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New Power Generation

Creating the wave of
engineers to make
wind energy work

02

DIGITAL INCLUSION / IMPROVING AIRCRAFT RELIABILITY / ENERGY SCAVENGING SENSORS



Read the signal

New data analysis technology, developed with EPSRC funding, is improving aircraft reliability, helping York's buses run on time and even assisting better management of chronic health conditions.

Words: Judy Redfearn

In 2002, Rolls-Royce was searching for new ways to improve maintenance and reliability of its engines – a huge factor in securing billion dollar contracts to supply the world's biggest aeroplane manufacturers.

The solution was new software and hardware technologies capable of analysing aircraft engine performance data quickly and accurately and making it available simultaneously at locations around the world.

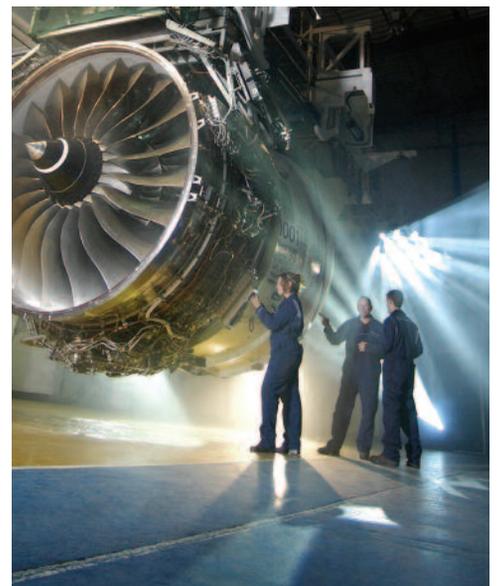
It sounds simple – but a fleet of aircraft in continual operation generates terabytes of data, equivalent to several thousand CDs worth in a year. Rolls-Royce needed a way of pooling this vast distributed data resource so that comparisons between signals could be made rapidly.

Rolls-Royce responds to automatically generated signals that could indicate the need for engine maintenance. This involves highly skilled engineers visually inspecting the engine vibration data which is downloaded to a database when the plane lands at a suitable airport.

However, getting a clear idea of the nature of the problem often requires comparison with data from similar aircraft, which may have been downloaded to databases held at different airports.

The Distributed Aircraft Maintenance Environment (DAME) e-science project, funded by EPSRC, tackled both of these issues. And it has already logged a positive impact.

Rolls-Royce is now using DAME technology in its new Intelligent Engine Health Monitoring systems to reduce maintenance disruption and



increase the amount of time an aircraft spends in flight.

“Towards the end of the project, we presented the results to Boeing who were then deciding on their engine providers for the 787 Dreamliner. They were impressed with the technology and that was one of the factors cited for choosing Rolls-Royce,” says Graham Hesketh, project manager for DAME at Rolls-Royce.

DAME built a computing grid that effectively transformed the widely dispersed databases into a distributed data repository that could be accessed by a maintenance engineer anywhere.

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Graham Hesketh

The swept 20-blade fan of the Rolls Royce Trent 1000

Researchers also developed pattern matching software, called Signal Data Explorer (SDE). “SDE searches a dataset of signal data for an ‘event’, an unusual pattern in the data, and then compares it with other ‘events’ held across the whole repository of datasets”, says York University’s Professor Jim Austin, who led the project. This enables new patterns to be linked to appropriate maintenance requirements.

Many transport operators already record data generated by sensors on their vehicles, but they lack the resources and know-how to interpret them accurately and efficiently. Now Cybula, a company spun-out from DAME research, is commercialising tools that could help.

“Industry often collects data then doesn’t know what to do with it. You have to think of the analysis first,” says Professor Austin.

For more information about EPSRC-funded research in this area contact:

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For more information about Cybula visit:
www.cybula.com

Other industries picking up DAME’s signal

Following the success at Rolls-Royce, train and bus operators, traffic managers, oil and gas pipeline operators and healthcare professionals are now knocking on Cybula’s door.

- The residents of York may soon be surprised to notice the city’s buses keeping better time. DAME SDE software is being used to analyse traffic flow data including CCTV footage. The plan is to make traffic lights more responsive to actual traffic flows and volumes.
- Dame SDE software can also detect leaks in pipelines. A leak sets up pressure waves in the liquid which can be detected by pressure and flow meters on the pipe. By analysing data from these meters, SDE can detect leaks and pinpoint where they are.
- SDE is being used to identify and search for signals in brain cell activity that could be related to different diseases.
- In Leeds SDE is helping patients and doctors manage chronic kidney disease by searching through data on kidney function for patterns that could be correlated with changes in treatment.