Space research

Horizon 2020 - Work Programme

Horizon 2020 Space Information day

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FP7 / SPACE
From
FP6 → FP7 → H2020

Total R&D

SPACE 1.43 B€

FP7
50.5 B€

+40% Inflat. adj.

SPACE 1.42 B€

H2020
~72 B€

SPACE

Space in FP6

0.24 B€

Space Based Applications

FP6

Space Based Applications & GMES

Other

×5 Inflat. adj.

No inflation adjustment

2014-15
Science ~5%
Prod./Serv. ~40%
Technology ~51%
Others ~4%
Activities developed under the FP7 / SPACE

Infrastructures

GMES Sentinel satellites

Contributing some 565 M€ from FP7 to ESA GMES Space Component development

Data for exploitation

GMES Space Component: Contributing Mission examples

Access to Space data for GMES and FP7 projects: contributing some 150 M€ from FP7

and many more...

Applications & Services

GMES Services

Monitoring of Earth systems

Land

Marine

Atmosphere

Horizontal applications

Security

Emergency

Climate Change

Space Foundations

Space Research Projects

International Cooperation: QB60

Protecting European Assets in Space: MAARBLE

Europe leading in the solution of Global problems: NEO SHIELD
The R&D Projects in FP7 / Space

999 PROPOSALS submitted in 6 CALLS (Call 6th in negotiation)

259 PROJECTS funded by EC with ~ 654 M€*

Further information available ec.europa.eu/embrace-space
New Multiannual Financial Framework 2014-2020

~ 12.000 M€

~ 3.800 M€

~ 1.400 M€

~ 6.300 M€
A view of the Space Research Programme
New in Horizon 2020

A new structure
- Only one Specific Programme
- 3 main pillars
- Focus on challenges rather than specific technologies
- More focus on innovation, closer-to-market activities
- A two-year work programme
  - only one work programme for all H2020 (excl. ERC)

More implementing bodies
- 7 Commission DGs
  - DG Enterprise and Industry
- 5 Agencies
  - REA, EACI (EASME), GSA
- JTIs, Art. 185, EIT, EIB
New/revised forms of funding

- Simpler reimbursement rules
- SME instrument ("SBIR" actions)
- Co-funding actions
- Prizes and financial instruments (loan and equity)

A single set of rules

- All research programmes and funding bodies
- Aligned to the Financial Regulation, coherent with other new EU Programmes
Horizon 2020 Space Work Programme

Consultations with stakeholders since 2010

Discussions with member states in September-November 2013

Publication: 11 December 2013
http://ec.europa.eu/research/participants/portal

A "two year" work programme 2014 and 2015

• 2015 “indicative” at this stage – final decision in 2014
• Call deadlines 26 March 2014 and end of 2014
Horizon 2020

The three pillars

- Excellent Science: ~33%
- Industrial Leadership: ~24%
- Societal Challenges: ~43%

~72,000 M€
State of play of H2020 / Space

Main topics

- Satellite navigation (Galileo)
- Earth Observation (Copernicus)
- SSA → Protection from Space-related threats (SST)

Support to EU flagships
- Galileo
- Copernicus
- SSA

SMEs
7%

Future Space Technologies
- Satellite navigation (Galileo)
- Earth Observation (Copernicus)
- SSA → Protection from Space-related threats (SST)

Administrative costs

MMF Budget reduction

Original Budget 1.737 M€

Operational Budget 1.416 M€
Budget
Indicative Evolution
Space 2014-2020

2016-2020 under study
European Global Navigation Satellite System

Horizon 2020 Framework Regulation:
Union level action and investment in space research are required in accordance with Article 189 (TFEU), in order to maintain the competitive edge, to safeguard Union space infrastructures and programmes such as Copernicus and Galileo and to sustain a future role for Europe in space.

144 M€

- R+D for Public Regulated Service
- Galileo Applications
- Calls
- EGNSS awareness raising
- RTD for enhanced Missions & services

Upstream Technology Development "post EGEP"
Galileo applications 2014

Galileo 1 - EGNSS applications

Galileo 2 - SME based EGNSS applications

Galileo 3 - Releasing the potential of EGNSS applications through international cooperation

Main aim is to ensure that Galileo is going to be used in the future...
EGNSS offers various possibilities for the development of new space enabled applications based on continuous, real-time, reliable, accurate and globally available position, velocity and time.

