling domains as well as remote sensing data experts .

Scope:

A better understanding of the issues shall be achieved by consolidating the observed changes documented from space-based data, their apparent spatio-temporal correlations and causalities. Research is needed, examining land surfaces at global, continental and regional

scales across different geophysical areas, wherever these are experiencing environmental stress caused by global scale phenomena, spanning a range of frequency of occurrences from multi decadal scale to rapid extreme weather events. The phase and amplitude of these changes need to be re-assessed based on modern and state of the art long term data sets established from the last two decades or more of remote sensing observations at global scale. This assessment may require analysing these observations in parallel with current global scale model predictions to examine the overall consistency in the spatial patterns, phase and amplitude of the changes estimated from multi-decadal remote sensing observations. Potential inconsistencies between the observations shall point at existing limitations in the remote sensing data quality and/or processing algorithms and shall help identify improvements needed in space observation techniques. This research relies heavily on a European capacity and knowledge in the analyses of space derived products in different geophysical domains. Contributing groups have to be organized accordingly, and have to be able to conduct research studies across the traditional geophysical boundaries. This activity shall include evaluations of current data streams and provide recommendations for further efforts in this arena.

Expected impact:

- Identification of physical inconsistencies in existing space derived observations.
- Identification of observation gaps and feedbacks to remote sensing data requirements.
- Recommendations for promoting future activities in this sector.

Instrument(s): Research and Innovation Actions (100%). *The Commission considers that projects requesting a contribution from the EU of 5 million Euro would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.*

EO 5 – 2014: Observation capacity mapping and needs for Climate change monitoring

Specific Challenge:

Climate research is a case that clearly illustrates the full complexity of needs for validation and calibration of space data, and hence of the remote sensing data at source. The latter includes a range of sensors operated by different space agencies that all need to ensure the provision of reliable and accurate data to contribute efficiently to the generation of Climate Data Records. More atmospheric species need to be monitored, simultaneously and for the same air mass, at local to global level. Space based remote sensing data have to be integrated with measurements taken at various places in the atmosphere, from the middle atmosphere down to ground level. Efforts must be coordinated at national and international levels to optimize the use of existing in-situ measurements, the deployment of new measuring systems and the design of campaigns dedicated to the calibration and validation of remote sensing

data. Vicarious calibration techniques requires detailed and complete documentation of the state of the atmosphere at time of satellite overpasses over a variety of land, water and icy surfaces to span a large range of environmental conditions. A comprehensive 3-D coverage has to be developed and implemented together with an appropriate validation strategy. While calibration and validation campaigns are conducted at national and international level, particularly to validate specific sensors and satellites, a European coordinated approach in charting systematically the available and needed instrument suites for systematic climate change monitoring in space and time, and the correspondingly required validation campaigns remains elusive.

Scope:

To achieve this, research is needed to assess gaps in remote observation availability and suitable approaches for defining virtual observation constellations. It should include mapping of ground based networks, airborne, balloons and sub-orbital platforms as well as space based sensors. Appropriate calibration and validation of data is to be assessed, charting the campaigns that will be needed to cover the climate change monitoring needs in years to come from remote sensing data gathered over land, water and icy surfaces. A mapping of available/deployed sensor technologies and measurements should be performed as a first step, to identify gaps in available systems and current knowledge to characterise the atmosphere for different ground level conditions and ensure the provision of reliable and accurate Climate Data Records for the atmosphere, land surfaces and oceans. This information should also lay the basis for drawing up the need for dedicated calibration and validation campaigns combining instruments and measurements deployed in ground based networks, airborne, UAV, balloons, sub-orbital and in-orbit platforms, as relevant for climate change monitoring. Since this activity is highly reliant on consensus of the scientific community involved in climate change and atmospheric measurements/modelling, the project will have to mobilise key players across Europe and globally, and will have to include mechanisms regarding best practices to reach a consensus on the strategies proposed.

Expected Impact:

The project is expected to lead to significant advances in greater consistency and cross-calibration/validation of long term space based measurements, providing a better overview of uncertainty of available data to generate Climate Data Records. Based on the work done, best practices regarding calibration/validation campaigns should be promoted.

Instrument(s): Research and Innovation Actions (100%). *The Commission considers that projects requesting a contribution from the EU of 5 million Euro would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.*

[Transition towards Copernicus]

If necessary two topics for actions in Marine and Atmosphere.

Call "Protection of European assets in and from space – 2014

The present call concerns space weather and Near Earth Objects (NEOs), while action to support the emergence of a Space Surveillance and Tracking capacity at European level will be dealt with under the heading "Other actions (not subject to calls for proposals)"

With increasing dependance on space-based services, the ability to protect our space infrastructures has become essential to our society. Any shutdown of even a part of space infrastructures could have significant consequences for the well-functioning of economic activities and our citizens' safety, and would impair the provision of emergency services.

Space harsh radiation and particle can damage spacecraft and ground infrastructure such as power grids and telecom networks. Space Weather activity aims at monitoring understanding and forecasting such phenomena to prevent it. Research is needed to improve our understanding and convert our scientific knowledge into an operational service.

NEOs such as Asteroid and Comets when impacting the earth can cause damages to an extent that it could threaten mankind. To meet this global concern, Research will promote a coordinated international effort to predict and mitigate the threats of NEO

PROTEC 1 - 2014: 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 FP7 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. Today, the services partly rely on ageing solar observational infrastructure that in the coming years is to be replaced by new space based observatories. The challenge is to harness the expected much richer and larger volumes of data to enable new and more sophisticated modelling of complex physical phenomena and their impact. This will necessitate new approaches to data processing and international cooperation in this domain.

Scope:

Exploratory work studying new ideas for data analysis and modeling of space weather with a view to enhancing the performance of space weather prediction.

Research into further improvement of existing models and their validation in the context of international cooperation with leading space weather service providers and/or related to emerging European space weather services.

There is scope for cooperation with international partners with relevant expertise (also non-EU entities with or without EU funding).

Expected Impact:

Projects are expected to deliver new insights into the detailed processes that generate space weather. This should contribute to new services able to predict, with a significantly higher precision than today, space weather events affecting the Earth and the near Earth space environment.

Instrument(s): Research and Innovation Actions (100%). *The Commission considers that projects requesting a contribution from the EU of 2 million Euro would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.*

PROTEC 2 - 2014: Access technologies and characterisation for Near Earth Objects (NEOs)

Specific Challenge:

In order to conduct close approach missions to NEOs, or to undertake mitigating demonstrations, it will be necessary to have a number of specific technologies and instruments readily available to conduct missions to asteroids with very weak gravitational fields.

In parallel, it is fundamental to acquire in-depth information on the internal structure and other physical properties of NEOs, not only for the design of most impact mitigation missions, but also for the assessment of the consequences of an impact on Earth.

Scope:

In the first type of action, research is to be conducted on technologies and instruments relevant to orbiting, hovering, and manoeuvring close to small asteroids with very weak gravity fields. Accurate guidance, navigation and control (GNC) of a high-velocity (> 10 km s-1) kinetic impactor spacecraft into a small NEO, as well as orbit determination and monitoring (types of observation and precision) before, during, and after a mitigation attempt, require further technology development. The same applies to means for material sampling and collection, in-situ analysis and sample return to Earth, which are of relevance to physical characterisation.

In actions covering the second specific challenge, scientific research is needed to identify suitable objects for possible missions for detailed characterisation of properties and for developing demonstration and testing of deflection techniques. A characterisation of the NEO population, in particular the small NEOs (50 – 300 m) is to be undertaken. Typical mitigation-relevant physical properties of NEOs include sizes, albedos, mineralogy, shapes, densities, structures, porosities, frequency of binaries, frequency of rubble piles, etc.

Expected Impact:

For the first type of action, projects are expected to contribute to the development of essential techniques and instruments, which would allow approaching and navigating in close vicinity and on the surface of asteroids and comets. The projects should aim at ESA TRL 5-6 (Technology Readiness Level) and are expected to address technologies needed for deflection as well as for sample return missions.

Projects addressing the second specific challenge are expected to lead to a comprehensive characterisation of NEO properties, which is mandatory for any mitigation or deflection mission. Data is to be made available in an open repository. The identification of suitable targets and their accessibility for exploratory missions or mitigation demonstration missions is expected. An analysis of possible future actions in European programmes such as Horizon 2020 and ESA actions is expected.

Instrument(s): Research and Innovation Actions (100%).

Call "Competitiveness of the European Space Sector: Technology and Science" – 2014

H2020-COMPET-2014

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–[2] 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.

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.

[2] Technology Readiness Levels are defined in the introduction to LEIT. 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". European Space Agency, Advanced Studies and Technology Preparation Division, http://sci.esa.int/sre-ft/50124-technology-readiness-level/05

COMPET 1 - 2014: 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. 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 EC-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 Urgent Actions as part of the Joint EC-ESA-EDA task force on Critical Technologies (see Ref XXX), 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. These encompass platform, payload and launcher technologies. In this context, technological spin in and/or bilateral collaborations should be enhanced between European non-space and space industries and projects 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.

