'98 Annual Report

European Space Agency
Agence spatiale européenne

THE ACTIVITIES

B

Scientific Projects
Scientific Research & Earth Sciences
Earth Observation
Telecommunications
Space Transportation
Manned Spaceflight & Microgravity
Technical & Operational Support
Technology
International Cooperation
Public Relations
Publications

Technical and Operational Support

Mission Operations

Operational support activities in 1998 were centred on the following projects and events:

- the launch of Pastel on the Spot-4 spacecraft
- the continuation of the ERS-1, ERS-2, Marecs-B2, ECS-4, ECS-5, ISO, Ulysses and Huygens missions
- the preparations for XMM, Envisat, Integral, Cluster-II and Rosetta mission operations, and for supporting the manned space programme.

ECS

ECS-4 and 5 continued to provide successful communications services to Eutelsat throughout the year, with operations conducted from the Redu (B) ground station. At the end of the year, Eutelsat decided to relocate ECS-5 from 21.5°E to 12.5°W. It also extended the contract for ECS operations to December 1999 (with the possibility of a further extension).

Marecs-B2

The Marecs-B2 mission-control operations are also conducted from the Redu (B) ground station, with the telemetry, tracking and control link provided by the Villafranca (E) ground station. The payload capacity is leased by ESA to Nuova Telespazio.

ERS-1 and ERS-2

These two remote-sensing spacecraft continued to be operated from the ESOC Mission Management and Control Centre, using the ESA ground station in Kiruna (S) as the prime command and control station with the Villafranca (E) station serving as back-up. Despite the reduction in solar-array power on ERS-1, Synthetic Aperture Radar (SAR) interferometery using both spacecraft has continued, ensuring global land coverage. There are still sufficient onboard resources to continue operating both spacecraft for several more years.

Ulysses

With the crossing of the ecliptic plane, Ulysses reached a significant milestone in early May, becoming the only spacecraft to have completed an orbit over the Sun's poles. At the end of the year, after more than 3000 days in space, all experiments on board were still functioning flawlessly and Ulysses continues to return first-class scientific data from its unique vantage point in space.

The ESA flight control team, located at the Jet Propulsion Laboratory (JPL) in Pasadena (USA), are now preparing for the second polar passes in 2000 and 2001, when the Sun will be at its most active.

ISO

Launched in November 1995, the very successful ISO scientific mission was terminated in April 1998 when the spacecraft's liquid-helium supply was finally depleted. A short technology test phase then followed to evaluate the performance of one of the scientific instruments under non-cryogenic conditions, and of such equipment items as the gyroscopes and star trackers, for the benefit of future ESA missions such as XMM and Integral. After being re-orbited, ISO was finally switched off on 16 May. All spacecraft operations had been conducted from the Villafranca (E) Control Centre.

Huygens

The Cassini spacecraft continues to perform well on its journey to the Saturnian system. The first of the four planetary fly-bys required to reach Saturn occurred without incident in April as Cassini passed within 284 km of the surface of Venus.

Two Huygens Probe checkouts on 27 March and 22 December, and a special test operation in May, were successfully carried out. The results confirmed the excellent health of both the Probe and its scientific instruments.

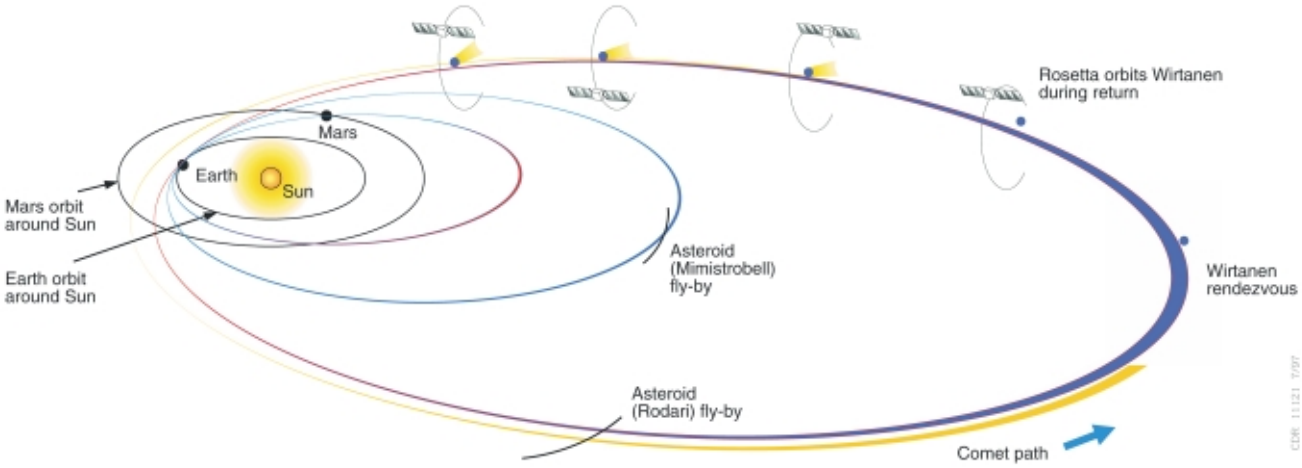
The Huygens engineering model, upgraded to be flight-representative, was installed at ESOC and has been used to characterise the Huygens Probe's behaviour and to explain some unexpected in-flight observations. It has proved to be invaluable for testing the sequences to be used for the checkouts.

