RAL

DESIGN & DISCOVERY

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RUTHERFORD APPLETON LABORATORY

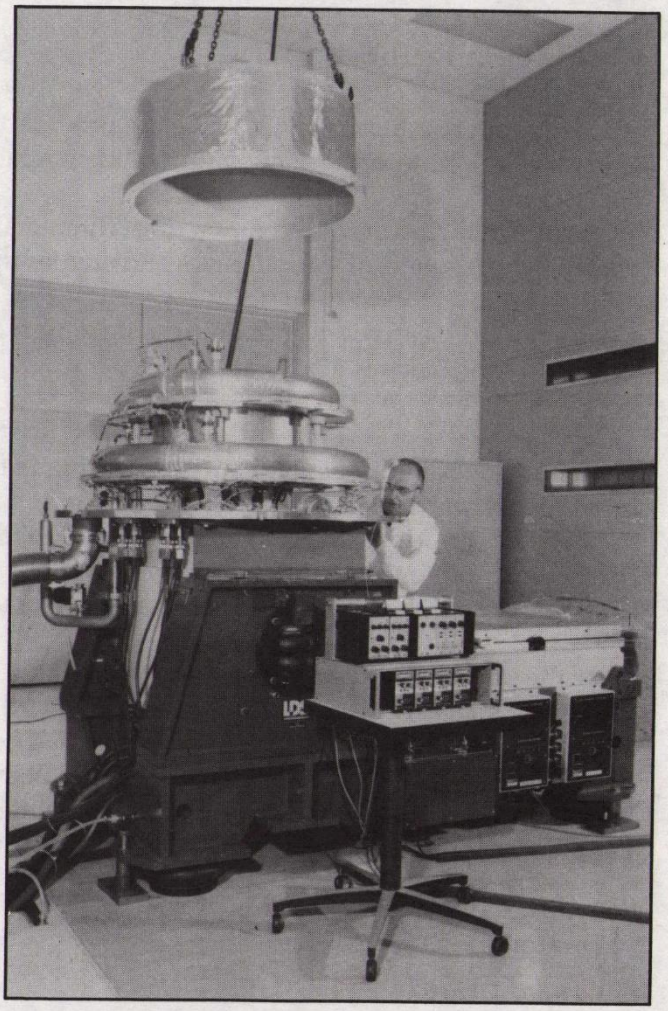
SCIENCE AND ENGINEERING RESEARCH COUNCIL

The RAL Space Environment Test Facility

As part of its role in supporting University space research, RAL has established facilities for the development, assembly, functional testing, qualification and integration of components and subsystems for space science instruments. The primary aim is to provide specialist services to UK University scientists and engineers during the development phase of projects funded by SERC, but commercial work is also undertaken if suitable facilities are not available elsewhere.

RAL's facilities include clean vibration and thermal vacuum testing systems, very clean assembly, integration, and test (AIT) rooms, and a modal analysis service. Extensive use is made of computers to control the operating functions and display measured and analysed data.

Vibration and structural analysis



• Vibration and shock excitation is provided by a Ling Dynamic Systems Type 954LS Vibrator/ Slip Table Combo system which is operated by GenRad 2506 and 2530 Controllers using their SINE, RANDOM, and SHOCK software.

• This vibrator can handle items weighing up to 35kg, applying the latest ESA and NASA environmental test specifications.

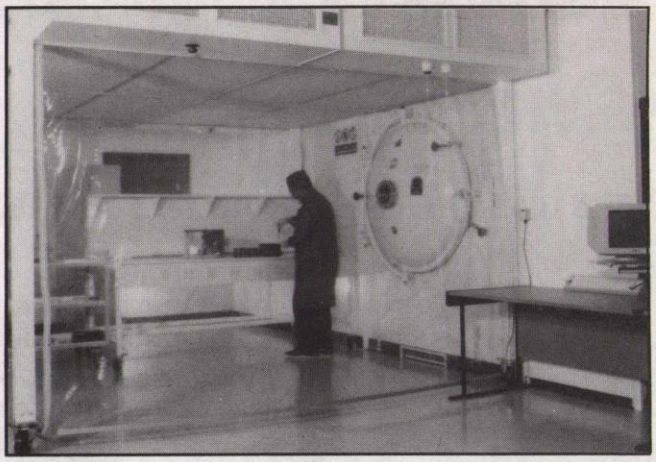
• Items being excited can be cooled down to 4K (-269°C) by a liquid helium cryostat designed and developed by RAL which stands over the vibrator.

• A smaller vibrator system (Derritron VP85/ TWA3) can vibrate items weighing up to 5kg in three axes.

• Data collection, analysis and storage (16 channels) is available via a GenRad 2515 Computer Aided Testing (CAT) system which also uses SDRC MODAL PLUS software for dynamic and modal analysis exercises.

• The dynamic response and modal analysis activities are closely associated with a Structural and Thermal analysis team which uses Finite element and other techniques to estimate the resonant responses of aerospace structures. IDEAS software is used for data collection and communication is via an Ethernet local network.

Thermal vacuum testing



• The main thermal vacuum facility is a turbo molecular pumped vacuum chamber containg a thermal shroud 1.0m diameter and 1.7m long. This is cooled using liquid Nitrogen to 100K (-173°C) and electrically heated to 345K (+72°C), to simulate the thermal cycling suffered by hardware whilst also in the vacuum of space.

• The facility is controlled by a desk top micro-processor which also provides graphical displays of measured and analysed data.

• Most of the work concerns thermal cycling and balancing of prototype items from university science groups who measure and define the thermal characteristics of their space instruments.

• Included in the facility is a bakeout tank in which space hardware is cleaned up prior to integration into spacecraft.

Clean room facilities

• Clean room conditions to Class 100 are provided by an AIT facility where university groups can assemble, integrate, and functionally test their space science instruments.

• Curtained enclosures, with down draft filtered air units overhead, can be joined together to provide clean rooms of various sizes and shapes up to 15 square metres floor area.

• A dedicated clean room containing a 3m x 3m x 5m long horizontal laminar flow clean tunnel to Class 100 conditions is also available.

These facilities are directed towards providing ready access for testing subsystems and small instruments, particularly where cleanliness of the testing or assembly environment is of paramount importance. Priorities can be readily adjusted to meet the requirements laid down by SERC's funding Boards. Formal testing of large instruments is not undertaken at RAL as there are suitable facilities available within the UK Aerospace industry and at ESA and NASA.

Over the past several years RAL has accumulated a lot of experience in the field of environmental testing for space; two of the experiments on board the GIOTTO spacecraft, which flew past Halley's comet in 1988, contained subsystems which had been tested at RAL. Recent testing has included subsystems for the ATSR instrument which will measure sea surface temperature when it is launcehed on ERS-1 in 1990. Currently the facilities are doing work on items for the ROSAT Wide Field Camera and on prototypes for the SOHO-Cluster, ISO, and SPECTRUM-X projects.

For further information on this project, please contact Mr Norman Ferguson, Rutherford Appleton Laboratory. Tel 0235 446526