ARIADNA NEWSLETTER
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ARIADNA NEWS:
STUDIES AWARDED FOR CFP 06/01

Study awards have now been finalised for Ariadna CFP 06/01. We would like to thank all the teams who submitted proposals and would encourage all to participate again. **A new Call for Proposal is foreseen to be issued in January 2007**.

The following teams have been selected to be offered studies under the proposed study areas:

06/1301 **The Gravitomagnetic London Moment**, Type of activity: Medium Study (4 months, 25 KEUR) - No studies awarded

06/3101 **Advanced Injectors for Chemical Rockets Inspired by Ink-jet Printing Technology**, Type of activity: Medium Study (4 months, 25 KEUR) - University of Southampton

06/3201 **Advanced Ceramic Fibers and Matrices: Hafnium Carbide Composites**, Type of activity: Medium Study (4 months, 25 KEUR) - No studies awarded

06/4101 **Global Trajectory Optimisation: can We Prune the Solution Space when Considering deep Space Manoeuvres?**, Type of activity: Extended Study (6 months, 35 KEUR) - Ecole des Mines de Paris, Politecnico di Milano, University of Glasgow & University of Reading

06/6201 **Attaching Mechanisms and Strategies Inspired by Spiders' legs**, Type of activity: Extended Study (6 months, 35 KEUR) - Universita' di Udine

06/6301 **Bio-inspiration from Plants' Roots**, Type of activity: Medium Study (4 months, 25 KEUR) - Scuola Superiore Sant Anna di Pisa

06/9401 **Active Coating for Position and Attitude Control**, Type of activity: Medium Study (4 months, 25 KEUR) - No studies awarded

06/9501 **Microstructured Radiators**, Type of activity: Short Study (2 months, 15 KEUR) - Ecole Centrale Paris, Ecole Polytechnique - Université de Nantes

ACT CAREER OPPORTUNITIES

The ACT is currently looking for 2 stagiaires in the fields of:

Trajectory optimisation using novel propellantless propulsion devices

(Duration: 3 months, September-November 2007)

Propellantless propulsion is a recurrent topic in S/C technology. Several planets, in particular the Earth, Jupiter and Saturn, posses a magnetic field, which opens the possibility to use interactions with it to design propellantless propulsion devices for planetary missions. In particular charged satellites and electro-dynamic tethers have been suggested. A tour to the big Jovian moons based on the latter concept has been studied more in detail in collaboration with ESA's Advanced Concepts Team.

Recently, an alternative device sharing some similarities with electro-dynamic tethers has been suggested by members of the Advanced Concepts Team: it is based on a partial shielding of a closed wire by means of a superconducting cylinder. In this way a situation similar to an electro-dynamic tether is achieved; but as a closed wire does not depend on the plasma, much higher currents are reachable which results in a shorter length of the wire (approx. 1m.) This should result in definite advantages considering stability and orientability.

A first assessment of the possibilities of the concept was performed within the Advanced Concepts Team. This led to promising results for different applications, namely drag compensation in LEO or orbital transfers in Earth's or Jovian orbit. The main task of the Stagiaire will be to extend these calculations towards more realistic scenarios.

Stagiaires tasks

The main topic is trajectory design with the partially shielded current device within a more realistic setup than considered until now. This will include applications in Earth orbit, but also for Jupiter and Saturn. The work encompasses:

- Derivation of the relevant equations of motion relaxing different constraints that have been imposed in the previous works. This in particular includes non-circular orbits, non-zero inclination and the orientation of the wire.
- Optimise the trajectory for different promising applications using the results from 1. This in particular will include orbital transfers in Earth and in Jovian orbit.

European Space Agency
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Candidate's profile: Engineer with strong knowledge in optimal control theory.

Candidate's qualifications:

- Interest and educational background in physics can be an advantage.
- Trajectory optimisation using novel propellantless propulsion devices
- Design of a swarm component (micro satellite) accounting for technology forecasts

Design of a swarm component (micro satellite) accounting for technology forecasts

(Duration: 3 months, April-June 2007)

Recent trends in the space community for smaller, cheaper and more frequent space missions are driving the development of micro- and nano-spacecraft. Such nano-spacecraft, generally understood as spacecraft of a few of kilograms in mass or less, may be flown in large constellations or swarm formations, for example, consisting of dozens or even hundreds of such craft. Such constellations may be used for scientific applications, exploring regions of space simultaneously, mapping magnetic field tensors or particle distributions. Swarm formation missions may have other applications, simulating large radar apertures in space by operating individual antennas on multiple, widely distributed spacecraft in unison, resulting in high-resolution imagery of Earth. The use of small spacecraft constellations can then enhance the overall performance of communication and remote sensing tasks currently done by a relatively small number of large platforms. Nano-satellites (mass between 1 and 10kg) and pico-satellites (less than 1 kg) impose significant limitations on mass, power and volume available for all subsystems. The continued development of micro-technologies for space applications have the advantage of reducing the total resources required and have the potential to further enable small satellite missions at these scales.

The reduced dimensions of the spacecraft will require substantial development efforts to achieve miniaturization of subsystems, not only with respect to size and weight, but also with respect to power. Forecast technologies should be analyzed and assessed in order to arrive to a complete system design of a single collaborative swarm component, which will be next implemented in a swarm intelligent system (multiple satellites working together in a coordinated and distributed manner in order to perform and share different tasks).

Stagiaires tasks

- Perform a critical review and identify innovative micro/MEMS technologies related to Telecom, power, navigation and propulsion for designing the swarm component
- Based on the previous analysis, collaborate on the system design of the swarm component
- Assess the performance capability of the swarm component in respect to the distributed space system

Candidate's qualifications:

- Space System engineering
- Strong interest in nanotechnology, MEMS and innovative technologies
- Capable to program with Matlab

For more details on these positions and to send your application, please send us an email writing to: act@esa.int

CONFERENCES ANNOUNCEMENT

The 2007 Space Flight Mechanics Meeting, hosted by the American Astronautical Society (AAS) and cohosted by American Institute of Aeronautics and Astronautics (AIAA) will be held in Sedona, Arizona, January 28 - February 1, 2007. The conference is organized by the AAS Space Flight Mechanics Committee and the AIAA Astrodynamics Technical Committee.

A special session will be Held by Outer Planets Mission Analysis Group of the Jet Propulsion Laboratory (JPL) and dedicated to the 2nd Global trajectory Optimization Competition, presenting the results of the competition of this year.

ARIADNA IN SHORT

With Ariadna, ESA intends to strengthen the bond between Academia and ESA by providing opportunities to work in partnerships and making up-to-date information available on on-going ESA studies and advanced space technology news relevant to the academic world. Check http://www.esa.int/ariadna for news or updates on coming Ariadna call for Proposals.

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