Pastel

This ESA optical payload, launched on 24 March on the French Spot-4 remote-sensing satellite, is operated using the Redu (B) mission-control system, which interfaces with the Spot-4 control centre at CNES in Toulouse (F). The in-orbit and commissioning tests were successfully completed during the year and Pastel is now awaiting its Opale companion terminal, to be launched aboard ESA's Artemis satellite in February 2000, in order to fully demonstrate European data-relay laser communications.

XMM

XMM mission operations will be conducted from ESOC, and the science operations from Villafranca (E). Major achievements in this context in 1998 were the successful ground-segment implementation review, the first deliveries of all major ground-segment software systems, and the start of ground-segment integration and testing. This culminated in a



Schematic of the Rosetta mission phases

successful demonstration of spacecraft telemetry processing ability during the first Control Centre 'listen-in test' conducted at the end of the year.

Cluster-II

All ground-segment changes that were considered mandatory since Cluster-I have been defined and their implementation is in process. This includes the transfer of the Odenwald (D) antenna to Villafranca (E), which was started in October and will be completed in September 1999. It has been confirmed that the science data-recovery objectives can be met with just the one ground station for the routine mission phase. A first System Validation Test has been conducted between ESOC and the actual spacecraft flight hardware at Dornier (D).

Envisat

The preparations at ESOC for Envisat's operation are progressing according to plan. The first System Validation Test has been successfully completed and system development and integration activities are on schedule for the LEOP and routine-phase operations.

Integral

Integral mission operations will be conducted from the Mission Operations Centre (MOC) at ESOC. The ground-segment development effort has proceeded according to plan, for an April 2001 launch, with completion of the architectural design phase for the major subsystems.

Rosetta

With approximately four years until launch, all ground-segment implementation activities are well under way, including the procurement of a new deep-space antenna. The Ground Segment Requirements Review was successfully completed in October. The Board requested that the potential of radio-frequency interference at S-band in deep space be addressed as a matter of urgency.

Manned Flight

ESOC's manned-flight support during 1998 was concentrated around collaboration with ESA's Directorate for Manned Spaceflight and Microgravity, NASA and the Russian Space Agency on operations analysis and appropriate systems interfaces for Columbus and ATV mission planning and control.

ESOC's International Space Station (ISS) related communications system (Interconnection Ground Subnetwork: IGS) reliably supported, as a common European infrastructure, all requisite communications services between the USA, Europe and Russia, as well as those within Europe between the many decentralised ISS utilisation and control community members.

Ground Systems Engineering

Ground Stations

Following a preliminary design phase, a contract was placed for the procurement of a 35 m deep-space dish antenna to be installed in the Southern Hemisphere. The system will support S-band and X-band up- and down-links and is also designed to be capable of supporting Ka-band reception at a later date. The design is due for review at the beginning of 1999.

The ESTRACK ground stations of Kourou, Villafranca and Perth were reconfigured with new-generation data-processing equipment (monitoring and control, telemetry and telecommand). The validation of equipment and software to support XMM operations is foreseen before mid-1999. The Kiruna ground station's reconfiguration to support Envisat will be completed in March 1999.

After approval by the ESA Council of the moving of the Cluster ground station from Odenwald to Villafranca, the dismantling and re-installation activities for the 15 m antenna were started in October.

The ESTRACK Network Control Facility at ESOC in Darmstadt (D)

The planned development of a fully digital system to replace all analogue receivers, modulators, demodulators and tracking systems at all ESA stations from the year 2000, successfully passed its design review. The first production unit should be delivered before the end of 1999.

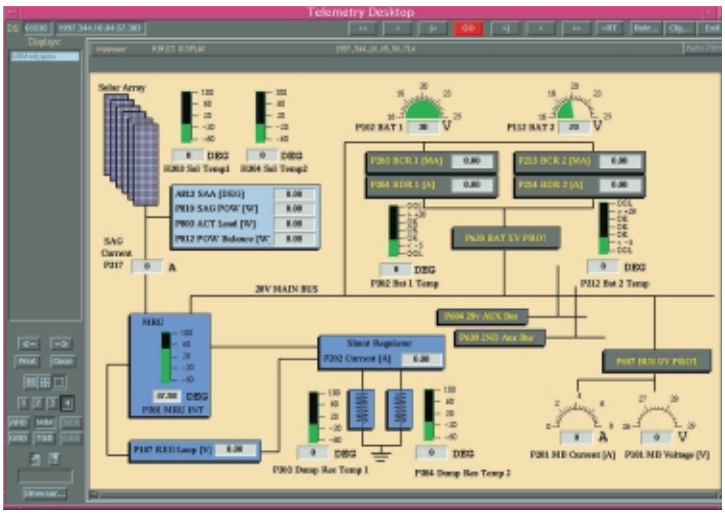
Flight Dynamics

A new-generation star-catalogue facility, which is planned to be used for all future spacecraft carrying star sensors, has already been used successfully for XMM. This novel facility is attracting both internal and external customers.

Support to external customers was provided by the ESOC flight-dynamics team in 1998 for the ETS, Comets and Delta missions. Consultant/expert support was also provided for the launch operations for Inmarsat's latest spacecraft, contributing substantially to the success of that mission. Highly valued support was also provided to the ARP programme, for which high-precision trajectories were computed with the help of IGS-derived GPS products.

The development of a versatile software package for the navigation of Earth-observation satellites

A typical SCOS-II display screen



(NAPEOS), which combines the orbit determination and control functions and also has precision-localisation capabilities, was completed in 1998.

Mission Control System

A new generation of Mission Control System (MCS) is being implemented:

- The SCOS-II generic MCS infrastructure system, which had already been used successfully for the MTP (LEOP), Teamsat and Huygens missions, also played a major role in the SOHO recovery activities. The system's implementation will be completed in 1999, at which time it will be renamed SCOS-2000.
- The deployment and customisation of the system for different missions has been shown to be both quick and cost-effective. It was configured to handle XMM's telemetry and telecommanding as a test case. PROBA will be the first project to use the system for both checkout and routine operations.

The Equator-S satellite, and some of the novel solar-cell types tested

Simulation

An activity was started to modernise the Software Infrastructure for Modelling Satellites (SIMSAT) currently in use. The new version of the product, SIMSAT-NT, will be available in mid-2000 and will be used in the Rosetta simulator implementation and for subsequent missions.

IT Infrastructure for Satellite Operations

A new Local Area Network (LAN) infrastructure was installed at ESOC in 1998 to replace installations that had been in use since the late 1980s and were no longer capable of meeting current/future requirements. The new technology provides switched high-capacity Ethernet connections (up to 100 Mbit/s per port) and also supports virtual LANs, allowing flexible reconfiguration to cope with changing utilisation scenarios for mission control or operational support facilities.

In-Orbit Communications Infrastructure

The Interconnection Ground Subnetwork (IGS) test bed has been continuously upgraded in support of the Columbus and ATV projects. This network is now available to provide communications support during the ISS Initial Utilisation Phase before the Columbus space segment is operational. Major connectivity and service enhancements have been made to the IGS test-bed relays at the Johnson and Marshall Space Flight Centers and additional IGS nodes have been introduced at DASA (D) and at ESTEC for the Columbus User Information Centre. The upgrading of a communications node for GSOC in Oberpfaffenhofen (D) is in preparation. The test bed has already been used successfully during the Spacehab mission on the STS-95 Shuttle flight, and to support a CNES mission to Mir.

Various studies were performed during the year in the field of Asynchronous Transfer Mode (ATM) technology, network management and low-cost multi-media implementations to support remote payload operations.

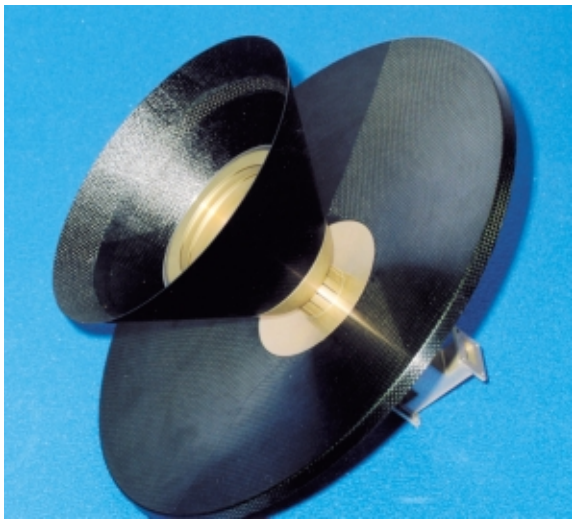
Electrical Engineering

Power

The demand for ever higher powers for all types of missions, and for telecommunications missions in particular, continued to drive the need for technology improvements in energy generation and storage. Several significant achievements in 1998 can be highlighted:

(a) Advanced solar cells

Technology in this area continues to evolve at a very rapid pace, with the mono-culture of silicon cells now being replaced by a variety of novel devices and



The Sopera shaped-beam antenna

materials. Compound solar cells with first-generation gallium arsenide (GaAs) on germanium mono-junction devices have already captured a major share of the market, and the development of multi-junction configurations with efficiency targets above 24% continues.

The pre-development of these multi-junction GaAs cells in Europe under ESA GSTP contract has shown very good results, culminating in the world-leading production of dual-junction GaAs cells by molecular-beam epitaxy at the Tampere University of Technology in Finland. These unique cells have a modest begin-of-life efficiency of about 21%, but strongly outperform all competitors at end-of-life due to their excellent particle-irradiation stability. Their superiority was confirmed by the testing of eight novel solar-cell types on the German Equator-S scientific satellite during the first half of 1998.

(b) Lithium-ion batteries

Lithium-ion batteries offer mass savings of 50% compared with today's nickel-hydrogen technology. Therefore, in a joint effort with CNES, such cells are being developed to qualification readiness for future large geosynchronous telecommunications spacecraft. A smaller battery module using low-cost commercial lithium-ion cells has also been developed to qualification readiness for small- to medium-sized spacecraft.

Antennas

Two major activities relating to antennas, which are a critical element both for spacecraft platforms and their payloads, can be reported for 1998:

(a) Antenna design: the Sopera shaped-beam antenna

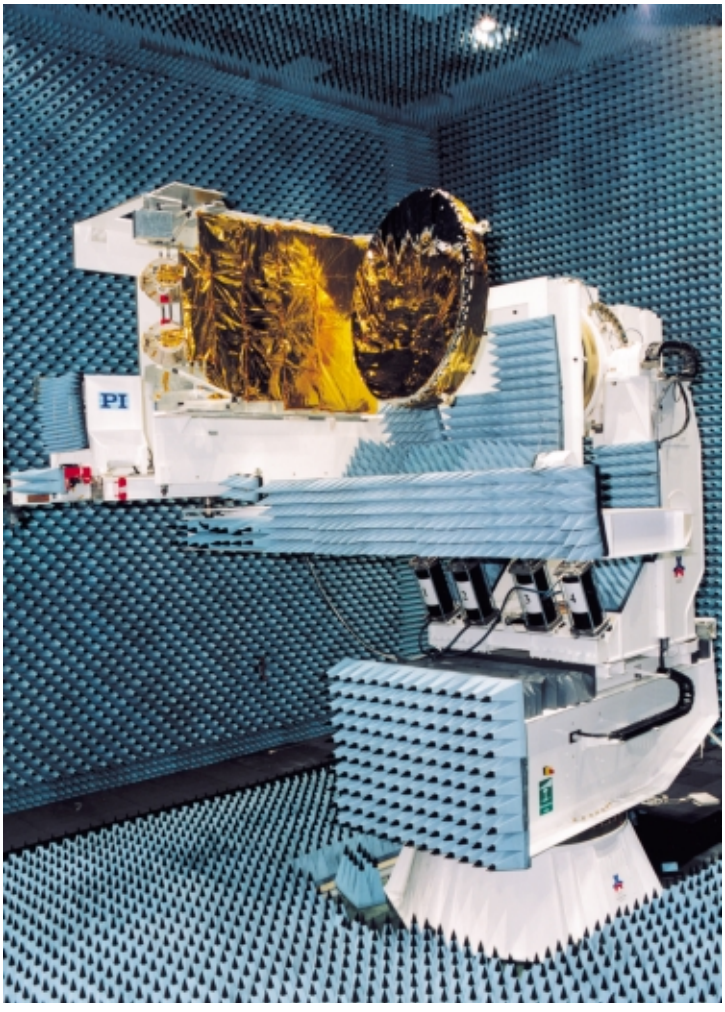
This novel antenna design by Rymsa (E) is the result of an ESA TRP/GSTP fast -track activity to develop a generic shaped-beam antenna providing full-Earth coverage for low orbiting (LEO) satellites. To ensure an equitable power flux density over the whole coverage area, the new antenna can have its minimum gain on its bore sight and a maximum at the edge of coverage, thereby compensating for differential path losses.

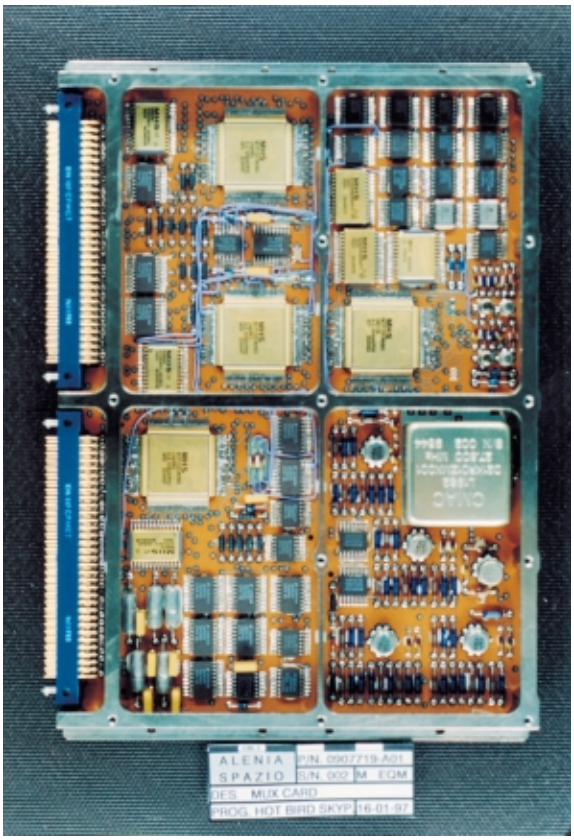
The TRP activity was performed with the Metop programme in mind, and the Sopera antenna has indeed been selected to provide the high-data-rate X-band link for the Metop spacecraft. This activity is therefore a good example of rapid response by the ESA TRP in collaboration with industry to progress a novel technology from concept to flight opportunity within 12 months. The antenna has obvious application for LEO satellite constellations for multimedia services operating in the Ku and Ka bands.

(b) Antenna testing: Eutelsat W24 flight antenna

Following the fire at their Cannes facility, Aerospatiale (now Alcatel Space) selected the Compact Payload Test Range (CPTR) at ESTEC as the only other suitable

One of the Eutelsat W24 antennas mounted on a mock-up of the spacecraft body on the CPTR main test positioner, at ESTEC (NL)





The Skyplex multimedia multiplexer

facility for measuring the East and West FM3 antennas destined for the commercial Eutelsat W24 series of satellites. The CPTR had already been qualified for Eutelsat via a previous campaign for the Hot Bird satellite series.

