ESTEC

The Establishment

It was the 35th Anniversary of ESTEC in 2003 and, in line with tradition, it was marked by hosting the 166th ESA Council Meeting at the Establishment.

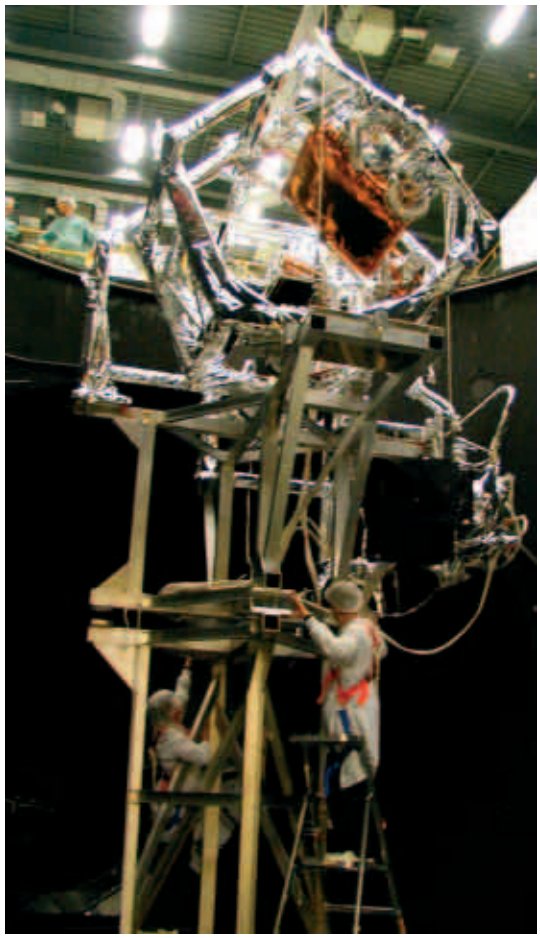
It was a very active year with a record number of visitors and Workshops/Conferences. There were some 6400 visitors and 72 events, compared with about 5600 visitors and 49 meetings in 2002. The strong political interest in ESTEC was reflected in the high number of VIP visits, including the opening of 'Physics on Stage 3' in November by HRH Prince Johan Friso of the Netherlands. Another significant ESTEC event was the Industry Space Days (ISD) Workshop, which served as a forum to gather industry's opinions and ideas concerning current European space-community issues. This event was timed to coincide with the 209th meeting of ESA's Industrial Policy Committee (IPC), and some of the most significant achievements in space technology were on display for both the IPC delegates and the ISD participants.

Building activities aiming at eliminating asbestos, removing temporary accommodation and barracks, and regrouping ESTEC staff by Directorate/Department continued. As part of this effort, construction of a new modular office building began.

In addition, a health and safety review of the ESTEC technical facilities was conducted in accordance with Dutch standards, leading to a substantial follow-up action plan. In the context of an ESA-wide project to enhance on-site security, different access levels have been assigned to the various areas within the Centre.

ESTEC Test Centre

The ESTEC Test Centre hosted several spacecraft during the year: MetOp-1 (flight-model payload) and SMART-1 for completion of their test campaigns; the Automated Transfer Vehicle Integrated Cargo Carrier (ATV ICC) for a vibration test campaign on the hydraulic shaker (HYDRA); and MetOp-2 (flight-model payload), which arrived in November for testing in the Large Space simulator (LSS).



Installation of the MetOp payload-specific test setup in the Large Solar Simulator at ESTEC

In parallel, a number of smaller test campaigns were conducted for various satellite instruments, antennas and solar arrays, in support of the Directorates of Science (e.g. Venus Express), Human Spaceflight, and Earth Observation, as well as for external customers.

The Test Centre's extremely heavy workload in 2001 and 2002 had meant the planned updating of the test facilities had to be delayed until 2003, when project schedules afforded the necessary access for infrastructure improvements to further improve customer service and further reduce test-campaign costs.

A major new investment in 2003 was the large Electromagnetic Compatibility (EMC) Chamber which, when completed in February 2004, will complement the existing large thermal, mechanical, and acoustic facilities, and will thereby provide customers with the full testing capability for both large and small space systems. This new facility, which is also suitable

for non-space tests, will be used for the first time in spring 2004 to test the first protoflight model of the ATV.

Development of a web-based inventory of ESA Member State environmental test facilities was begun.

European Co-ordinated Test Centres

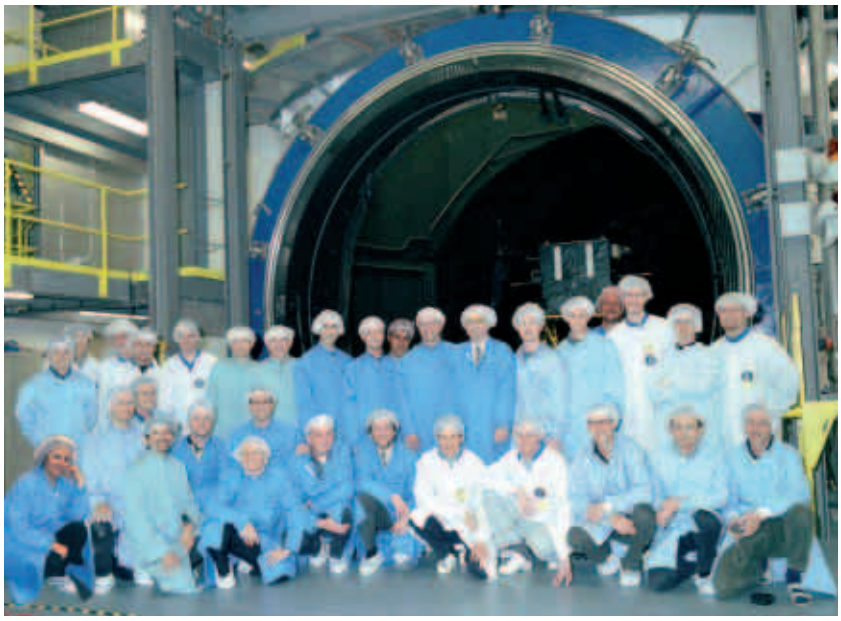
ESA-related activities at the co-ordinated test centres included the testing of the MetOp service module at Intespace (F) at the beginning of the year, and the first MetOp spacecraft flight model at the end of the year. At IABG (D), tests were conducted on MetOp's solar array and ASCAT antenna. The new cryogenic vibration test facility at CSL (B) was used for the Herschel/Planck instruments. In addition, the large thermal-vacuum chamber was modified to accommodate the Planck cryogenic tests.

The ESTEC Laboratories/Facilities

Electrical Engineering

There was sustained activity in the European Battery Test Centre, supporting both ESA projects (BepiColombo, Cryosat, Galileo, etc.) and external customers (CNES, Inmarsat, Mitsubishi, Astrium), and for the evaluation of advanced technologies.

The new RF corona test facility at ESTEC



The SMART-1 team in front of the Large Solar Simulator at ESTEC

For the Solar Array Laboratory, significant investments were begun to support the development of high-efficiency solar cells and solar-panel qualification and testing, both at Spasolab (external facility) and at ESTEC.

The Payload Systems Laboratory will host all Galileo System validation and verification test facilities. In 2003, the Galileo Ground Segment System Test Bed (GSTB-V1) was installed and accepted, along with the Galileo Signal Validation Facility (GSVF) and the Galileo System Simulation Facility (GSSF). These facilities will be used for the in-orbit operation and performance verification for the first two Galileo satellites (GSTB-V2, A and B).

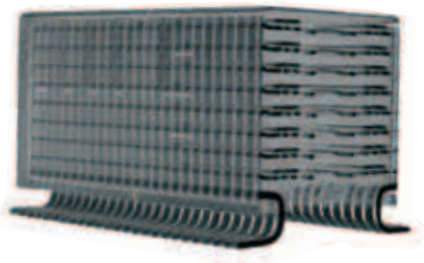
In 2003, a new RF corona test facility was added to the Laboratory. The test bed is software-controlled and can perform automated pressure and temperature profile cycling to given specifications.

Mechanical Engineering

Much progress was achieved with the ISO/IEC 17025 accreditation of the Optics, Mechanical Systems, Life-Sciences Instrumentation, Electric Propulsion, and Metrology Laboratories. This accreditation (by the RvA), which adds system-quality and

technical-authority value at international level, will be formalised early in 2004.

A record number of tests were performed in the Mechanical Systems Laboratory (more than 45), in support of ESA projects, technology programmes and industry, many in 'fire-brigade mode'. Activities in the Propulsion Test Laboratory in support of ongoing ESA projects included the acceptance testing of all flight-model cold-gas thrusters for CryoSat, due for launch in 2004. Significant upgrades were made to the ESTEC Optics Laboratory during the year to enhance its laser-testing capabilities for lidar applications in Earth remote sensing.



X-ray image of a 3D component package

Components and Materials

The Electromechanical, Electrical and Electronic (EEE) Components Laboratory continued to provide value-added project support to the space community in the form of parts testing, failure analysis, and technology characterisation activities. In following the rapid evolution in semiconductor technologies, the Laboratory has continued to enhance its analytical capabilities, particularly in the areas of advanced packaging technologies, environmental testing, monolithic microwave components, and micro-system technologies.

The ESTEC Materials Laboratory supported projects Agency-wide by analysing new materials and unusual manufacturing processes to assess their suitability for particular space applications. Spacecraft hardware that had been environmentally tested was checked for degradation, and failure investigations were performed both for ESA projects and European space industry.

The new Science missions such as BepiColombo, Venus Express and Solar Orbiter pose great materials and processes challenges due to their operating in close proximity to the Sun and their exposure to high temperatures and harsh solar radiation. Candidate materials for these missions have been exposed to simulated near-Sun environments in the ESTEC laboratory, and additional work has been done on new methods for lifetime modelling by thermal analysis.

Investments such as the new mass spectrometer for the off-gassing facility enable novel organic materials to be selected for use in manned environments. The nano-indentor tool and scanning acoustic microscope are now used to ensure the reproducibility of processes involving advanced ceramic composites such as C-SiC, as well as more conventional processes such as brazing.

Staff preparing a high-intensity materials test for ESA's BepiColombo mission