Independent access to space has been singled out by Ministers responsible for space as one of the main objectives of the EU space policy. A specific topic will be devoted to it.

Expected impact:

- To reduce the dependence on critical technologies and capabilities from outside Europe for future space applications, as identified in the EC-ESA-EDA Critical Space Technologies for European Strategic Non-Dependence (see Ref XX).
- 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, projects 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 projects 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.
- Projects should improve the overall European space technology landscape and complement the activities of European and national space programmes.
- Proposals that include development activities up to space qualification will be favoured in terms of their potential impact.

Instrument(s): Research and Innovation Actions (100%). *The Commission considers that projects requesting a contribution from the EU of 2.5 million Euro would allow this specific topic to be addressed appropriately. A maximum of one project per identified Urgent Action line will be selected for funding. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.*

COMPET 2 – 2014: Independent access to space

Specific challenge:

The ability to access space is a vital strategic capability for Europe as it has been underlined by EU Council in several resolutions and conclusions. Such capability is necessary to ensure a leading position alongside other major spacefaring nations. The present topic will support research into breakthrough technologies to provide access to space which are complementary and in synergy with the on-going work undertaken by Member States and the European Space Agency to develop launcher capabilities. Research efforts should demonstrate strengthened Europe's capability in terms of having an available, reliable and competitive launch service to ensure the development of a world-class European space-industry and satellite-based applications and services.

Scope:

All possible technologies will be considered provided that they can demonstrate complementarity and no overlapping with on-going launcher developments. Due consideration will be given to the potential of these technologies to strengthen competitiveness and cost-efficiency as well to their commercial potential. Areas of potential improvements for conventional launching systems could be: high energy density green propellants, high performance engineered materials for advanced lightweight structures, innovative avionics solutions for safer and more reliable launch operations, adaptation and use of the launcher last stages for providing extra functionality regarding multiple access to space of small payloads and platforms. Regarding innovative systems to access space, proposal could cover, among other disruptive technologies: air breathing propulsion systems, ground launch assist (hypervelocity accelerators for low-cost delivery of large numbers of small, high-g tolerant payloads to LEO); air launch / drop systems, and systems based on sub-orbital flights for delivering payloads and platforms.

Expected impact:

The technological developments to be addressed must demonstrate a relevant optimisation of the launch propulsion systems in terms of fostering the European capabilities of accessing space.

Incremental or disruptive advances over current technologies and functionalities must be proved and assess in terms of commercial viability. In this context, key advances to achieve a quick and frequent access to space will be prioritised.

Instrument(s): Research and innovation actions (100%).

COMPET 3 – 2014: In-Space electrical propulsion and station keeping

Specific challenge:

Advances in-Space propulsion beyond the use of chemical technologies will enable a much more competitive development and exploitation of Space systems. The challenge is to enable major advances in electric propulsion for in-space operations and transportation, and guarantee the leadership of European capabilities in electric propulsion at world level within the 2020-2030 timeframe. The objective is to propose a Programme Support Activity (PSA), for the future implementation of a Strategic Research Cluster (SRC) in Horizon 2020. The overall budget for such an SRC could be in the range of several tens of millions of euros and should achieve a full in-orbit validation of the electric propulsion systems developed at pre-commercial level during the SRC. This validation is to be achieved not later than 2023.

Further information on the concept of a Strategic research cluster in Horizon 2020 is available from http:/xxxx.

Scope:

In-Space transportation begins where the launch vehicle upper stage separates. It comprises the functions of primary propulsion, reaction control, station keeping, precision pointing, and orbital manoeuvring necessary for all satellites.

Some of these technologies will be used in commercial and governmental communications satellites for orbit positioning and station-keeping. Further development is needed to maintain European leadership in this domain which is threatened by a very strong competition of non-European actors aiming at proposing all-electric platforms. Research and development of promising electric propulsion technologies, far beyond the current state of the art, is encouraged. A first objective for the SRC is to foster incremental advances in the development of thrusters by extending their specifications and operative ranges by a factor of at least 3. A second objective is to set up activities for promoting possible disruptive RTD in the field of in-space electrical propulsion.

In order to assess the commercial viability of the technologies developed, the proposal should envisage studying the impact of using electrical thrusters in several types of generic platforms. Examples of these are: kick stages, propulsive modules of interorbital vehicles (as tugs for contribution to in-orbit services), transfer of different payloads towards deep space, GTO transfer for communication satellites, and orbit control. To validate the electrical thrusters to be developed at pre-commercial level during the SRC, a qualification flight will have to be executed not later than 2023. This will serve as a validation for future mission implementation.

Alternative approaches, not already planned for development by other entities are encouraged.

Expected impact:

The initial expected life of the PSA action is 5 years. In this time, the consortium should have delivered:

- Identification and definition of all the activities required to address the challenge of this topic. The contents of the activities must be in agreement with the objectives and boundaries defined in the scope.
- A fully detailed master plan to coordinate all the activities for the whole duration of the SRC.
- A plan for the analysis and evaluation of the results during the execution of the activities within the SRC.
- A plan for the specific exploitation and potential use of the SRC expected outputs.
- A risk assessment and contingency analysis for the SRC.

The execution of the SRC during a first period of 5 years will assure reaching the TRL-6 in the future devices that will form the next-generation of European electrical space thrusters. The goal at the end of the SRC will be to guarantee the leadership of European capabilities in electric propulsion at world level within the 2020-2030 timeframe.

Instrument(s): One Coordination and Support Action (100%).

COMPET 4 – 2014: Space Robotics Technologies

Specific challenge:

The challenge is to enable major advances in space robotic technologies for future on-orbit satellite servicing. The objective is to propose a Programme Support Activity (PSA) for the future implementation of a Strategic Research Cluster (SRC) in Horizon 2020. The overall budget for such an SRC could be in the range of several tens of millions of euros and should achieve an in-orbit demonstration at a significant scale of an autonomous system with key elements for the future sector of on-orbit satellite servicing. This demonstration will be achieved not later than 2023. Further information on the concept of a Strategic research cluster is available from http:/xxxx.

Scope:

Driven by the objective of on-orbit satellite servicing, the final target of this topic is to increase the competitiveness of the European Space Industry in sectors demanding robotics solutions. The benefit of investing in space robotics technologies for future on-orbit satellite servicing should also be of benefit in sectors as human-robotic partnership, orbital debris removal, and in-situ planetary exploration but would also spin-off in all terrestrial activities where human intervention is impossible or too hazardous (Submarine, Nuclear Biological and Chemical Industries Crisis Management etc.). Therefore, synergies with the current industrial robotics shall be fostered.

The SRC led by this PSA is expected to address robotics issues in a wide sense at two levels: (1) design and manufacturing of reliable and high performance robotic building blocks for operation in space environments, and (2) developing advanced robotic concepts and functions.

The robotic building blocks (1) will likely involve: sensors and actuators, materials and structures, manipulators and tools, hardware and control of robotic systems, processing algorithms; sensor fusion and perception; communications and energy systems.

The robotic concepts and functions (2) are expected to involve several of the following areas: mobility, manipulation, and vision; interoperability with other robots; human-machine co-operation; partly and highly autonomous operations (in very remote locations that have high Earth communication latencies).

As most of the space robotics technologies required are mature enough (with the exception of the autonomous operations that require demonstration and/or validation), particular effort must be made to achieve an effective application of technology, i.e. rigorous systems engineering and system performance analysis, rather than an approach based on pure technology development. To validate the performance of integrated servicing systems three different levels of demonstration can be foreseen: Earth analogues; ISS infrastructure and in-orbit demonstration.

In any case, the final stage of the SRC must involve a space demonstration, understood as the spaceflight of a scaled version of a particular technology. However, a validation of the technology at the level of a qualification flight for a future mission is not required.

Expected impact:

The initial expected life of the PSA action is 5 years. In this time, the consortium should have delivered:

- Identification and definition of all the activities required by 2023 to address the challenge of this topic. The contents of the activities must be in agreement with the objectives and boundaries defined in the scope.
- A fully detailed master plan to coordinate all the activities for the whole duration of the SRC.
- A plan for the analysis and evaluation of the results during the execution of the activities within the SRC.
- A plan for the specific exploitation and potential use of the SRC expected outputs.
- A risk assessment and contingency analysis for the SRC.
- The execution of the SRC during a first period of 5 years will assure an advance in European robotics technologies for space: consolidation of building blocks, development of advanced concepts and functions. This will be done with the aim of paving the way for the European activity in areas were robotics are key enabling technologies, such as for example on-orbit servicing, orbital debris removal, autonomous operations in planetary surfaces.

The SRC designed and developed by the PSA is expected to deliver its final results at the end of the H2020 cycle (2023-2024). During its lifetime:

- The SRC shall exploit the potential to generate intense public interest by demonstrating an application (such as satellite repair, refuelling or “cleaning space”, etc.), which citizens can easily relate to.
- Some or all the entities involved in the operational projects of the SRC should be in a privileged position to explore the for-profit viability of some or all the solutions and technologies developed within the SRC.

Instrument(s): One Coordination and Support Action.

COMPET 5 – 2014: In-Orbit demonstration/Validation (IOD/IOV)

Specific challenge:

The challenge in H2020 is to make access to space possible for new technologies and innovations by means of in-orbit demonstrations (IOD) and/or validations (IOV). This maturity level is crucial to enable the competitiveness, non-dependence and innovation of the European space sector. Apart from assessing launching opportunities, platforms may need to be developed (complementary to those already existing in Europe) to affordably harness existing European launching capabilities for placing new space products in orbit.

At this initial stage of Horizon 2020 studies are needed to help define the envelope and the requirements for the implementation of affordable missions of IOD/IOV (in combination with the launching system to be selected) within the Horizon 2020 timing and development contexts.

Scope:

Many of the technologies developed for space will need to be demonstrated in orbit in order to be accepted as new space products. In many cases, in order to be considered for future missions, flight heritage is a requirement, in particular when a high risk is associated with the use of totally new technologies and innovations. It is the intention of the Commission to ensure that two opportunitites for IOD/IOV are co-funded during H2020 (one in 2016-2018 and another one in 2019-2020) as a final step in the process of supporting space RTD.

IOD refers to the spaceflight of a scaled version of a particular technology or critical technology subsystem, which would still need further steps to be ready for mission adoption. IOV would already serve as a qualification flight for future missions implementation. Such a successful validation flight of a particular technology would not require any additional space testing before it can be adopted for a specific mission.

The studies to be performed should define possible scenarios for one or both future flight opportunities to be developed as part of this topic, one in 2020 and another one in 2023. The intention is to cater not only for European technology developments (components, payloads, spacecraft subsystems, etc.) and/or innovative system architectures from EU R&D programmes, but also for those from projects financed by ESA, National Space Programmes or European private initiatives (e.g. satellite communications).

The studies will cover proposals for the IOD/IOV platforms in connection with affordable launch systems. A description of the missions to be accomplished, with the resources availble to host a technological package for demonstration are also required. The studies will have to consider different approaches for the platform for the IOD/IOV activities, such as: dedicated spacecraft, autonomous multiple payload dispenser systems, segments/rings and upper stages of launchers, among others. Proposed solutions should be suitable to recurrently place new space products into orbit to perform relevant missions, and to demonstrate their viability by proving maturity of technology payloads.

The future technologies that will be hosted in the IOD/IOV missions will have a TRL equal or higher than 6 at the moment of the presentation of the proposal. The industrial applicability of

the technologies in the short/medium term is an important requirement. Other prioritisation criteria will be based on the balance of packages to ensure the maintenance of a relevant number and variety of technologies in order to optimize the IOD/IOV.

Expected impact:

Identification of a portfolio of solutions and opportunities to implement IOD/IOV missions for enabling the flight and operation of innovative space technologies developed in Europe. These solutions will be fully parametrised (technical aspects, implementation of the technologies and the mission, cost, commercial viability).

Downselection of those solutions which are suitable for a Horizon 2020 context, and which are RTD based and innovative.

Instrument(s): Coordination and Support Actions. *The Commission considers that projects requesting a contribution from the EU of 500.000 Euro would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.*

COMPET 6 – 2014: Bottom-up space technologies at low TRL

Specific challenge:

In the mid- and long-term the competitiveness of the space sector and its ability to serve the Union's internal and external policies including the Common Security and Defence Policy depends on the continuous incorporation of novel, or 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, 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 from non-space sectors, such sectors must be actively researched for potential ideas. This should mobilise both 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 activities and demonstrate technologies that are potentially disruptive, and not only incremental. Such highly innovative technologies should lead to radical improvements in performance, and will enable emerging missions. Drastic improvements in miniaturisation, efficiency and functionality are expected.

Proposals based on low TRL (1-3) ideas and technologies which could have a final application in future space systems are solicited. The target is to demonstrate these up to TRL 4-5. In this first call, proposals on the fundamental areas of knowledge are foreseen, in which, among others, some of the Key Enabling Technologies (KETs) play a major role. In particular, proposals are sought with relevance for the fields of: "high-resolution imagery", "radiation-hardened instrument components", "in-situ sensors/instruments of physical

parameters" and "advanced satellite communications techniques".

Expected impact:

Spinning-in of new enabling technologies to space systems 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.

Projects should mobilise new incorporation of non-space actors, especially SMEs, and research groups into the space landscape.

Ideally projects should result in developments affecting a range of sectors.

Instrument(s): Research and innovation action (100%). *The Commission considers that projects implemented in less than 24 months and requesting a contribution from the EU of 1 million Euro would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts. Only up to two projects will be financed on each of the four lines ("high-resolution imagery", "radiation-hardened instrument components", "in-situ sensors/instruments of physical parameters" and "advanced satellite communications techniques") foreseen.*

Space exploration and science

Space exploration is a catalyst for the emergence of new technologies, scientific results and innovation that have significantly improved the safety and quality of life on Earth delivering value across all economic areas. Technological priorities for Europe covering the whole spectrum of space exploration activities have been identified and endorsed by EU Council (automation and robotics; novel energy production and storage; advanced propulsion; life support systems). The International Space Station (ISS) plays a key role as a platform for the preparation of next human exploration missions. Life support is one of the key technologies for human exploration and a domain that can bring together a wide array of participants from the space sector and beyond.

Europe has also, over the years, established a leading position in space science, with missions to various destinations in our Solar System. The proposed approach is to enable the European space science community to make a concerted effort to capitalise on current European space science infrastructure, and to achieve the highest possible science return from operational and future space missions. To this end coordinated activities which further science in the context of space missions, i.e. preparing for space missions and deploying scientific activities in support of future or operational missions will be supported, as well as activities that enhance scientific exploitation of space data emphasising the use of data from European space missions. The 2014 call topic on space science focuses on Mars data and on the definition of a European sample curation facility. Proposers should note that helio/plasma physics and Earth

observation data are dealt with in call sections on Earth observation and space weather respectively.

COMPET 7 - 2014: Space exploration – Life support

Specific challenge:

ISS is the current cornerstone of European activities in human spaceflight. With its assembly now complete, and with several years of operations ahead until 2020 and possibly beyond, ISS should be used to the fullest extent for optimising and broadening the scientific, technological and operational return of Europeans investments. ISS should also be further used as a test-bed for the preparation of future exploration ventures as well as for enabling overall scientific progress and provide benefits to citizens. The selection of these projects in the area of life support will depend on their suitability for research on-board ISS.

Scope:

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. Projects demonstrating closed loop regenerative life support system technologies (including for instance modelling of complex microbial ecosystem, trace elements, circular dynamic system) for safe production of healthy consumables and in particular food for future manned exploration missions should be proposed to be implemented by leveraging synergies between space and non-space actors (e.g. biotechnology, nutrition, food, industrial ecology, health sectors). These on-ground preparatory activities are a prerequisite to potential flight hardware development and activities to be conducted on-board ISS.

Expected impact:

Projects are expected to prepare the ground for further innovative development of R&D in human spaceflight and future terrestrial applications. Systems are expected to be developed and tested on the ground and demonstrate operational capability (or close to). An important impact is also the potential applicability of these test projects on-board ISS. Results will therefore have to attain the necessary maturity to fulfil this promise.

The results are expected to have a significant impact in stimulating non-space actors' contribution to space exploration. This research topic should attract active participation of researchers in academia and SMEs. The results should be actively disseminated in the relevant scientific publications, as well as towards potential user communities as appropriate.

Instrument(s): Research and innovation actions (100%). *The Commission considers that projects requesting a contribution from the EU of 2 to 4 million Euro would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.*

COMPET 8 - 2014: Science in context: sample curation facility and scientific exploitation of data from Mars missions

Specific Challenge:

Two specific areas of space science where there is a significant underinvestment when compared to the potential scientific return for Europe are sample curation facility and the exploitation of data of Mars.

One of the main mid-term goals of global space exploration activities is to bring back samples from the Moon, Mars, or asteroids. These sample return missions will be developed in the context of ESA programmes or in the international context. However, a European extra-terrestrial sample curation facility will be required in preparation for such missions. The challenge here is to study and map all the aspects required to develop such a facility at the European level, taking into account specificities of receiving potential Moon, Mars and Asteroids samples.

With the highly successful Mars Express mission, launched in 2003, and still operational, Europe firmly established its role on Mars science and exploration. In the last decade an extensive amount of data has been acquired of the atmosphere, surface and sub-subsurface of Mars. The challenge is to fully exploit this data for fundamental scientific purposes, and in preparation for the next set of European Mars missions to be launched in 2016 (ExoMars orbiter and lander) and 2018 (ExoMars rover) and prepare for a future Mars Sample Return international campaign.

Scope:

An action on sample curation facility should analyse what facilities, analytical methods and instruments, and analogue samples are required in what timeframe taking into account specificities of receiving potential Moon, Mars and Asteroids samples in order to adequately serve future sample return mission that will take place with European involvement.

