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

Proposal for Forming an IAA Study Group

Title of Study:
The Applications of Micro-Satellites and Cube-Sats to Planetary Science and Exploration Missions

Proposer(s): Leon Alkalai, Member IAA

Primary IAA Commission Preference: Commission 4
Partner IAA Commission: Commission 1
Secondary IAA Commission Interests: *Commissions 3, 6*

Members of Study Team

Chair(s): Leon Alkalai, Filippo Graziani and John Baker

Secretary: Rene Laufer and Pierre Bousquet (CNES/France)

Other Members:

The following is a tentative list of participants in the study, amongst Commission 4, as well as members from other Commissions including in particular from Commission 1. Moreover, a number of people on the list below are already working on CubeSats or Micro-Sats in their own organizations and would be very interested in participating in the study.

Andy Petro, NASA HQ
Tibor Balint, NASA HQ
Robert J. Twiggs, Stanford University (emeritus), Morehead State University
Jordi Puig-Suari, CALPOLY
Jaime Esper, GSFC
Rainer Sandau
Benjamin K. Malphrus, Morehead State University
Chantal Cappelletti, GAUSS Srl
Piero Galeone, ESA Education Office
Larry Paxton, APL
Andy Klesh, JPL
Charles Norton, JPL
Joseph Lazio, JPL
Butler Hines, ARC
John Hine, ARC
TBD, CNES
TBD, ESA
Pam Clark, Catholic University, USA
Milind Pimprikar, CANEUS
Shinichi Nakasuka, Tokyo University
Junichiro Kawaguchi, JAXA

Alexander Deghtiarev, Yuznoye, Ukraine
Julie Castillo, JPL/USA
Tomas Komarek, JPL/USA
Joel Michaud, CNES/France
Joel Poncy, TAS/France
Stephan Ulamec, DLR/Germany
William Frasier, Ball Aerospace/USA
Hajime Yano, JAXA-ISAS/Japan
Karen McBride, UCLA/USA

Short Description of Scope of Study

Overall Goal:

Whereas CubeSats and various forms of Micro-Sats have been in existance for the past 20-30 years, they have been primarily focused on Earth-bound applications and primarily developed by universities and small businesses. In light of recent advances in spacecraft and science instrument technologies, Cube-Sats and small satellites can now be considered for very low cost planetary missions. COTS components utilization and accessibility of miniaturized technologies and devices make small satellites a more powerful and cheaper tools than in the past to carry out low cost exploration.

The new generation of Cube-Sat is compatible with capabilities that exist within many universities, allowing students first-hand experience with the design and development of spaceflight hardware and systems, and hence an opportunity to further expand workforce in aerospace and space sciences. Further, if Cube-Sats are launched piggy-back on larger missions, they also provide a way to allow emerging countries to test their capabilities and to get involved in the big game at a low cost.

This study will focus on developingn a clear vision and a concensus on the future use of such small (~ 1-10kg) satellites for science and technology demonstration missions beyond Earth orbit, including but not limited to the exploraiton of the Earth's Moon, Mars, Outer Planets, Small Bodies (asteroids and comets) and other destinations.

There is a clear need to develop a consensus view of the use and application of Micro-Sats and Cube-Sats across international agencies, universities, etc. The focus of the study would be to detail case studies of where Cube-Sats can be used effectively in the future to perform science as well as technology demonstration missions beyond Earth's orbit. Examples will include:

1. Network Science of a small or large number o f Micro-Satellites
2. Technology Demonstration missions
3. Education and Outreach missions
4. In-Situ science exploraiton
5. Adjuct micro-spacecraft for safety and engineering
6. Etc.

Intermediate Goals:

Methodology:

A core study group will be formed and it will meet regularly at leading CubeSat and Micro-Sat workshop and conferences, or which there are many:

a) IAA Symposium on Small Satellites for Earth Observation, Berlin, April 2013
b) IAA 10th Low-Cost Planetary Missions Conference (LPCM10), Pasadena, June 2013
c) Small Satellite Symposium in Utah, USA (August, Summer Session)
d) Small Satellite and Cubesat Symposium in CalPoly (April, Spring Session)
e) Small Satellite Symposium, Roma, Italy (January, Winter Session)
f) Workshops of which there are many each year in the USA and in Europe

Time Line:

The study is expected to be completed in **two years**. This is possible due to the large interest across many agencies, and based on plenty of existing work to build on.

Final Product (Report, Publication, etc.):

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

Target Community:

A world-wide distribution is expected which will include all international space agencies, international universities, small businesses, large corporations, NASA field Canters such as JPL, GSFC, space research institutions such as APL, IPGP, ESTEC/ESA, tc.

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 strongly supported by JPL.

To be returned to the IAA Secretary General Paris by fax: 33 1 47 23 82 16 or by email: sgeneral@iaamail.org

Date: March 4th, 2013
Updated: August 25th, 2013

(No Signature required if document authenticated).

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: