Thermal vacuum testing

Creating a facility to measure the thermal conductance of spacecraft components to increase certainty in design and engineering, and reduce time, effort, and costs.

The Oxford Brookes team set out to create a facility that can measure thermal conductance of such components to a known accuracy, across a wide temperature range. Such a facility offers the prospect of a database of thermal conductance across a range of common spacecraft components, and more accurate thermal models of systems and instrumentation. This in turn can reduce vacuum testing requirements, and offer greater certainty and reduction of over-engineering in design, thereby reducing costs. Additionally, it will allow thermal testing of assembled or complex components such as circuit boards, and allow testing of bolted or welded joints before and after simulated launch vibration.

Designers and engineers face significant challenges in predicting the thermal properties and behaviour of spacecraft, their associated sub-systems, and structural components in an orbital environment. Predictions are dependent on assumptions made and the accuracy of available data – which is often scarce in the case of unique systems, components and materials.

The project:

- The team successfully designed, assembled and commissioned an effective test rig.
- Vacuum test data produced for a number of Commercial, Off-The-Shelf (COTS) components.
- Further development offers the prospect of more reliable, component-specific datasets for COTS hardware, and reliable testing of structural components and joints, across wider temperature ranges, to aid thermal engineers.
- Production of reliable data sets would facilitate the development of more accurate thermal models of systems and instrumentation in spacecraft, reducing time, effort, and costs.

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For further information see https://space.brookes.ac.uk