The objective of all these 3 topics is to develop new and innovative GNSS-based applications.
Galileo 4 - EGNSS awareness raising, capacity building and/or promotion activities in and outside of EU

Awareness raising – knowledge and visibility of Galileo and EGNOS
Capacity building – ability to benefit from services offered by Galileo and EGNOS
Promotion activities – actions aims at promoting the use of innovative GNSS applications

The overall objective of this action is to use various means to promote the use of Galileo and EGNOS inside and outside of the EU.
Research and Development activities related to Galileo Public Regulated Service (PRS)

The Galileo Public Regulated Service or ‘PRS’ is an encrypted navigation service designed to be more resistant to jamming, involuntary interference and spoofing. It is similar to other Galileo services, but with some important differences:

• Ensures continuity of service to authorised users when access to other navigation services is denied.
• In cases of malicious interference, the PRS increases the likelihood of continuous availability of the Signal-in-Space.
• Provides an authenticated position - velocity - timing service

Procurement topics:
1. Development of enabling technologies for PRS
2. Enabling the development of low-end PRS receivers

The overall objective of these procurements is to enable space-related technologies and the demonstrators for PRS applications.
Galileo applications

Galileo 1 - EGNSS applications

Galileo 2 - SME based EGNSS applications

Galileo 3 - Releasing the potential of EGNSS applications through international cooperation

2015

10-15M€

5-10M€

0-5M€
GNSS Evolution: R&D for enhanced mission and services

R+D to achieve the best performance from the EGNSS infrastructure and to reap the full benefits of the initial services (2014-2020)

★ Prospective research in advanced GNSS mission concepts

★ R&D for enhanced services
  • Ionosphere modelling and prediction
  • Commercial service performance
  • Safety of Life Service, EU-US collaboration

★ R&D in GNSS signal evolution

6M€ Procurement
Prepare for 2nd generation Galileo system
R+D to have European state-of-the-art and cost-effective technologies for the development of the next generation Galileo system.

GNSS Evolution: infrastructure-related R&D activities

55 M€

ESA - Indirect Management

EGEP

Horizon 2020 EGNSS RTD

Indirect Management

Transition from ESA framework...

to EU MFF 2014-2020 framework...

2015

Other actions

2013

2014

2015

2016

2015 indicative
Earth Observation

2014-2015
New ideas for Earth-relevant space applications

Scientific exploitation of existing and forthcoming European space infrastructure needs to be enhanced, by stimulating the emergence of novel ideas on what can be observed from space. 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.

- Development of new/emerging uses for Earth-relevant space-based data
- Could include a wide variety of Earth-relevant space-based data (e.g. remote-sensing data, gravity data, magnetic data, GNSS signals)
- Mitigation test mission

10 M€
EO 2: Climate Change relevant space-based Data reprocessing and calibration

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.

5,5 M€
Observation capacity mapping in the context of Atmospheric and Climate change monitoring

Space based remote sensing data have to be integrated with measurements taken at various places in the atmosphere. Efforts must be coordinated at national and international levels to optimise the use of existing in-situ measurements, the deployment of new measuring systems and the design of campaigns for calibration/validation of remote sensing data. Research is needed to assess gaps in remote observation availability and approaches to define virtual observation constellations.

- Gather the consensus of key players
- Foster advances in the consistency and cross-calibration of long-term measurements
- Better overview of uncertainty of available data to generate Climate Data Records

6 M€
Service Deployment

Land
- GIO pan-EU & local Land services
- GIO global land

Marine
- MyOcean2

Atmosphere
- MACC-II

Emergency
- GIO EMS

Security
- G-NEXT
- G-SEXTANT

Climate
- div. FP7 projects


Predefined beneficiary
Atmosphere and marine

H2020 continuity actions for Atmosphere & Marine 11 M€
EO 1: Bringing EO applications to the market

It is essential that EO products and information generation are taken out of the research environment and products are put into the market. The outcome of these innovation projects 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.

"Innovation actions (70%)"

10 M€
**Stimulating wider research use of Copernicus Sentinel data**

Europe’s investment in the Copernicus Sentinel satellites will provide Europe with an unprecedented source of operational satellite data. Data streams are expected to amount to several terabyte per satellite orbit, thereby delivering unprecedented temporal and spatial resolution and data continuity. To utilise the high scientific potential of the Sentinel data, stable and predictable access methods need to be developed, such as:

- Efficient data retrieval from repositories
- Software for reading/transforming data for access by scientific users
- Data fusion (various Sentinels/contributing missions)
- Advanced visualisation techniques

![Sentinel Satellite Image]

**11 M€**
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 for EO are to be examined.
Protection of European assets in and from Space

2014-2015
Space Weather

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

- **Focus on international aspects**

Access technologies and characterisation for Near Earth Objects:

Account should be taken of complementary efforts currently in progress (UN Action Team 14, ESA’s SSA and other national programmes, e.g. US, RU, Japan, China).

- Physical characterization & modelling (thermal properties, Yarkovsky drift, structure, reaction to impactor...)
- Investigate feasible mitigation techniques
- Mitigation test mission

8 M€
Participation of the EU Satcen in the Space Surveillance and Tracking Service Function

Objectives

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

Continuation of the STA and STEP projects in FP7

security classification

1 M€
Identified Beneficiary
Passive means to reduce the impact of Space Debris

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
- non-technical issues including legal issues should be considered.

Alignment with international and European guidelines and legal requirements.

6,5 M€
3. Space surveillance and tracking (SST)

- H2020 Contribution to a consortium of MS preparing the SST support programme (Commission proposal (COM (2013) 107 final)

4. Improving the Performances of the SST at European Level

- 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.

Additional funds from Copernicus and Galileo Consistent with the proposal for establishing an SST support programme (COM (2013) 107)

security classification
Competitiveness of the European Space Sector

Non-dependence & technology development 2014-2015
Technologies for European non-dependence and competitiveness

“Independence” would imply that all needed space technologies are developed in Europe.

“Non-dependence” refers to the possibility for Europe to have free, unrestricted access to any required space technology.

The objective of this action is to contribute to ensure European Non-dependence.

A selection of the list of urgent actions for critical space technologies defined by the Joint EC-EDA-ESA Task Force will apply for this call.
Technologies for European non-dependence and competitiveness – Urgent Actions

1) Application Specific Integrated circuits (ASCIS) for Mixed Signal Processing (U11)
2) Advanced thermal control systems (U2)
3) Space qualification of low shock non-explosive actuators (U1)
4) Alternative to Hydrazine in Europe (U5)
5) High density (up to 1000 pins and beyond) assemblies on PCB (U17)

10 M€
Technologies for European non-dependence and competitiveness – Urgent actions 2015

1) Advanced materials and material technology for combustion chambers (U4)
2) Fiber Optic gyro (FOG) based Inertial Measurement Unit (U6)
3) Power amplification: Travelling Wave Tube (TWT) materials (U7)
4) Passive components (U13)
5) Active discrete components (U14)

2015 indicative

10 M€
Independent access to space

All possible complementary technologies not overlapping with ongoing launcher developments. Proposals are expected in:

- Conventional launching systems
- Innovative systems to access to Space

The objective is to develop technology for relevant optimisation of the launch propulsion systems to foster the European capabilities of accessing space

2014 8 M€

2015 6 M€
Strategic Research Clusters - Call for Programme Support Activity (PSA)

- **SRC**: System of operational grants connected through to a roadmap designed by a separate consortium receiving a PSA grant
- As part of the application, **PSA** presents a WP for itself and for SRC

- During its 5-year life: identifies activities, delivers a detailed master plan, a plan for analysis and evaluation of results, a plan for the specific exploitation and potential use of SRC outputs, risk assessment and contingency analysis of the SRC

- COM remains responsible for calls for operational SRC grants to be included in future WP of Horizon 2020

- **PSA**
  - ≥3 partners from ≥3 member states or associated states
  - open to ESA participation
  - PSA partners may participate in operational calls (restrictions apply)
PSA for In-Space electrical propulsion and station keeping

Major advances in electric propulsion to guarantee the leadership of European capabilities at world level within the 2020-2030 timeframe in:

- Incremental advances in the development of **thrusters** (with an in-orbit validation not later than 2023)
- Promoting possible **disruptive RTD in the field of** in-space electrical propulsion

The **final objective** of the SRC is to validate electrical thrusters during the SRC with a flight to be executed not later than 2023

*Open for ESA participation*

*Consortium of ≥3 orgs from ≥3 countries*

Programme Support Activity (PSA), for the future implementation of a Strategic Research Cluster (SRC)
Strategic Research Cluster:
- In-space electrical propulsion & station keeping

**CHALLENGE:** 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... *(in the range of several tens M€)*

**SCOPE:**

1st **OBJECTIVE:** to foster *incremental advances* in the development of thrusters...

