Preparing for disruptive innovation in space - the EC Framework Programme Approach

Christos Ampatzis

European Commision
Research Executive Agency
Space Research

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Outline

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  - A bottom-up product
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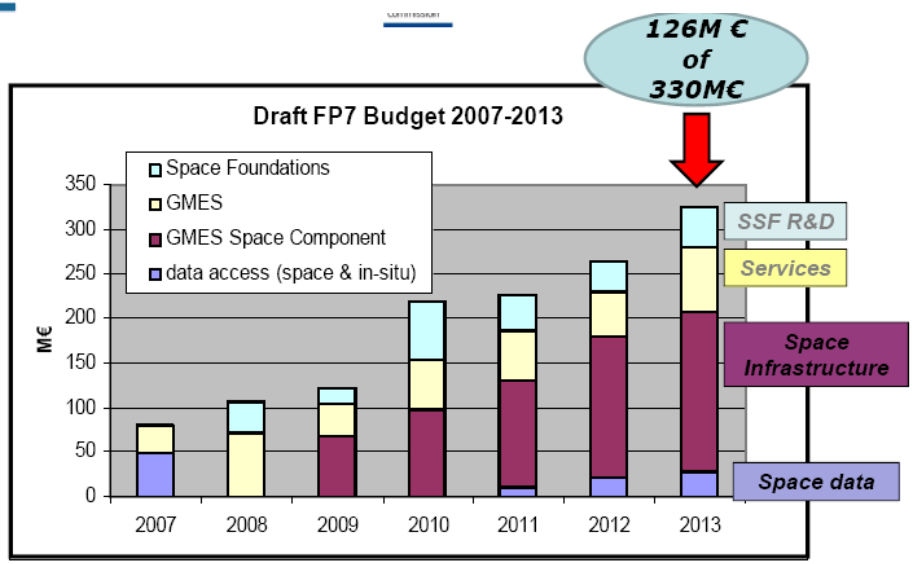
  - International Cooperation
  - Can we use it for space?
- The carrot & the stick
- How-to?

Introduction

European Commission

FP7 space (very briefly)

2007-2013
1.4B€



- **European Commission Enterprise & Industry Space Unit**
  - **Policy**
  - **Space Work Programme**
- **Research Executive Agency Space Unit**
  - **Evaluation, Negotiation**
  - **Follow-up – Financial + Technical Management**

REA

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FP7-Space (Theme 9)

9.1. Space-based application at the service of the European Society

Developing satellite observation systems and the GMES services for the management of the environment, security, agriculture, forestry and meteorology, civil protection and risk management

9.2. Strengthening the foundations of Space science and technology

Support research for long term needs such as space transportation, bio-medicine, life and physical sciences in space.

9.3. Cross-cutting activities

SME relevant research, International cooperation, cross-thematic approaches, dissemination actions, European Space Policy implementation actions

Disruptive Innovation as a call topic

In the 5th space call – FP7-SPACE-2012-1

"Most of the efforts will probably result in welcomed but incremental improvements, however, radical innovations are needed to drastically change the game."

Targets:

- enable the emergence of new concepts
- prepare the long term competitiveness of Europe' space sector
- Finance high risk/high gain research

Evaluated according to FP7 rules

- S/T excellence + Impact considered against rules in the WP

~ **2M €** EU contribution

~ 5+1 **collaborative** projects

~**3 year** duration

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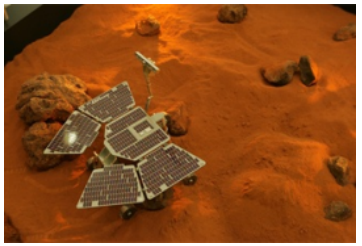
Disruptive Innovation as a call topic



Activity 9.2: Key technologies for in-space activities

Looking for:

- products or components which are a generation ahead, leap-frogging competitors.
- developments driven not by incremental improvements, but rather by radical innovation which may then lead to “disruptive technologies”.

