

## **Proposal for Forming an IAA Study Group SG 4.17**

**Title of Study:**  
**Space Systems for Biomedical Research**

**Proposer(s): Chantal Cappelletti (CM) and Filippo Graziani (M)**

*(Must be member(s) of the Academy M or CM)*

**Primary IAA Commission Preference:** Commission 4 Space Systems Operations and Utilization

*(From Commission 1 to Commission 6)*

**Secondary IAA Commission Interests:** Commission 2 Space Life Sciences

*(From Commission 1 to Commission 6)*

### **Members of Study Team**

**Chair(s):** Chantal Cappelletti, Filippo Graziani

*(Must be member(s) of the Academy, M or CM)*

**Secretary:** Chiara Massimiani

#### **Other Members:**

*(Open to members and non- members of the Academy)*

Robert J. Twiggs, Stanford University (emeritus), Morehead State University, USA

Jordi Puig-Suari, California Polytechnic University, USA

Benjamin K. Malphrus, Morehead State University, USA

Francesco Torchia, Italian Air Force, Italy

Paola Verde, Italian Air Force, Italy

Angelo Notarangelo, CSS Genetics Research Center, Italy

Carlo Alberto Gurgel Veras, Brazilian Space Agency, Brazil

Simone Battistini, University of Brasilia, Brazil

Alexander Deghtiarev, Yuznoye, Ukraine

Fernando Aguado Agelet, University of Vigo, Spain

Elwood Agasid, NASA Ames

Tibor Balint, NASA HQ

### **Short Description of Scope of Study**

**Overall Goal:** *Space environment is characterized by extraordinary conditions that can support and improve biomedical research on human diseases. The results obtained by several researches suggest that space environment exposure including microgravity and ionizing radiation can cause biological changes in cell structures, functions and in human health not always reproducible at ground.*

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-2-

Instructions and application form: see: "Scientific Activity" section at <http://iaaweb.org/content/view/256/393/>

*For example results of studies performed on tissue culture for organ regeneration demonstrated the advantages of growing tissues in microgravity; preliminary on-orbit tests showed that the space environment is a fundamental tool to find new treatments for cancer cure.*

*The high costs related to space missions and the great amounts of data needed to validate results in biomedical research are some of the factors that constrained the space biomedicine.*

*Another main constraint is the possibility to have access to space. Recently, only the International Space Station is giving the possibility to support biomedical research in space, but launch and room availability inside the ISS are not sufficient for the amount of experiments that the biomedical community can perform.*

*The goals of this study is to find new space systems to improve biomedical research in space solving several issues such as high costs, samples analysis on board, payload recovering and also ethical issues and safety issues.*

*A possible way to improve the biomedical research in space could be the use of cheap and autonomous space systems (e.g. CubeSats). At the same time, several technical issues to use this kind of system need to be solved (e.g. thermal environment, reentry, on board sample analysis)*

*The main goals of this working group are:*

- 1. Study possible technical solutions to design ad hoc platform for biomedical research in space,*
- 2. Study new technologies and materials to improve samples return on ground,*
- 3. Find new solution to improve launch capability or space biomedical payloads,*
- 4. Design specific standards for biomedical research in space*

*In order to achieve these goals, members of the team have been selected from biomedical and aerospace engineer areas.*

### **Intermediate Goals:**

### **Methodology:**

*(Email works, workshops, stand alone conferences, interim publications, etc.)*

*A core study group will be formed and it will meet regularly at leading CubeSat and Micro-Sat workshop and conferences, such as:*

- Small Satellite and Cubesat Symposium in CalPoly (April, Spring Session)*
- Aerospace Medical Society Annual Meeting*
- Small Satellite Symposium in Utah, USA (August, Summer Session)*
- International Astronautical Conference 2014*
- IAA Symposium on University Satellites Missions in Rome (January 2015)*
- Workshops of which there are many each year in the USA and in Europe*

Monthly teleconference will be organized using internet to update the participants on the study group progresses.

### **Time Line:**

The study is expected to be completed in **two years**.

### **Final Product (Report, Publication, etc.):**

The Final Product will be a highly authoritative Report that will be published by the IAA. The results of the study will be widely disseminated in international forums such as IACs, COSPAR General Assembly, peer-reviewed journals and briefs sent to space policy decision makers and takers.

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-3-

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**Target Community:**

A world-wide distribution is expected which will include all international space agencies, international universities, small companies, biomedical research centers, large corporations.

**Support Needed:**

It is expected that the participants will be working on this study as part of their existing work at their representative organizations. No special support is required.

**Potential Sponsors:**

This work is being supported by University of Brasilia, Morehead State University, Italian Air Force, Nasa Ames, GAUSS Srl, Yuznoye, University of Vigo, CalPoly University, CSS Genetics Research Center, Brazilian Space Agency, Kentucky Space.

To be returned to the IAA Secretary General Paris

by fax: 33 1 47 23 82 16 or  
by email: [sgeneral@iaamail.org](mailto:sgeneral@iaamail.org)

**Date:** 09 March 2014

**Name:** Chantal Cappelletti

*(No Signature required if document authenticated).*

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-4-

Instructions and application form: see: "Scientific Activity" section at <http://iaaweb.org/content/view/256/393/>

**Follow-up Section for IAA use only**

**Initial Phase**

**Application received:**

**Commission Approved:**

**SAC Approved:**

**Web Site Section opened:**

**Members Formally Appointed by IAA:**

**Final Phase**

**Peer Review by Commission Completed:**

**Recommended by the Commission:**

**Final Report Received:**

**SAC Approved:**

**BOT Accepted:**

**Publisher Selected:**

**Study Published:**