



## **Sheffield Engineering – Rolls Royce Scholarships**

### **PhD full-fees scholarship for China Scholarships Council scholars from Zhejiang University**

**Project:** *Enhancing complex system prognosis through data fusion*

Complex systems have many and varied sensor measurements which provide insight into the complex dynamics and interactions within the system. As a system evolves through-life, expected degradation can affect the system behaviour in complex, difficult to predict, ways. The estimation of degradation is therefore highly uncertain.

Researchers in the Rolls-Royce UTC in Control and Systems Engineering have made important advances in degradation estimation for gas turbine engines through the development of techniques to process measurements with algorithmic techniques. However, while individual degradation estimates give some indication of the engine state, they need to be interpreted and collectively analysed to best determine system health.

Previous work at the UTC has investigated the fusion of measurement data for diagnostic purposes, i.e. identifying the degradation effects which have caused a fault to occur. This provides value to maintenance operations but still incurs maintenance and asset availability impact. Significant commercial benefits can be realised by estimating the remaining life until an impending fault occurs, i.e. the system's prognosis.

Data fusion seeks to optimally combine information to estimate a state from a plurality of inputs. Here we seek to estimate the probability distribution for a component's time-to-failure from a combination of operational history (usage, maintenance, etc), legacy and novel degradation estimation algorithms, and engineering beliefs. Novelty in the approach will come from an approach that supports user interaction in a decision support framework and incorporates traceable uncertainty estimates. A route to implementation on an embedded platform will also be developed and will affect the methods employed.

The projects draws on the data and expertise available through strong links with RR.

**Supervisors:** Dr R F Harrison (Automatic Control and Systems Engineering) and Professor P J Flemming (Automatic Control and Systems Engineering)

**Scholarship:** Sheffield Engineering scholarships cover the full cost of PhD registration fees for 3 years

**Eligibility:** Sheffield Engineering scholarships are available to students who secure a CSC scholarship. Applicants must meet the University of Sheffield English Language requirements, full details of which are available at:

<http://www.shef.ac.uk/postgraduate/info/englang.html>

**Applications:** Please send a CV together with a brief covering letter to Dr Catherine Biggs, Faculty of Engineering Head of Research Studies at [c.biggs@sheffield.ac.uk](mailto:c.biggs@sheffield.ac.uk) by **17<sup>th</sup> Feb 2010**. Include the title of the project in your covering letter and any English language test results.