For the exploitation and development of tools for the exploitation of data of Mars for scientific research, and analysis in preparation of the two ExoMars missions the scope is to rely on the data available through the ESA Planetary Science Archive or other means (e.g. instrument teams) which may be combined with data from NASA missions. This includes data from the atmosphere, surface and sub-surface of Mars, as well as data from the Martian moons Phobos and Deimos. Enhanced data products would be fed back to the ESA archives.

Expected impact:

In the first case the action is expected to result in a roadmap, including analysis of opportunities and risks, for the implementation of a European extra-terrestrial sample curation

facility taking into account specificities of receiving potential Moon, Mars and Asteroids samples.

In the second case projects are expected to result in scientific publications, open access tools for data use interacting with European archives, and in high-level data products, such as digital maps or atmospheric models, which can be used in the preparation for the operational phases of the ExoMars missions.

Instrument(s): Research and innovation action (100%). *The Commission considers that projects requesting a contribution from the EU of 2 million Euro would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.*

International Cooperation in Space matters

COMPET 9 - 2014: Technology "demonstrator projects" for exploration

Specific challenge:

The EU, together with ESA, initiated the high-level platform for space exploration with three dedicated international high level conferences at ministerial level (i.e. Prague in 2009, Brussels in 2010, and Lucca in 2011). The next conference will be hosted by the United States in January 2014. One of the potential outcomes of the International Space Exploration Forum (ISEF) as proposed by Europe is to advance towards the identification of possible future collaboration domains building on technology "demonstrator projects," to be proposed by one or more actors and linked to exploration missions.

Scope:

This project will allow implementing the technology "demonstrator projects" to be initiated after the ISEF meeting. These demonstrator projects would target underpinning enabling technologies for space exploration, notably robotics, energy, propulsion or life support. Actors, including international partners, interested to participate to such demonstrator projects could form clusters around several technology "demonstrator projects". Technology demonstrator projects open to international partnerships would allow developing cutting edge space technology making an important success factor for European researchers and industry.

In line with the objectives of the Union's strategy for international cooperation in research and innovation (COM(2012) 497) and the Commission Staff Working Document "A Role for Europe within a Global Space Exploration Endeavour" preparing for a European position for ISEF, international cooperation is encouraged, in particular with countries active in space exploration.

Expected impacts:

Clusters around technology "demonstrator project" would meet and discuss how to build such

projects, including governance, technical appraisal, costing aspects and possible funding arrangements. Workshops and information events should be part of the activity. Concrete results and further steps may be presented at the next ISEF meeting.

Instrument: Coordination and Support Actions (100%). *The Commission considers that projects requesting a contribution from the EU of 1 million Euro would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.*

Outreach and Communication

COMPET 10 – 2014: Outreach through education

Specific Challenge:

Space endevours bear a significant potential of inspiration and motivation for the younger generations. Positive exposure to and experiences in the space domain can contribute moreover to building long-term partnerships between peoples from different cultural backgrounds and countries inside and outside Europe. The challenge is to design and run sustainable outreach activities which can act as catalysers, motivating pupils and students at different ages and education levels.

Scope:

One of the main obstacles for the development and sustainability of the European space industrial fabric (and the delivery of cutting-edge scientific achievements) is the lack of scientists, engineers and technicians with specific interest on the area of space research and development.

The main delivery of the action should be an initiative capable of attracting the interest of a significant number of students towards space, while creating at the same time a relevant impact outside the targeted population in terms of news coverage, social-media interest, stakeholders' involvement, etc.

The key advancements of the European space initiatives (FP7-H2020 projects, Copernicus and Galileo) should be given a privileged position in the proposal, but the main objective should remain attracting the interest of students, mainly European, for space science and technology.

Proposals should take into account similar activities of ESA and national education programmes. They could focus in the context of the classroom or outside the normal classroom environment.

Expected Impact:

The expected impact as a whole is developing and testing certain tools and mechanisms for children and/or teenagers (and potentially teachers) to know more about space science and technology and the European initiatives in this field. The testing of tools should pay special attention to potential differentiated results in terms of gender or socioeconomic status.

By the end of the action the initiative should have proven its capacity to:

- Reach out to a significant number of students among the target group and stimulate an active response among a significant number of them.
- Achieve a significant coverage by media and attention by stakeholders.
- Potentially, being able to track and estimate the results of the action, sampling the numbers of students involved and the numbers of students that opt for a technical career related to space when compared to the general population of students in their cohorts.

Instrument(s): Coordination and Support Actions. *The Commission considers that projects requesting a contribution from the EU of 1 to 2 million Euro would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.*

COMPET 11 – 2014: Transnational and international cooperation among NCPs

Specific Challenge:

The action shall reinforce the network of National Contact Points (NCP) for Horizon 2020 within the Space domain. Activities are to build on the achievements obtained already in FP7. Special attention should be given to helping less experienced NCPs rapidly acquire the know-how accumulated already in other countries, and to promote the SMEs participation within the Space Theme..

Scope:

One of the best ways to reinforce the actions of the NCP network is to identify and share good practices. This may entail various mechanisms such as benchmarking, joint workshops, training, and twinning schemes. Practical initiatives to benefit cross-border audiences should be included, such as the organisation of information days in preparation of calls, and trans-national brokerage events. The specific approach should be adapted to the nature of the theme and to the capacities and priorities of the NCPs concerned.

Proposals are expected to include all European NCPs who have been officially appointed by the relevant national authorities. If certain NCPs wish to abstain from participating, this fact should be explicitly documented in the proposal.

The action may also involve Horizon 2020 contacts from third countries and the international cooperation partner countries. This is of particular importance for countries which have concluded specific S&T cooperation agreements in the Framework Programme context, and

where national contact persons may also have been nominated. Where such Horizon 2020 contact points have not yet been active, the establishment of a Horizon 2020 contact could be promoted through the national space agency or space research institutes.

Expected Impact:

The action is expected to lead to an improved NCP service across Europe, therefore helping to simplify access to Horizon 2020 calls, lowering the entry barriers for newcomers, and raising the average quality of submitted proposals. A more consistent level of NCP support services across Europe and outside should result.

More effective participation of SMEs and organisations from third countries is expected, alongside European organisations, in line with the principle of mutual benefit.

The impact on these areas is expected to be achieved within a three to four years' timeframe. For this reason, it is considered that the project should last for at least 3 years.

Instrument(s): Coordination and Support Actions. *The Commission considers that one project requesting a contribution from the EU of 2 million Euro would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.*

Call "Earth Observation" – 2015

Space enabled Applications

New innovative geo-spatial products for commercial exploitation are enabled by space data, and directly enhance the competitiveness of the European value-adding and geo-information service sector. This will also further validate the premise that space systems produce information complementary to in-situ data, which often cannot be acquired in any other way. This is key to return on the major space investments made in Earth Observation space infrastructure, and validating Europe's investments made, especially in the Union's Copernicus programme. With the availability of Copernicus data, actions will be funded in 2015 which have high business potential and are developing space enabled EO products and applications close to the market.

EO 1 – 2015: Bringing EO applications to the market

Specific challenge:

If space investments made in earth observation are to generate economic return, it is essential that EO products and information generation are taken out of the research environment and products are put into the market. For such applications 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 user, in order for users to accept the innovative potential which the product promises. Furthermore, the commercial providers will have to prove 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:

The outcome of this innovation project [ref to funding art in H2020 RoP] 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, but priority will be given to those applications which cannot be addressed in the context of the calls of Horizon 2020 societal challenges. A preference will also be given to 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://xxxx.

Expected impact:

Projects 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.

Projects are expected to enhance the European industry's potential to take advantage of market opportunities and establish leadership in the field, and to boost business activity.

It is expected that projects 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 a significant number of new jobs.

Instrument(s): Innovation actions (70%). *The Commission considers that projects requesting a contribution from the EU of 1 million Euro would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.*

Tools for access to space data

Efficient and widespread exploitation of the existing and planned European space infrastructure is only possible if further effort can be made for the processing, archiving and standardised access to retrieved satellite data. Sustainable availability has also to be coupled with generic search, data-mining and visualisation techniques inviting wide re-use, also through standardised approaches. Such re-use has to be achieved at European and global level, and coordination with mechanisms promoted in the context of the Global Earth Observation System of Systems (GEOSS) is to be achieved.

For successful exploitation of space borne sensors to take place, it is furthermore necessary to develop easy-to-use, calibrated and validated data products, taking into account the latest and emerging remote sensing capabilities. Validation efforts have to provide researchers and users with uncertainty ranges of space data to make the subsequent usage verifiable.

EO 2 – 2015: Stimulating science use of Copernicus Sentinel Data

Specific challenge:

Europe's investment in the Copernicus Sentinel satellites will provide Europe with an unprecedented source of operational satellite data. The first and largest streams of data will

become available from Sentinel 1 (SAR data) during 2014, to be followed shortly thereafter with data from sentinel 2 and 3 (optical imaging data). Data streams are expected to amount to several terabyte per satellite orbit, thereby delivering unprecedented temporal and spatial resolution and data continuity, calling for new data handling and processing paradigms. While this data is ingested into the operational Copernicus services, wide scientific re-use is limited and still needs to be stimulated with easy-to-use interfaces for scientific R&D.