2nd **OBJECTIVE:** to set up activities for promoting possible *disruptive RTD* in the field of in-space electrical propulsion, including the *increase of electric power* for propulsion...

2014: **PSA** – Open for proposals *(4 M€)* of Programme Support Actions
PSA for Space Robotics Technologies

- To enable major advances in space robotic technologies for future on-orbit satellite servicing.
- **The final objective** of the SRC in H2020 is to achieve an in-orbit demonstration of an autonomous system (at a significant scale) for on-orbit satellite servicing (not later than 2023), planetary surface exploration, debris removal, human-robotic partnerships.
- Spin-off to Earth bound activities like underwater and automotive applications.

*Open for ESA participation
Consortium of ≥3 orgs from ≥3 countries*

Programme Support Activity (PSA), for the future implementation of a Strategic Research Cluster (SRC)

4 M€
1 PSA
In-Orbit demonstration/Validation (IOD/IOV)

- To make access to space possible for new technologies and innovations by means of IOD and/or IOV

- The objective of this topic is to motivate studies (~500 k€) 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
Bottom-up space technologies at low TRL

• Spinning-in of new Enabling Technologies (e.g. KETs) with TRL 1-3 to space systems up to TRL 4-5. **4 + 5 lines** are targeted:

  2014
  1) High-resolution imagery
     2) Radiation-hardened instrument components
     3) In-situ sensors/instruments of physical parameters
     4) Advanced satellite communications techniques

  2015
  1) Energy storage
     2) Energy production
     3) Materials and structures
     4) Wireless power transmission
     5) Thermal management systems

**Objective:** mobilising the incorporation of non-space actors (SMEs, R&D groups) into the space landscape
Competitiveness of the European Space Sector

Space exploration & science

2014-2015
Space Exploration – Life Support

This call focus on closed loop regenerative support system technologies.

Synergies between space and non-space sectors actors is expected. Participation from SMEs and academia is encouraged.

*Open for ESA participation*

Science in context: sample curation facility and scientific exploitation of data from Mars missions

A) **Roadmap** for the implementation of a European extra-terrestrial sample curation facility (Moon, Mars, Asteroids)

B) **Development of tools** for the exploitation Mars data for scientific research, **and analysis** in preparation of the ExoMars missions (2016 / 2018)
Space Exploration – Habitat management

ISS is the current cornerstone of European activities in human spaceflight. Its scientific and technological utilisation should be strengthened as a platform for the preparation of the next steps in human exploration. Life support is one of technological priorities for Europe.

This call focuses on microbial quality control of indoor environment in space. Synergies between space and non-space sectors actors is expected. Participation from SMEs and academia is encouraged.

Open for ESA participation

2015
6M€
Scientific exploitation of astrophysics, planetary and comets data

Supporting space astronomy observation proposals in Astrophysics and comets data.

Objective: the development of tools for advanced processing and the generation of high-level data products. These will be made available through appropriate archives (ESA, NASA, JAXA...)

2015 6 M€
International cooperation
Outreach/communication
2014-2015
Technology "demonstrator" projects for exploration

Demonstrator projects would target underpinning enabling technologies for space exploration (e.g. robotics, energy, propulsion or life support).

International Cooperation 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.
Outreach through Education

Trying to stimulate the interest of children and young adults in space careers and achieve a good impact on media for reverberation purposes.

Very open topic: classroom activities or outside the classroom

Transnational and international cooperation among NCPs

Reinforcing the network of National Contact Points (NCP) for Horizon 2020, building upon work done in FP7.

