

## PhD Scholarship at Australian Centre for Space Engineering Research

Required Background: Bachelor Degree in Electrical Engineering  
Application Deadline: 31/03/2012  
Supervisors: Dr Steven Tsitas, Prof Andrew Dempster  
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### Ultracapacitor use for high power compact lightweight spacecraft

ACSER is investigating a constellation of formations of small SAR spacecraft for disaster monitoring including floods. In order to achieve the high temporal resolution (short time between revisits) of less than a few hours necessary for disaster support a large number of spacecraft are anticipated. To implement such a system affordably the smallest spacecraft mass is required that can meet the requirements for data quality (e.g. resolution). The problem for the SAR design can be restated as "how low can you go"; how small can a spacecraft based SAR be made that meets the data quality requirements.

Spacecraft imaging radars require high power because of the long range to the ground from orbit. Generating high power on a spacecraft typically requires large solar panels and a bank of batteries, which is a major obstacle to designing very compact and lightweight spacecraft. Ultracapacitor based power systems offer a solution by allowing electrical energy to be stored as the spacecraft orbits generating power from its solar arrays. This energy can then be delivered with high power when imaging is required. This research will develop a design for a spacecraft electrical system that uses ultracapacitors and small solar panels to deliver high peak power in a compact lightweight spacecraft. The use of ultracapacitors as a replacement for batteries for other spacecraft power needs may also be investigated. Batteries suffer from the effects of cyclic charging and discharging which is common in orbit, and must be kept within a relatively tight temperature range which places demands on the spacecraft thermal control design.

The smallest SAR spacecraft currently contemplated are around 100kg. This project seeks to reduce that to the order of tens of kilograms. Such a breakthrough will help lead to a large scale constellation of high resolution satellites, delivering the elusive "high spatial/high temporal" resolution from space for the first time.

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ACSER and the Garada Project will be providing scholarships for some students. All prospective students should, however, apply for:

- Australian Postgraduate Award (APA; for Australian citizens) OR an
- International Postgraduate Research Scholarship (IPRS; International students).

Suitability for the ACSER and Garada scholarships will be assessed in the same way as applicants for APA and IPRS. For more information about these scholarships please go to <http://research.unsw.edu.au/postgraduate-research-scholarships>.

Further Information on the project may be obtained from Dr Steven Tsitas ([s.tsitas@unsw.edu.au](mailto:s.tsitas@unsw.edu.au)).