Scope:

To utilise the high scientific potential of the Sentinel data, stable and predictable access methods need to be developed, such as

- research into efficient information retrieval from observations;
- developing software to read and transform data for access by non-specialist, including data mining techniques;
- developing data fusion methods (data from several sentinels and /or other contributing satellite missions);
- advanced visualisation techniques (allowing also for sensory exploration of data beyond visual experience).

A particular aspect of interest is also the international use and re-use of Sentinel data, as acceptance of Copernicus data in a global context will be a key to success of Europe's contribution of GMES to GEOSS.

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://xxxx.

Expected impact:

Significantly wider re-use of data should be achieved, in Europe as well as internationally. Further opportunities for new uptake of satellite data should be created. Possible models for operational supply of data to users, especially for further scientific exploitation should be demonstrated. The work should promote the definition of best practices and their adoption in scientific and commercial user communities, and in a GEOSS context if possible.

This research topic should attract active participation of researchers in academia, specialising on the use of sentinel data and their integration and/or comparison with other sensor data. It should actively involve students performing research with satellite data.

Instrument(s): Research and Innovation Actions (100%). *The Commission considers that projects requesting a contribution from the EU of 2.5 million Euro would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.*

EO 3 – 2015: Climate Change relevant space-based Data reprocessing and calibration

Specific Challenge:

Research areas such as Climate Change address long time periods of data records, where

historical data are essential to identify reliable trends and anomalies. The data from past remote sensing missions available either from European and non-European missions, must be made accessible in a way to establish seamless time series of similar observations, contributing to the generation of Climate Data Records across sensors and technologies over two decades and more. At the same time, the relevance of space derived variables and products need to be increasingly adapted and enhanced to optimally fit the requirements from current policy issues in a variety of EU sectors. This includes the assessment of mitigation and adaptation strategies in different societal benefit areas.

Scope:

The remote sensing data maintained in archives of the relevant data holding agencies will require to be reprocessed to ensure the generation of consistent time series of data and products with the most up to date operational algorithms. These time series shall benefit from the panoply of available source data to ensure producing the most reliable, accurate, stable and complete Climate Data Records. Manipulation of historical data at the relevant sources will be required to enable quick analyses, bulk reprocessing and wide access to different science and application communities. Interoperability of diverse observation collections, sensor calibration and sensor-to-sensor cross calibration will have to be included, as well as estimates of the associated uncertainties and biases.

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://xxxx.

Expected Impact:

The project is expected to significantly contribute to the availability of validated space-based observational data on Climate Change as a long time series, providing consistent Climate Data Records over a time period corresponding to the satellite era.

Instrument(s): Research and Innovation Actions (100%). *The Commission considers that projects requesting a contribution from the EU of 6 million Euro would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.*

EO 4 – 2015: Technology developments for commercial imaging

Specific Challenge:

Observation concepts based on fractionated sensors (e.g. telescope arrays) have revolutionised astronomy, and their observation potential from space (swarm missions, satellite constellations…) has yet to be realised. This represents a departure from an approach of many different sensors residing on one satellite, in favour of many smaller single-sensor missions. It remains to be established for which areas of Earth observation (land monitoring, atmospheric

measurements etc.) this approach might be particularly effective, be it in performance, risk management and cost effectiveness. Equally, it needs to be understood which technologies would be needed to allow a network/constellation to act as one instrument. Specific requirements for the sensors may also be needed to allow benefit to be taken of such mission concepts.

Scope:

Research should be undertaken to review the emerging fractionated observation system concepts. The required technology challenges as regards interfacing, formation flying, communication within the constellation or with ground stations are to be identified. Potential benefits to be obtained (e.g. monitoring performance, risk mitigation, cost effectiveness, responsiveness) are to be examined in light of observation needs in different earth observation domains. Constellations of instruments might be of the same instrument type, or include a variety of different instruments. The results obtained should enable mission designers and implementers to decide what missions should be initiated for which application areas.

Expected Impact:

Projects are expected to contribute to increasing the effectiveness of future developments by addressing

- significant advances in performance
- greater coherency between different measurement sources,
- mission planning parameters.

Instrument(s): Research and Innovation Actions (100%). *The Commission considers that projects requesting a contribution from the EU of 2.5 million Euro would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.*

Call "Protection of European Assets in and from Space" – 2015

The present call concerns space debris as Near Earth Objects and space weather have been already covered in the 2014 call of this Work Programme. The support to the emergence of a **Space Surveillance and Tracking** capacity at European level is channelled through "Other actions (not subject to calls for proposals)"

PROTEC 1 -2015: Passive means to reduce the impact of Space Debris

Specific Challenge:

Reducing the impact of collisions between active satellites and orbital debris is a challenge that needs to be addressed at multiple levels. In addition to SST which addresses anti-collision other aspects must be considered:

1. Prevention, avoid adding new debris to the already large debris population.
2. Mitigation, specifically de-orbiting solutions for satellites and launcher upper stages at the end of their operational life.
3. Protection, i.e. shielding satellites from impact of small debris.

Scope:

To develop and test concepts and technologies needed for safe de-orbiting and disposal of space objects. Planned end-of-life de-orbiting or safe disposal of new satellites and launch vehicle's upper stages as well as non-technical issues including legal issues should be considered.

Expected Impact:

Innovative and cost effective solutions for post-mission disposal of satellites and launcher upper stages which are in line with or exceed international and European guidelines and legal requirements.

Instrument(s): Research and innovation actions (100%). *The Commission considers that projects requesting a contribution from the EU of 4 million Euro would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.*

Call "Competitiveness of the European Space Sector: Technology and Science" – 2015

Following the equivalent 2014 call within this Work Programme, the 2015 call maintains the support in certain key areas (critical technologies, access to space, low TRL) while extending its reach to other areas of space science and exploration and new domains of international cooperation.

Competitiveness of European Space Technology

COMPET 1 – 2015: 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. 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 EC-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 Urgent Actions as part of the Joint EC-ESA-EDA task force on Critical Technologies (see Ref XXX), 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. These encompass platform, payload and launcher technologies. In this context, technological spin in and/or bilateral collaborations should be enhanced between European non-space and space industries and projects 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.

Expected impact:

- To reduce the dependence on critical technologies and capabilities from outside Europe for future space applications, as identified in the EC-ESA-EDA Critical Space Technologies for European Strategic Non-Dependence (see Ref XX).
- 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, projects 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 projects 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.
- Projects should improve the overall European space technology landscape and complement the activities of European and national space programmes.

Proposals that include development activities up to space qualification will be favoured in terms of their potential impact. Technologies identified on the list of Urgent Actions and not addressed in the equivalent 2014 call will be preferentially considered.

Instrument(s): Research and Innovation Actions (100%). *The Commission considers that projects requesting a contribution from the EU of 4 million Euro would allow this specific challenge to be addressed appropriately. A maximum of one project per identified Urgent Action line will be selected for funding. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.*

COMPET 2 – 2015: Independent access to space

Specific challenge:

The ability to access space is a vital strategic capability for Europe as it has been underlined by EU Council in several resolutions and conclusions. Such capability is necessary to ensure a leading position alongside other major spacefaring nations. The present topic will support research into breakthrough technologies to provide access to space which are complementary and in synergy with the on-going wok undertaken by Member States and the European Space Agency to develop launcher capabilities. Research efforts should demonstrate Strengthen Europe's capability in terms of having an available, reliable and competitive launch service to ensure the development of a world-class European space-industry and satellite-based applications and services.

Scope:

All possible technologies will be considered provided that they can demonstrate complementarity and no overlapping with on-going launcher developments. Due consideration will be given to the potential of these technologies to strengthen competitiveness and cost-efficiency as well to their commercial potential. Areas of potential

improvements for conventional launching systems could be: high energy density green propellants, high performance engineered materials for advanced lightweight structures, innovative avionics solutions for safer and more reliable launch operations, adaptation and use of the launcher last stages for providing extra functionality regarding multiple access to space of small payloads and platforms. Regarding innovative systems to access space, proposal could cover, among other disruptive technologies: air breathing propulsion systems, ground launch assist (hypervelocity accelerators for low-cost delivery of large numbers of small, high-g tolerant payloads to LEO); air launch / drop systems, and systems based on sub-orbital flights for delivering payloads and platforms.

Expected impact:

The technological developments to be addressed must demonstrate a relevant optimisation of the launch propulsion systems in terms of fostering the European capabilities of accessing space.

Incremental or disruptive advances over current technologies and functionalities must be proved and assess in terms of commercial viability. In this context, key advances to achieve a quick and frequent access to space will be prioritised.

Technologies identified not addressed in the equivalent 2014 call will be preferentially considered.

Instrument(s): Research and innovation actions (100%).