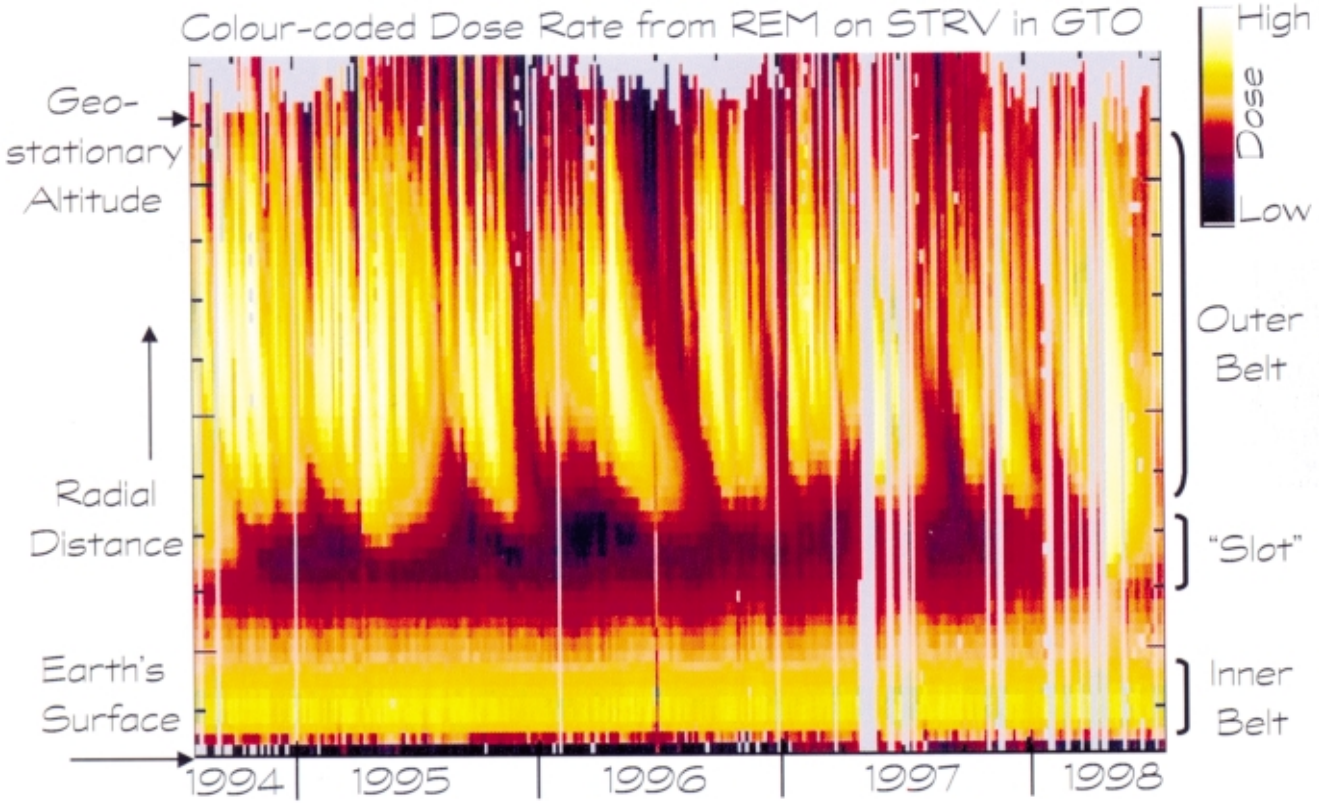
Wave Propagation

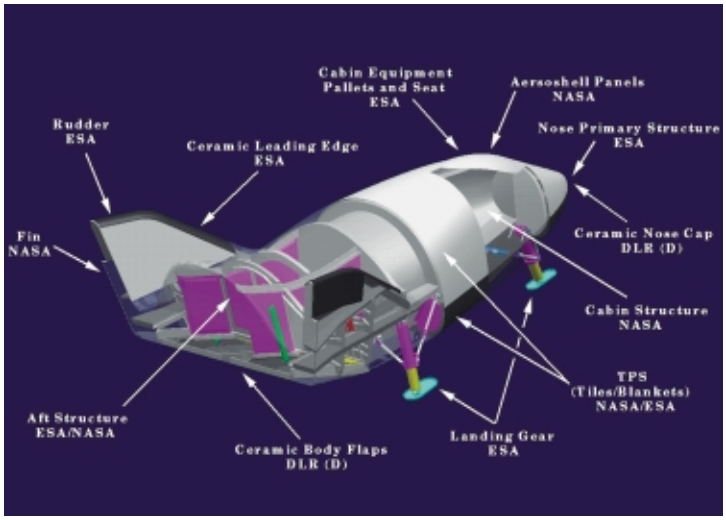
A high-precision ground-based atmospheric water radiometer has been developed, by Officine Galileo (I), which measures the atmospheric noise temperature at seven different frequencies. Apart from retrieving water-vapour and liquid-water contents, it can also derive a temperature profile using four oxygen absorption lines. The antennas used were built by Rymsa (E) and the nonlinear retrieval algorithm was developed by Tor Vergata University (I). The instrument's main application is the continuous monitoring of atmospheric conditions for calibration and validation campaigns and in-orbit testing.

Star Sensors

The new SETIS sensor is an autonomous, CCD-based, attitude-measurement sensor capable of locating and tracking stars with high precision, as well as targets such as asteroids or distant planets. Having detected a star pattern in its field of view, SETIS compares it with co-ordinate information contained in its internal star-catalogue memory. Having identified a pattern match, it computes its own pointing direction in inertial co-ordinates. It therefore gives any spacecraft

A typical colour-coded REM data plot, from the STRV-1b spacecraft operating in Geostationary Transfer Orbit (GTO)





The X-38 Crew Rescue Vehicle, with the mechanical components designed and manufactured in Europe highlighted

on which it is mounted the ability to recover from the so-called 'lost in space' scenario. SETIS has been designed and developed under ESA's GSTP programme by Jena-Optronik GmbH (D).