Examples areas:

- Accessing space (re-usable)
- Sustaining activities in space (power, energy storage)
- Surviving the hazards of space
- Providing a base beyond earth

Expected Impact:

Projects are expected to open new avenues of research. They should strengthen also the future potential for high-risk/high-impact research and innovation, and contribute to new research alliances. Enhancing the relations with established international space powers is regarded to add value to European space activities.

Disruptive Innovation as a call topic
The evaluation 'survivors' (**under negotiation**)

- Space Radiation Superconductive Shield
- Innovative Thermal Management concepts for thermal protection of future space vehicles
- Self-deployable Habitat for Extreme Environments
- Space Thermoacoustic Radio-Isotopic Power System
- Pulsed Chemical Rocket with Green High Performance Propellants
- Advanced Ablation Characterization and Modelling

Disruptive Innovation as a bottom-up product

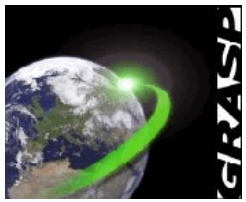
- Projects submitted to often *loosely* defined open general topics
  - e.g.: Technologies for Space Exploration
- Freedom
  - Teams define the topic & deliverables, schedule, milestones
  - Can include non-EU partners
- However, disruptive innovation can *also* emerge through:
  - Pre-defined topics, e.g., lists of critical technologies

Disruptive innovation as...

European Commission

Some examples:

BETS: Propellantless deorbiting of space debris by bare electrodynamic tethers
www.thebetsproject.com/



GRASP: GReen Advanced Space Propulsion
www.grasp-fp7.eu

Microthrust: MEMS-Based Electric Micropropulsion for Small Spacecraft to Enable Robotic Space Exploration and Space Science
http://www.microthrust.net

Disruptive Innovation as International Cooperation

Clear focus on International cooperation

The inclusion of international partners (from third countries (**ICPC**), countries which have signed an **agreement** with the EU covering Science and Technology, as well as other **space-faring** nations (such as the US and Japan) could help to advance technology and enhance research partnerships with established space powers. **These aspects should be taken into account in the proposal. International partners will be eligible to participate and to be funded.**

Enhancing the relations with established international space powers is regarded to add value to European space activities.

See:
'*New agreement on cooperation between the European Commission and NASA*'

Disruptive Innovation as can we use it for space?

- Shuffling the cards

Activity 9.3: SME specific research

- Bringing terrestrial SME research capabilities into the space domain
(i.e. bringing SMEs not working in space domain together with space players)
- (Small) projects, with SMEs in leading role
- Majority of requested EU funding is to go to SMEs in the project

Wikipedia:
A **disruptive innovation** is an innovation that helps create **a new market and value network**, and eventually goes on to disrupt an existing market and value network (over a few years or decades), displacing an earlier technology.

Disruptive Innovation as can we use it for space?
The evaluation 'survivors' (**under negotiation**)

- Modular CMOS Photonic Integrated Micro-Gyroscope
- Smart technology for artificial muscle applications in space
- Generic SDR-bAsed Multifunctional spAce LINK
- Methodology and assessment for the applicability of ARINC-664 (AFDX) in Satellite/Spacecraft on-board communicatION networks
- Small and Medium Enterprise Satellite
- Photonic Biosensor For Space Application

Disruptive Innovation as Demonstration

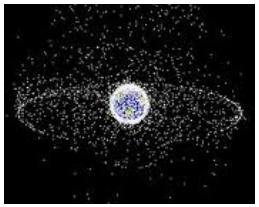
From a theoretical study to a proof-of-concept and to reality

- Bridging technology gaps & beyond ground testing

- **QB50 www.qb50.eu**
  An international network of 50 CubeSats for multi-point,
  in-situ measurements in the lower thermosphere and re-entry research
  ~8M € EU contribution

- **Piezoelectric Assisted Smart Satellite Structure**
  under negotiation
  ~2M € EU contribution

- **Active Removal of Space Debris**
  in the coming 6th call…
  ~7M € EU contribution



- **(NEOShield) www.neoshield.net**
  ~4 M € EU contribution
  (no launch, no demo)

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The carrot & the stick

European Commission

Horizon 2020 (next FP)

- Simplification is a major target

Space in H2020:

- *Output-based funding possibility*
  - Reduce financial administrative burden
  - High-trust funding scheme

*FP7 criticized for **complex** procedures for financial administration* →DG ENTR study to substantially simplify FP for participants.