COMPET 3 – 2015: 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 from non-space sectors, an active search must be done in non-Space areas of knowledge. 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 and increased functionality are as well expected.

Proposals based on low TRL (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 first call, proposals on the fundamental areas of knowledge are foreseen, in

which for example some of the Key Enabling Technologies (KETs) are playing a major role. In particular, proposals are sought with relevance for the fields of: "energy storage", "energy production", "materials and structures", "wireless power transmission" and "thermal management systems" in the domain of space.

Expected impact:

Spinning-in of new enabling technologies to space systems 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.

Projects should mobilise new incorporation of non-space actors, especially SMEs, and research groups into the space landscape.

Ideally projects should result in developments affecting a range of sectors.

Instrument(s): Research and Innovation Actions (100%). *The Commission considers that projects implemented in less than 24 months and requesting a contribution from the EU of 1 million Euro would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts. Only up to two projects will be financed on each of the five lines foreseen ("energy storage", "energy production", "materials and structures", "wireless power transmission" and "thermal management systems").*

Space exploration and science

In 2015 support for space science and exploration will continue in the area of exploration, focusing on habitat management. Alongside this area, and in order to address the mandate of the specific programme to enable the exploitation of space data, in the area of science the Union will support in 2015 initiatives for the exploitation of astrophysics and comets' data.

COMPET 4 – 2015: Space exploration – Habitat management

Specific challenge:

The International Space Station (ISS) is the current cornerstone of European activities in human spaceflight and a pillar of the European strategy for space exploration. With its assembly now complete, and with several years of operations ahead until 2020 and possibly beyond, it should be used to the fullest extent for optimising and broadening the scientific, technological and operational return of Europeans investments. ISS should also be further used as a test-bed for the preparation of future ventures as well as for enabling overall scientific progress and provide benefits to citizens. The selection of these projects in the area

of habitat management will depend on their suitability for research on-board ISS.

Scope:

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. Projects demonstrating microbial quality control of indoor environment in space (e.g. development of early detection and warning systems for environmental contamination and pollution) should be proposed to be implemented by leveraging synergies between space and non-space actors (e.g. industrial ecology, health sectors). These on-ground preparatory activities are a prerequisite to potential flight hardware development and activities to be conducted on-board ISS.

Expected impacts:

Projects are expected to prepare the ground for further innovative development of R&D in human spaceflight and future terrestrial applications. Systems are expected to be developed and tested on the ground and demonstrate operational capability (or close to). An important impact is also the potential applicability of the test projects on-board ISS. Results will therefore have to attain the necessary maturity to fulfil this promise.

The results are expected to have a significant impact in stimulating non-space actors' contribution to space exploration. This research topic should attract active participation of researchers in academia and SMEs. The results should be actively disseminated in the relevant scientific publications, as well as towards potential user communities as appropriate.

Instrument(s): Research and innovation actions (100%). *The Commission considers that projects requesting a contribution from the EU of 3 million Euro would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.*

COMPET 5 – 2015: Scientific exploitation of astrophysics and comets data

Specific Challenge:

Europe has an impressive track record in space astrophysics and comets research. Astrophysics missions such as XMM- Newton, Herschel and Planck, soon Gaia that which will provide 3D map of our galaxy to the highest possible precision, or the future James Webb Space Telescope are an opportunity for European researchers. The challenge will however be to allow the European astrophysics community to make the best possible use of those missions by supporting space astronomy observation proposals, using archived data, and making comparisons (including calibrations) between different missions, instruments, and between space and ground-based data. Likewise in comets research the challenge will be to allow the European astronomy community to make the best possible use of the current European missions to comets (Rosetta), in combination with information from international

(e.g. NASA, JAXA) missions and ground-based telescope observations.

Scope:

Astrophysics projects shall make use of or prepare for the use of ESA astrophysics missions, possible in combination with ground-based observations, and/or data from non-ESA missions (e.g. NASA, JAXA, or other national missions). Comets projects shall prepare for and make use of the Rosetta mission, possibly in combination with ground-based observations, and/or data from non-ESA missions (e.g. NASA, JAXA, or other national missions).

Both activities shall add scientific value by advanced analysis of the data leading to scientific publications, higher level data products which can be used by other scientists in their studies. possibly in combination with the development of open source tools for processing and visualisation of astrophysics or comets data. Enhanced data products should be suitable for feeding back into the ESA archives.

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. Projects are expected also to add value to existing activities on European and international levels, and enhance and broaden research partnerships.

Instrument(s): Research and Innovation Actions (100%). *The Commission considers that projects requesting a contribution from the EU of 1.5 million Euro would allow this specific challenge dedicated to astrophysics or comets to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.*

International Cooperation in Space matters

The prospects for continued scientific exploration and discovery in the Solar System has increased in recent years with Cassini, Juno, Dawn, New Horizons missions, Rosetta and future planned missions such as OsirisRex and JUICE. Missions are also still considered to Jupiter's Moon Europa and the rest of the Jovian system etc. Many of the science questions inherent to future missions relate to the prospects for life in the Solar System — either due to the potential to find life among the outer planet region or by improving our understanding of the potential contribution to the origin of life on Earth by Solar System material such as comets and asteroids. As a consequence, some of the future mission opportunities and their potential encounters with other Solar System bodies raise serious questions about biological or organic contamination that may be carried to the outer Solar System or contaminate small Solar System bodies that are visited or harvested by space probes.

COMPET 6 – 2015: International Cooperation in space science

Specific challenge:

Europe has a long-standing tradition of international collaboration in space sciences with missions open to international partnerships or by participating to missions of partners (e.g., with USA, Japan, Russia, China, and India). With the increasing international competition in space science Europe should continue to play a leading role in planetary science shaping the research in the field including the elaboration of planetary protection guidelines.

Scope:

In line with the objectives of the Union's strategy for international cooperation in research and innovation (COM(2012)497), international cooperation is encouraged, in particular with space powers active in planetary science. The diverse range of competences spread among universities, research institutes, and space agencies in different countries in the world, should be harnessed in this proposal in view of establishing a coordinated authoritative position in the planetary protection research field. Networking, experts meetings and workshops resulting in recommendations for further action and guidelines for future missions are part of the effort.

Expected impact:

This activity would allow reviewing the planetary protection status of outer Solar System bodies including small Solar System bodies. That may include to establish a new categorisation and the measures that should be taken (or not) to protect them from Earth-sourced biological and organic contamination. Addressing the categorisations of future missions to the outer Solar System and making recommendations will improve the Committee on Space Research (COSPAR) Planetary Protection Policy and help to resolve scientific uncertainties associated with current knowledge. This project should provide the basis for a regular exchange of information on the issue of planetary protection and identify also opportunities for European scientists to participate in future international missions.

Instrument(s): Research and innovation actions (100%). *The Commission considers that projects requesting a contribution from the EU of 1 million Euro would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.*

SME Instrument Call 2014 and 2015

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 specific challenge of the actions envisaged under this call could cover any aspect of the Specific Programme for Space (XXX insert reference to FP and SP). 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.

Scope:

The SME instrument consists of three separate phases and a coaching and mentoring scheme for beneficiaries as per the description of the SME instrument.(insert link and description)

Expected impact:

Enhancing profitability and growth performance of SMEs by combining and transferring new and existing knowledge into innovative, disruptive and competitive solutions seising European and global business opportunities. Market uptake and distribution of innovations tackling the specific challenges in space in a sustainable way. Increase of private investment in innovation, notable leverage of private co-investor and/or folllow-up investments. The expected impact should be clearly decribed in qualitative and quantitiva terms (e.g. on turnover, employment, market size, IP management).

Instrument(s): Research and innovation actions (100%) and innovation actions (70%).

Fast track to Innovation – pilot

Fast track to Innovation Topic

Under this Fast Track to Innovation (FTI) pilot, proposals for innovation actions linked to any technology field will be invited, on the basis of a continuously open call (with its first cut-off date in 2015) and a bottom-up-driven logic.

[Any legal entity may participate and proposals may be submitted at any time. The Commission shall initiate three cut-off dates per year to evaluate proposals. Time between a cut-off date and signature of the grant agreement or notification of the grant decision shall not exceed six months. No more than 5 legal entities shall participate in an action. The amount of the grant shall not exceed EUR 3 million.

Proposals shall be ranked according to the impact, quality and efficiency of implementation and excellence, with the criterion of impact given a higher weighting. Factors such as time sensitivity and the international competitive situation shall be taken into sufficient account when evaluating the impact of a proposal, to allow for flexibility according to the various specificities within different fields of applied research.]

PART B Other actions (not subject to calls for proposals)

In 2014

Activity 1 – Developments for a Galileo Public Regulated Service (PRS)

Financing the development of the security module for the **Galileo Public Regulated Service (PRS) will be addressed.** It should be noted that this development is about cryptology, secured design, etc. and is related to dual-use technology development; hence this corresponds largely to classified development. The proposed activities to be funded from the Horizon 2020 Space theme are only a part of the overall development, and that complementary tasks are expected to be carried out in the Security theme of Horizon 2020, as well as by some Member States.