On-board Multiplexers

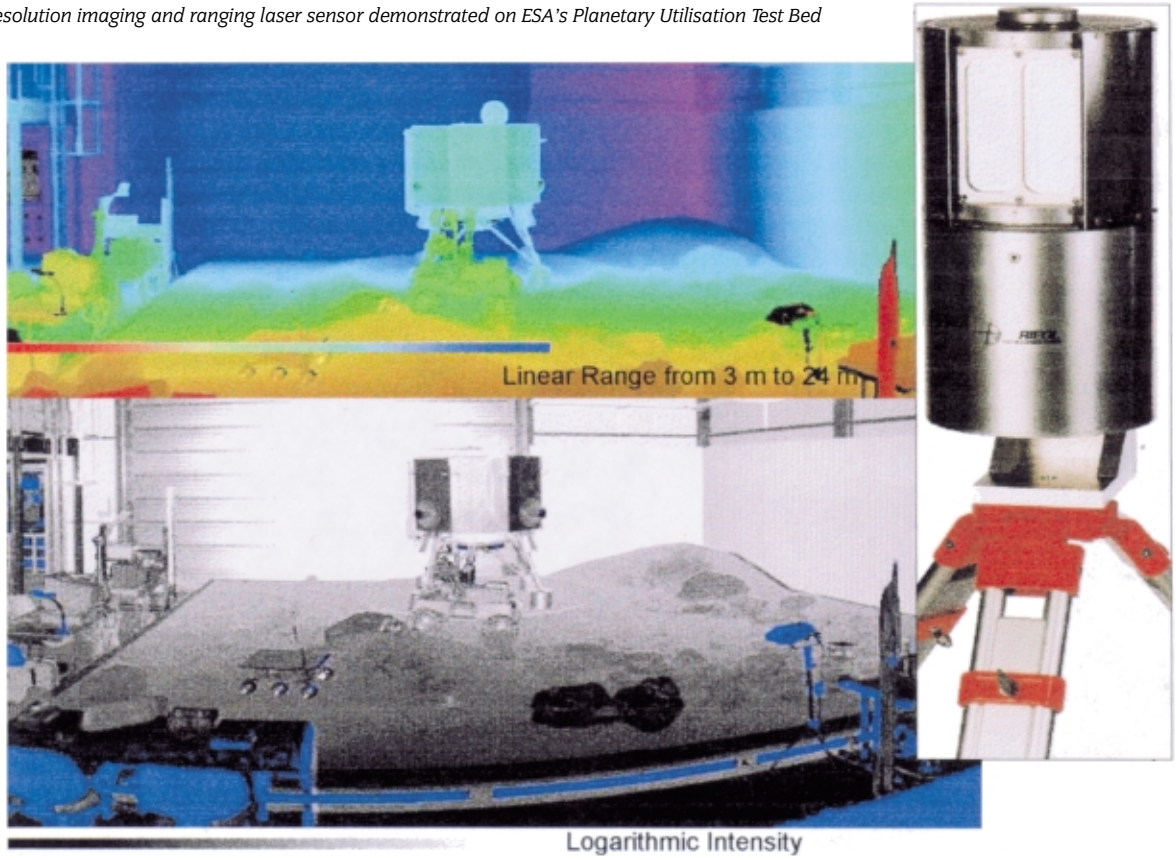
The 'Skyplex concept' was devised by ESA engineers, working together with Eutelsat, in 1994, to meet the needs of satellite operators seeking more flexible and more efficient capacity allocation for up-linked multimedia data streams. The first Skyplex unit, developed in the framework of various ESA technology programmes, was flown on Eutelsat's Hot Bird 4 satellite less than two years later. Since the successful test and demonstration campaign with the Hot Bird 4 unit in March 1998, Eutelsat has flown three more units on the Hot Bird 5 satellite launched in October, and has commenced commercial services.

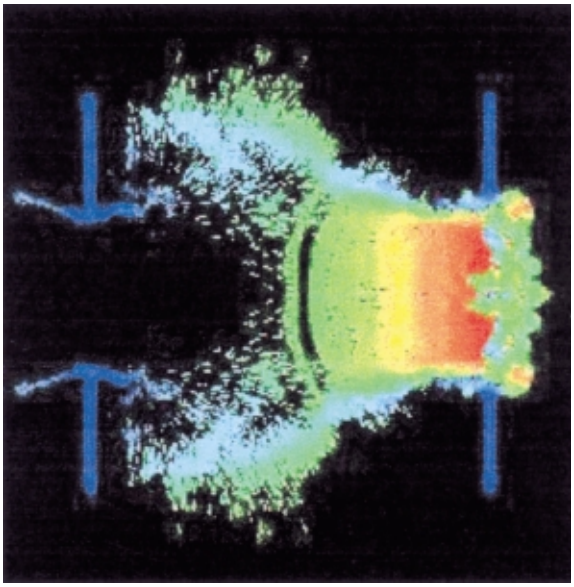
Space Environment Monitoring

ESA has a continuing programme to develop and fly monitoring instruments to support the assessment of the space environment and its potentially hazardous effects on technological systems. A Radiation Environment Monitor (REM) developed in cooperation with the Paul Scherrer Institute (CH) has been flown on the Mir space station (1994 – 1996) and on the STRV-1b microsatellite (launched in 1994 and still operational). REM's measurements of electrons and protons with energies above 2 and 20 MeV, respectively, are providing important data with which to improve existing radiation-belt models both in the context of the International Space Station and to support future space-weather-related activities.