Focus of EU funded projects firmly on **research and innovation** rather than on financial administration.

no longer time-sheets and costs, but **lump-sums** for whole projects.

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Disruptive innovation: How to?

European Commission

How to best fund innovation?

- Bottom-up open call vs tender?
- Collaborative project?
- Many instruments?
  (e.g., FP7, ARIADNA, GSP…)
- Funding/timeline?

Decentralisation may have benefits!

How to evaluate innovation?

- Separate call?
- Who? Independent experts?

Where is disruptive innovation in the TRL development maps?

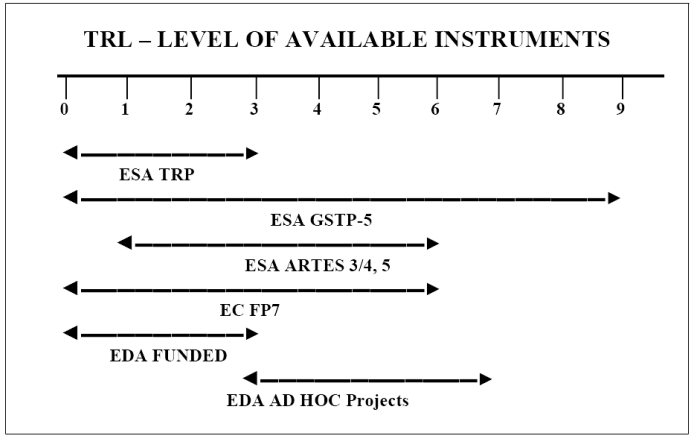

Figure 2 Funding instruments and their TRL-levels

How do we track/monitor disruptive innovation?

- "flags" – experts/ POs: ground-breaking nature, Innovation potential
- projects from specific call

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Disruptive innovation: How to?

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How do we treat failure?

- FP7 reimburses actual costs upon completion of R&D as foreseen in Grant Agreement
- In principle, failed research can be funded! (but it's taxpayers money + crisis)

Who dares wins???

In the end we all face the same question:

A great idea and a bad proposal

vs

A good idea and a good proposal

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Disruptive innovation as...

European Commission

SEVENTH FRAMEWORK PROGRAMME

?

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More information

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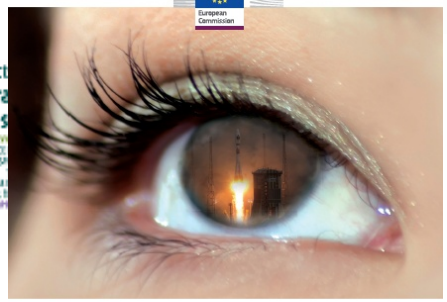

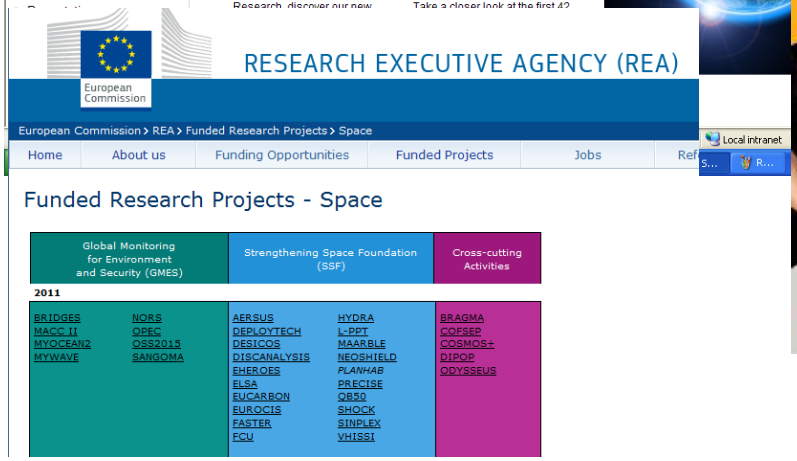

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Eye on Space

Space Research

Space Research projects under the 7th Framework Programme for Research (4th call)

Thank you!