Two specific public procurement actions are to be funded from the Space budget with EUR XX million each, and these topics are outlined as follows. The procurement will be opened early in 2014, and the contracts are expected to be awarded by mid-2014, and will run for 30 months.

These procurement activities will be implemented and managed by the **EuropeanEuropean GNSS Agency** (GSA) according to the provisions of Commission Decision xxxx [Dir ENTR.H to complete Decision reference].

Procurement topic: Coating-PUF

Physical unclonable functions (PUF) technology is, at present, among the most promising technology to provide secure RED key storage. With Coating-PUF the key is destroyed when a device is tampered with, because tampering alters the device coating that contributes to the device's unique signature. This technique allows a very high level of integration, at near-to-zero cost, and works without the need for a power supply. PUF technology might be also combined with intrusion detection.

The European leader in this field is Intrinsic-ID and it is currently working on demonstrating the applicability of this technology to the PRS domain through an FP7 collaborative project managed by the GSA (PREMISE) for road and ground applications.

However, industrialisation of the coating material and coating process needs to be achieved. This is a gap in the security chain that shall be resolved as a matter of priority through a restricted procedure. Applications are multiple, in particular space for sensitive material.

Expected impact: Action under this topic shall provide significant improvement in the security performances of the PRS security module and in its different applications, in particular space.

Procurement topic: 3D-IC and Scalable SM architecture

European technology is progressively loosing grounds in nanotechnology; three-dimensional integrated circuits (3D-IC) may represent an opportunity for another path towards continuing

the scaling and optimisation of performance, whilst requiring less investment.

Stacking chips using a 3D-IC processes should allow segregation of layers between different functions and technologies; highly computational layers would be separated by high security layers managing input/output and other security functions. 3D-IC could also enable on-chip antennas to be embedded in silicon ICs. These security layers could be developed within EU secure foundries, using ICs fabricated in EU secure manufacturing facilities. However, access is needed to high performance technologies required to implement the fast processing layers, which at present are produced mainly in Taiwan.

Because there is no standard for 3D-IC fabrication, it is now urgent that an infrastructure is setup to enable broad adoption of 3D-ICs. This will benefit prices, allow more frequent fabrication runs, and boost the availability of engineers. The objective is to build a security module with space capacities with the required skills objective to use it since 2016.

A scalable security module (SM) architecture would enable rapid design turnaround time, without the need to completely redesign the whole SM system. In fact, it should be noted that each time the IC technology process shrinks, design validation becomes exponentially more complex. In this way, it is possible to re-design sub-systems of the PRS (Public Regulated Service) receiver and PRS SM without completely re-designing the whole system; allowing reuse of the effort and time spent developing the original design on technologies that might have become redundant. Initial studies on the feasibility of such an approach for the PRS SM are being undertaken by the GSA. By the end of 2013 an architectural proposal will be delivered, setting the base for the implementation of a first demonstrator for space capacity.

Expected impact: Action under this topic shall provide significant improvement to the security performance of the PRS security module and in its different applications, in particular space.

Activity 2 – Space Surveillance and Tracking: participation of the EU Satellite Centre in the SST Service Function

In its proposal (*COM (2013)107 final*) for "**establishing a space surveillance and tracking support programme (SST)"**, it is foreseen that the EU Satellite Centre (EUSC) shall participate in the implementation of the objective to prepare the setting up and operation of a service function to provide SST services to Member States, the Council, the Commission, the EEAS, public and private spacecraft operators, and public authorities concerned with civil protection.

The EUSC has acquired significant experience in Space Situational Awareness, including SST, through research projects - named SPA and STEP - funded through the FP7 SPA and STEP projects.

The STEP project in particular focused issues related to the development of data policy aiming to facilitate the elaboration of coordinated information exchanges, data handling

processes and operational interfaces. These activities are in line with the role of front desk SST service provider that is envisaged for the EUSC under the SST proposal. The present activity seeks to ensure the transition of EUSC activities in the context of STEP towards the specific role of front desk SST service provider.

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

From 2015 onward, once a consortium of Member States working with the EUSC has been set up to provide a SST service, the EUSC shall benefit from both the SST support Programme (2.1.7.B.2 In 2015 Activity 3) and from complementary activities aiming at improving the performances of the SST at European level (2.1.7.B.2 In 2015 Activity 4).

Expected impact: This activity should contribute to the identification of the necessary functional elements of the SST service delivery function. It should assess the type of data and interfaces which could be made available to the various users and contribute to the design of the SST at European level but also propose improvements which could be undertaken among the SST users.

Instrument(s): Research and innovation action (100%) for a predefined beneficiary.

Activity 3 – Studies & Communication

During 2014 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 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.

Special attention will be given to events which aim to explore and implement specific initiatives in the field of space for innovation, and the question of how space exploration could contribute to innovation as well as events related to space exploration. These events should support the political debate and consensus building in Europe.

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.

Furthermore, procurement will be necessary of actions such as studies, preparation of roadmaps to underpin planning or actions to evaluate the outcomes of previous R&D actions such as FP7.

As regards studies, the following are currently foreseen:

- Study of the structural needs of the four distinct space science communities (Earth observation, astrophysics/fundamental physics, planetary sciences, space weather/heliophysics) in order to achieve a marked increase in scientific exploitation of data from European space missions. This should include the analysis of the effects of mission governance structures on the data exploitation chain, the data exploitation funding mechanism (national, ESA and EU), the various (national and ESA) archive set-ups, data dissemination and search mechanisms, data standardization issues, coordination of data processing and analysis, and visualization tools.
- A study is to be performed to establish how best Horizon 2020 can support the research into breakthrough technologies to provide access to Space using alternative concepts to conventional rocket-based launch techniques in parallel to the ongoing work to develop Europe's existing conventional rocket-based launch capabilities.

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.

The overall commitment appropriations for this set of activities (by using framework contracts and/or calls for tender) will be up to EUR X million in 2014.

Activity 4 – Horizon 2020 project evaluation (EGNSS)

During 2014 it is envisaged to support the implementation of Horizon 2020 with expert groups advising the Commission and GSA on evaluation of calls for proposals, as well as conducting reviews of activities started with Horizon 2020 finding.

The overall commitment appropriations for this set of activities (by using expert contracts) will be up to EUR X million in 2014.

Activity 5 – Horizon 2020 project evaluation (REA)

During 2014 it is envisaged to support the implementation of Horizon 2020 with expert groups advising the Commission and REA on evaluation of calls for proposals, as well as conducting reviews of activities started with Horizon 2020 finding.

The overall commitment appropriations for this set of activities (by using expert contracts) will be up to EUR X million in 2014.

In 2015

Activity 1 - GNSS Evolution, Mission and Services related R&D activities

In the first half of Horizon 2020 the Galileo mission will gradually become operational and will provide, the first European only navigation services to the citizens worldwide on top to the European Geostationary Navigation Overlay Service (EGNOS) which is fully operational

since March 2011. This is the time to make a concerted research and innovation effort in the accompaniment of the gradual deployment of the services, and to consolidate the mission and services to match at best the expectations of the user communities. At the same time Europe should ensure that it maintains the performance of the infrastructure and that the appropriate protection elements are in place to avoid sudden disruption of services.

The main objective is to support the development of enabling technologies for future generations of European GNSS missions, and to support activities that enable the full exploitation of the European GNSS infrastructure in public, scientific and commercial fields.

This should result in a strengthening of the European capacity in this field and in an efficient deployment of services at the benefit of the user communities, supporting at the same time the development in Europe of innovative GNSS-based applications.

Procurement topic (1): Advanced mission concepts

To satisfy the EU strategic objective to guarantee uninterrupted GNSS services and to maximise the benefits for European civil society, it is key to anticipate and assess the changes in the global GNSS context and usage, so as to identify the corresponding impacts on the definition of the GNSS services and the related mission objectives. It is therefore instrumental to develop a prospective vision of the GNSS arena at the horizon 2020 and beyond.

Activities should study new and innovative mission concepts for Galileo and EGNOS, with the aim to propose a realistic vision of the use of GNSS and SBAS in the long term future (2020+). Proposed concepts should be seen in a broad context, considering not only the evolution and trends of the sector world-wide but also the evolution of alternative technologies as well as the opportunity to exploit synergies with other space-based missions, in Europe or in cooperation with other space faring nations. The R&D activities should also aim at improving the knowledge on specific parameters (clock drifts, spacecraft position and attitude, difficult environment/multipath, atmospheric delays…), for developing innovative models leading to better performances.

The overall commitment appropriation for this activity area in 2015 is up to EUR X million.

Funding scheme: public procurement

Procurement topic (2): Ionosphere prediction service

Today, GNSS has become an indispensable asset commonly used in the daily life of many EU Citizens through applications such as route guidance. It has become also a critical component for the operations of many national infrastructures, such as air traffic management, power

networks, telecommunication and logistics and transport, all key sectors that rely heavily on satellite-based navigation and timing information.