The first Standard Radiation Environment Monitor (SREM) unit, which has its origins in the REM initiative, will be flown on the STRV-1c microsatellite late in 1999. Several future ESA technology and science missions, including PROBA, Integral and Rosetta, will also carry SREMs.

High-resolution imaging and ranging laser sensor demonstrated on ESA's Planetary Utilisation Test Bed





Simulation of micro-meteoroid impact damage on a honeycomb sandwich structure

Attitude Control

The highly challenging recovery of the SOHO spacecraft during the year was supported with detailed analysis and simulation activities conducted at ESTEC to provide the best possible understanding of the satellite's dynamic behaviour.

Mechanical Engineering

There was particular emphasis in 1998 on supporting ESA's endeavours in the areas of manned spaceflight and microgravity. The co-operative NASA/ESA development of the prototype Crew Rescue Vehicle (X-38 project) for the International Space Station was heavily supported in terms of mechanical design, structural analysis and verification, leading to important participation by European industry in this programme. Multiple microgravity instrumentation technologies were prepared for the various Space Station facilities, among them a digital holographic interferometer for the visualisation of temperature distributions in convective flows, and an automated multigeneration device for fruit-fly (Drosophila) cultivation in experiment containers for Biolab and the Modular Cultivation System (MCS). Several technology building blocks for payload-tending robot systems were also completed, including a ground station for the commanding and monitoring of robot-supported payload tasks.

There was also a strong technology focus during the year on the development of enabling technologies for future Space Science missions. This included building-block developments for space observatories (mirror technologies), stellar interferometers (adaptive optics) and X-ray missions (micro-channel plates). There was a major thrust in the preparation of means to support scientific investigations on planetary surfaces and comets. Very small integrated rovers capable of supporting versatile scientific measurements within 50 m of a lander and with superior locomotion capability even over rough terrain, were designed and prototyped. A high-resolution imaging and ranging laser sensor for planetary missions was manufactured and successfully tested with targets simulating Mars and Moon surface scenes. The achieved ranging distance to non-co-operative targets was up to 300 m with a range resolution of 25 mm.

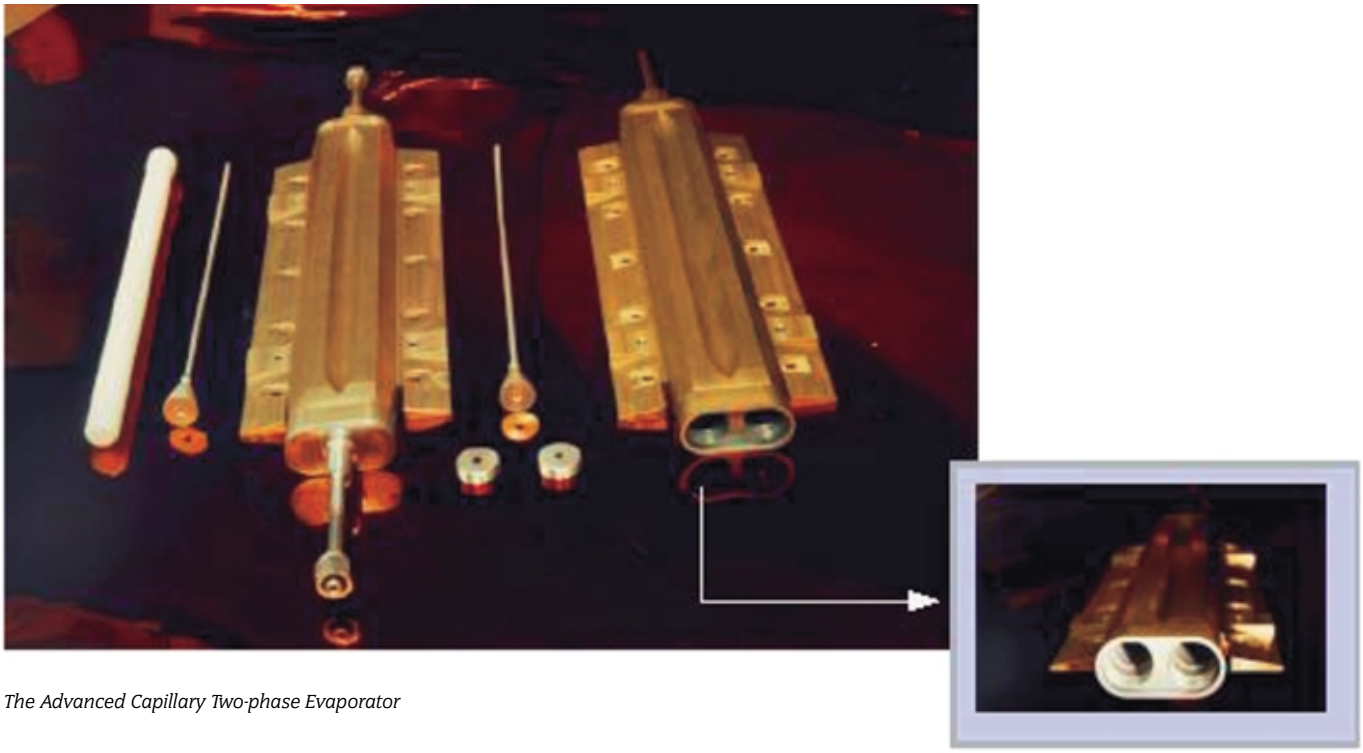
Work on free-space optical communications continued to be a major activity, to meet the commercial market's needs for global multimedia satellite networks. A compact laser terminal using Nd-YAG technology and coherent detection was developed for LEO-satellite constellations and submitted to final system testing. Taking full advantage of the advanced technology already at hand, a new class of terminals is now under development for long-range GEO-GEO links, and work has been initiated on optically switched high-capacity in-orbit networks. An engineering demonstrator of an optically phased telescope array for advanced laser communication terminals combining 16 telescopes of 3 cm aperture was also realised and successfully tested. Other contributions to telecommunications satellite programmes included new mechanisms for steerable antennas flown on the Eutelsat W24 satellite, and various consultancies in the domain of structures and mechanisms for such commercial projects as Hispasat-1, Astra-2B and Hot Bird.