Christos.Ampatzis@ec.europa.eu

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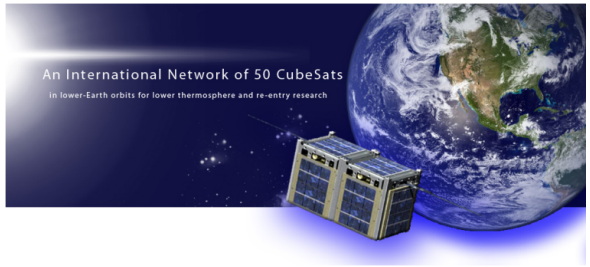
Disruptive Innovation as Demonstration

Under negotiation from the 5th call…



QB50 www.qb50.eu

An international network of 50 CubeSats for multi-point, in-situ measurements in the lower thermosphere and re-entry research

~ 8M € *EU contribution*

coordinator VKI BE, US+RU participation

- *study in situ the temporal and spatial variations of key constituents and parameters in the lower thermosphere (90-320 km) with a network of ~40 double CubeSats.*
- *study the re-entry process by measuring a number of key parameters during re-entry and by comparing predicted and actual CubeSat trajectories and orbital lifetimes.*
- *In-Orbit Demonstration (IOD) of technologies and miniaturised science sensors and the Gossamer-1 solar sail technology demonstration package.*

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Disruptive Innovation as Demonstration
Under negotiation from the 5th call…

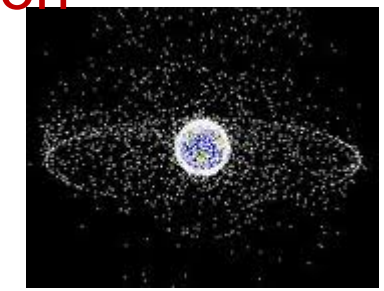
PEASSS: Piezoelectric Assisted Smart Satellite Structure

- *The main objective of the PEASSS project is the development, manufacturing, testing and qualification **in a space environment** of "smart structures" which combine composite panels, piezoelectric actuators/generators, and next generation sensors for accurate pointing and power generation.*
- *Focus on improving earth observation*
- *Nanosatellite assembly, ground testing & launch*

Collaborative Project with ~2M € EU contribution

Disruptive Innovation as Demonstration

In the forthcoming 6th call…



Debris collision threats

- *Performing an in-orbit removal of debris*

Demonstrating concepts and technologies for active debris removal (capture or contactless)

- *Including dynamical problems, e.g. of uncooperative encounter*
- *Concept must be scalable for future use*
- *Must show the removal of an object in 1-2 years from launch*
- ***One Collaborative Project with 7 M € EU contribution***

Disruptive Innovation as Demonstration
Under negotiation from the 5th call…

NEOShield www.neoshield.net

A Global Approach to Near-Earth Object Impact

Threat Mitigation

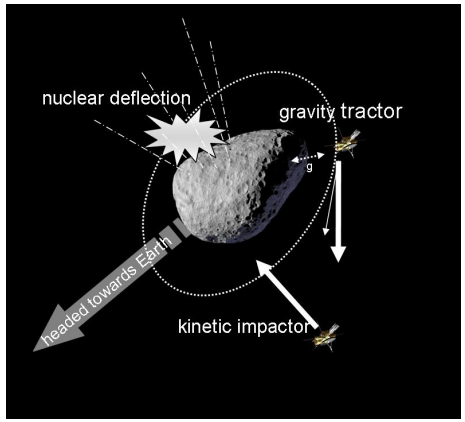
~4M € *EU contribution*

DLR, DE coordinator,US+RU participation

Explore feasibility of methodologies

Experiments and modelling of NEO behaviour during deflection attempt.

Global response campaign roadmap



NEOShield

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