In this situation, a disruption of GNSS signal provision resulting from a technical failure would have a major impact on the European society. One of the main hazards that affect the provision of reliable satellite navigation and timing services is the solar activity, which has proven effects that can cause major failure in the functioning of satellite navigation systems. With the gradual deployment of the Galileo services, it is key to anticipate such effects and advise the user communities of any potential disturbance of service, allowing thus, in case of critical use of GNSS signals (electrical power grids, telecommunications, transport), the timely shift towards reversionary or back-up systems in case of sudden availability.

It is proposed to continue the research in the field of space weather and ionosphere effects with the aim to define and develop an ionosphere activity prediction tool.

The overall commitment appropriation for this activity area in 2015 is up to EUR X million.

Funding scheme: public procurement through indirect management with GSA

Procurement topic (3): Commercial Service

In 2015, tests involving the Commercial Service and including the real signal in space (SIS) will be executed through the CS Demonstrator, in order to test authentication and real-time data transmission for high accuracy services. In order to complement these activities, GSA will run application demonstrations and co-funded receiver development projects. In addition to the above, H2020 activities shall complement the already foreseen activities for the CS through studying the performance improvement of the CS foreseen services, notably for authentication services, for which a performance and threat framework has not yet been established and fully accepted by the GNSS community. It may also support evolutions of CS service level definitions that will be used as a basis for future contracts with external service providers, and the research and development of new services that can be part of the CS bundle, either by adaptations of the Galileo infrastructure and/or signal definition in future Galileo versions, or by using additional ground-based data services to complement the signal in space. H2020 CS-related activities shall also cover the CS + OS synergies, for example for authentication, by covering the development of technologies and elements related to OS I/NAV evolutions related to OS navigation message authentication (NMA) that will complement the CS spreading code-based authentication.

The overall commitment appropriation for this activity area in 2015 is up to EUR X million.

Funding scheme: public procurement

Procurement topic (4): Support to the Galileo Safety of Life Service re-profiling, in particular for Advanced Receiver Autonomous Integrity Monitoring – ARAIM

The ARAIM concept is the alternative to which more effort is being devoted with the intention to provide a global integrity service based on multiple satellite constellations.

In this respect, cooperation with the United States of America was formally established through the creation of a specific EU-US ARAIM sub-group in Working Group C of the EU-US cooperation agreement. The first Interim Report of the Group was published on February 2013, while the Final Report, with conclusions and recommendations on the Advanced RAIM concept, is targeted by mid-2014.

It is proposed to continue the work on the ARAIM concept based on such conclusions and recommendations produced by the EU-US ARAIM sub-group.

Several actions are foreseen to be then undertaken:

- Technical work will need to be carried out in order to develop, compare, and eventually select the most suitable implementation option of the concept into the actual Galileo System and/or any other additional system concerned.
- Studies will need to be conducted on the optimisation of the user receiver ARAIM algorithms for various types of operations or targeting different user communities. Simulations may be required to assess performance of different solutions and conduct the necessary trade-offs.
- Coordination actions with other GNSS stakeholders to ensure the adoption of a solution which is recognized and shared by all involved parties. First actions in this area should be launched towards the awareness and distribution of such recommendations in the relevant Standardization for a (ICAO, EUROCAE...). As fundamental part of the awareness actions, the use of Galileo in those international fora will be promoted.

The overall commitment appropriation for this activity area in 2015 is up to EUR X million.

Funding scheme: public procurement

Procurement topic (5): Signals evolution

Future improvements of the positioning, navigation and timing services of the European GNSS (EGNSS) programmes Galileo and EGNOS depend to a large extent on potential enhancements of the navigation signals which are transmitted by those systems. The Galileo programme is currently in its in-orbit test and validation phase and the Galileo satellite constellation is gradually being built up. In 2015 several Galileo satellites will broadcast operational signals which will be precisely measured and monitored on-ground in order to

validate the signal performance and to identify means for further performance improvements.

In order to analyse and recommend improvements of the EGNSS signal characteristics, the Commission is assisted by the Compability, Signal and Interoperability (CSI) Working Group which is reporting to the European GNSS programme Committee.

The activities to be carried out in this procurement topic will aim at supporting and further expanding and evaluating the recommendations stemming from this working group. It will be also necessary to consider feedbacks from receiver manufacturers in order to assess the technical feasibility of new signal structures for the different Galileo services.

The overall commitment appropriation for this activity area in 2015 is up to EUR X million.

Funding scheme: public procurement

The total indicative budget to be allocated for the subject *Activity 1* tasks under "other actions" for the budget year 2015 ***EUR X million***.

Activity 2 - GNSS evolution, infrastructure-related R&D activities

The Horizon 2020 programme shall cover (under the chapter "*Leadership in enabling and industrial technologies*") the infrastructure-related R&D activities for the EGNSS, which comprise the early phases of Galileo and EGNOS evolution programmes, while their implementation in the EGNSS infrastructures shall be financed out of the EGNSS programmes budget line.

Pursuant to the agreed Galileo and EGNOS governance between ESA, EC and GSA for the period 2014 to 2020[3], ESA shall be responsible for *research, technology, design, development and procurement of major evolutions and future generations of European GNSS infrastructure*. EC will thus elaborate with the support of ESA shall the detailed GNSS work programmes for technology and infrastructure related R&D which shall be consolidated and eventually endorsed by the Commission through adoption of the work programmes.

Activities are to be conducted pre-dominantly through procurement, with ESA acting on the Commission's behalf as technical programme manager and procurement agent. The mode of

[3] Galileo and EGNOS Governance 2014-2020 (text is subject to approval of the GNSS Regulation by the Co-Legislator)

implementation as of 2015 is through procurement contracts under an agreement on indirect management with ESA.

The following activities will be supported through funding by the Space theme in 2015:

1) EGNOS further evolution Phase B activities
2) Galileo 2G phase B (system, satellite, payload and ground)
3) GNSS research and technology
4) GNSS System Studies and Validation Activities
5) EGNSS R&T Technical Management

Funding scheme: procurement through indirect management with ESA

The total indicative budget to be allocated for the subject *Activity 1* tasks under "other actions" for the budget year 2015 is **EUR XX million.**

Activity 3 - Space surveillance and tracking (SST)

In its proposal (*COM (2013)107 final*) for "**establishing a space surveillance and tracking support programme (SST)"**, it is foreseen that the H2020 will contribute to the funding of the SST support programme will be partly supported by Horizon 2020, since R&D activities for better space surveillance are part of the Horizon 2020 Specific programme. This contribution to the SST programme will be realised through a grant to a predefined beneficiary resulting from the implementation of the programme to support the emergence of a SST capacity at European level.

This action specifically aims (1) at supporting the pooling 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 2015 in the context of the SST support programme, in which the designated beneficiary will be the consortium resulting from the implementation of the support programme for the emergence of a SST capacity.

Instrument: Research and innovation actions (100%) for predefined beneficiary. *A total of X million Euro has been set aside for this activity.*

Activity 4 –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, possibly within a trans-Atlantic perspective. 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 working with the European Union Satellite Center 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.

As a first step, Horizon2020 will support the consortium to identify and prioritize which assets within the European SST programme need to be either updated or renewed and propose possible candidate locations to deploy new systems in order to improve the overall performance.

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

This activity should result in an action plan (including scope and priorities) for future EU research and innovation actions to upgrade and develop new assets which form the SST at European Level.

The activity may also include a request for the initial funding of the priority upgrading and development of assets identified in the action plan.

The action will deliver a sound analysis of the performances of the SST assets which will be networked within the SST at European level beyond those existing today.

This action will be the basis for initial and further funding to support the upgrading and development acquisition of these assets in coming years.

Instrument: Research and innovation action (100%) for a predefined beneficiary. *A total of XX million Euro has been set aside for this activity.*

Activity 5 – Studies & Communication

During 2014 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 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.

Special attention will be given to events which aim to explore and implement specific initiatives in the field of space for innovation, and the question of how space exploration could contribute to innovation as well as events related to space exploration. These events should support the political debate and consensus building in Europe.

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.

Furthermore, procurement will be necessary of actions such as studies, preparation of roadmaps to underpin planning or actions to evaluate the outcomes of previous R&D actions such as FP7.

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.

The overall commitment appropriations for this set of activities (by using framework contracts and/or calls for tender) will be up to EUR X million in 2014.

Activity 6 – Horizon 2020 project evaluation (EGNSS)

During 2015 it is envisaged to support the implementation of Horizon 2020 with expert groups advising the Commission and GSA on evaluation of calls for proposals, as well as conducting reviews of activities started with Horizon 2020 finding.

The overall commitment appropriations for this set of activities (by using expert contracts) will be up to EUR 2 million in 2014.

Activity 7 – Horizon 2020 project evaluation (REA)

During 2015 it is envisaged to support the implementation of Horizon 2020 with expert groups advising the Commission and REA on evaluation of calls for proposals, as well as conducting reviews of activities started with Horizon 2020 finding.

The overall commitment appropriations for this set of activities (by using expert contracts) will be up to EUR X million in 2014.