Focus on:
- helping less experienced NCPs rapidly acquire the know-how accumulated already in other countries
- promote the SMEs’ participation
- promote 3rd countries’ participation
SME instrument + Fast Track to innovation

The SME instrument will be a major part of achieving the target of at least 20% of the combined budget of LEIT and Societal Challenges for SMEs
- Initially 5% of LEIT and Societal Challenges budget
- rising to at least 7% averaged over duration of programme

Fast Track to Innovation pilot - launch in 2015:
- maximum 5 partners, up to EUR 3 million per project
- Bottom-up logic
- Continuously open call with three cut-off dates per year
- Time to grant not exceeding 6 months
- Project will not require Programme Committee approval
- Covering all fields across LEITs and Societal Challenges

8,5 M€
[8,75 M€ in 2015]
Rules for Participation
- Essentials -
• **Calls for proposals:** not overly prescriptive, bottom-up, broad description of call topics
  
  Principle: Industry knows better than Commission which solutions are viable and how to stay competitive in the world market

• **Minimum consortium**
  
  Three partners from at least three member states or associated states
  International participation possible

• **Open competition for grants, EU rules**
  
  Evaluation by independent experts.
  No geo-return principle (also valid for EU funds delegated to ESA)

• **IPR owned by the creator(s)**
  
  Access rights for exploitation to be granted free of charge to project partners
  (Consortium agreement must provide details)
Forms of funding

1. Grants: Strong simplification of the funding rates
   - **Research and innovation actions**: 100%
     With flat rate of 25% of direct cost for indirect cost
   - **Innovation actions**: 70%
     With flat rate of 25% of direct cost for indirect cost
     *Exception – non-profit entities = 70% + 25%*
   - **Coordination and Support Actions (CSA)**: 100%
     With flat rate of 25% for indirect cost
     *Some exceptions to the 25% flat rate apply: e.g. subcontracting
     is a direct eligible cost but does not give right to extra 25%*

2. Procurement Following financial regulation

3. Others Co-fund 70% (Art. 185-187… but not used in the WP / Space)

"Rules for participation and dissemination in Horizon 2020 "

On the web Participant Portal
The SME instrument in Horizon 2020
SME support: integrated approach

20 %
global
budgetary
target in
LEIT & SC

'Innovation
in SMEs'

http://www.eurostars-eureka.eu/

http://ec.europa.eu/enterprise/
policies/finance/

Collaborative projects
13%

SME instrument
7%

Eurostars II
Enhancing Innovation Capacity
Market-driven Innovation

Access to Risk Finance
SME instrument

Phases

IDEA  business coaching throughout the project  MARKET

Concept & Feasibility Assessment
- Feasibility of concept, Risk assessment, IP regime, Partner search, Design study, Pilot application

Demonstration Market Replication Research Development
- Development, prototyping, testing, piloting, miniaturisation, scaling-up, market replication, research

Procurement

SME window EU financial facilities

Support via networking, training, information

IDEA

Lump sum: 50,000 €
~ 6 months

MARKET

1-5 M€ EC funding
~ 12 to 24 months

No direct funding
**Phase 1: Concept and feasibility assessment**

**Input:** Idea/Concept: "Business Plan 1"

(\~ 10 pages)

10% budget (1.75 M€)

**Activities:**
- Feasibility of concept
- Risk assessment
- IP regime
- Partner search
- Design study
- Pilot application etc.

**Output:** elaborated "Business plan 2"

Lump sum: 50,000 €

\~ 6 months

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**Phase 2: R&D, demonstration, market replication**

**Input:** "Business plan 2" plus description of activities under Phase 2 (\~ 30 pages)

\~ 88% budget (15.1 M€)

**Activities:**
- Development, prototyping, testing, piloting, miniaturisation, scaling-up, market replication, research

70% COSTS

**Output:** "investor-ready Business plan 3"

1-5 M€ EC funding

\~ 12 to 24 months

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**Phase 3: Commercialisation**

Quality label for successful projects

Facilitate access to private finance

(Don't forget COSME)

**SUPPORT** via Enterprise Europe Network (training, information, IP management, knowledge sharing, dissemination)

SME window in the EU financial facilities (debt facility and equity facility)

Possible connection to public procurement activities

No direct funding

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**SME instrument**

Not necessarily sequential
Register as expert!

• For proposal evaluation
• For project reviews

At the participant portal:

https://ec.europa.eu/research/participants/portal/page/experts
Thank you for your attention!

More information at
http://ec.europa.eu/embrace_space