The increasingly recognised problem of space debris and meteoroid impact damage on spacecraft structures was assessed numerically, and verified experimentally using advanced smoothed particle hydrodynamics techniques.

Thermal Control and Life Support Technology

The Agency's technology activities in the thermal-control domain were focused in 1998 on two-phase heat transport and on low-temperature cooling.

Interest in two-phase heat-transport systems has increased strongly, resulting in such systems being baselined for the Celestri/Teledesic satellite constellation and considered for other tele-communications spacecraft also. Typical applications of Capillary-Pumped Loops (CPLs) and Loop Heat Pipes (LHPs) are the thermal control of active antennas, north-south radiator coupling and deployable radiators. The Agency's efforts in this area were concentrated on further improvement of major components for such loops, e.g. successful development of an advanced capillary evaporator and first activities to miniaturise CPL/LHP systems. In addition, activities were started to develop



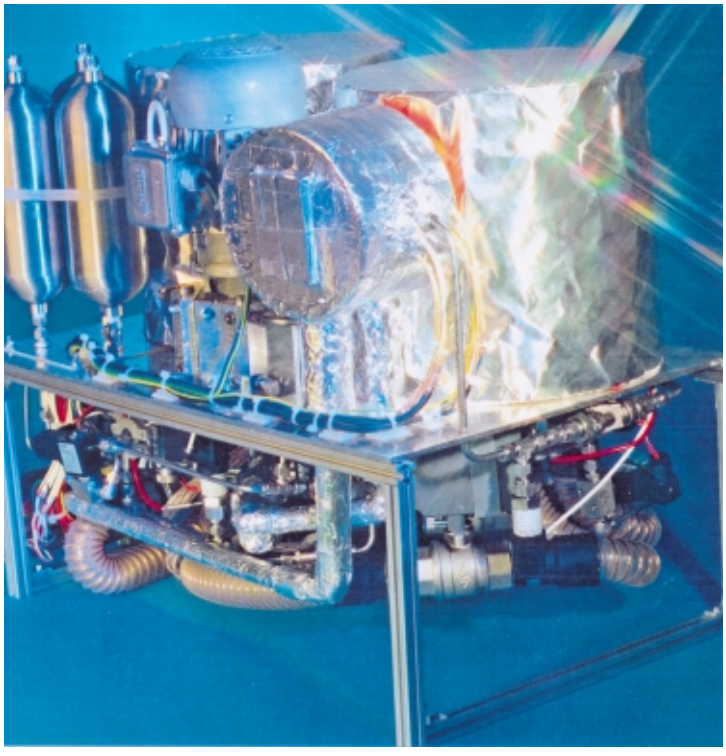
The Advanced Capillary Two-phase Evaporator

deployable radiators and to space-qualify LHPs, including the in-orbit demonstration of such items.

In the area of mechanical cryocoolers, emphasis has been put on the development of Pulse Tube Coolers, which should allow the technology to be simplified and improved in several respects. Qualification of the two-stage 20 K Stirling cooler and the 4 K JT cooler was continued in parallel. The provision of very low temperature cooling in space, which is based on pre-cooling using the above 20 K and 4 K coolers, is aimed at high-sensitivity detector operation for scientific missions. Work has continued on the various technologies associated with this temperature range: open-loop dilution refrigeration to produce 0.1 K (for the Planck mission), recyclable 0.3 K ^{3}He sorption refrigeration (for the First mission), 10 mK adiabatic demagnetisation refrigeration (for superconducting tunnel junctions), and nano-cryogenics with the NIS cooler (Normal Insulator-Superconductor tunnel junction).

In the physico-chemical life-support domain, the emphasis has again been on air revitalisation and atmosphere trace-gas monitoring technologies of particular relevance to the International Space Station (ISS). The air revitalisation system has reached the stage where the oxygen loop is now closed so that all of the oxygen is recycled from the exhaled carbon dioxide. The atmosphere trace-gas monitoring system, based on infrared spectroscopy, has been reconfigured for increased capability in terms of stability, detection limits and number of identifiable compounds in the gas mixture, anticipating ISS requirements. These are two areas where European technology is sufficiently mature to be seriously considered for ISS upgrades, perhaps in the context of the ESA/NASA barter process. The MELISSA (Micro Ecological Life Support System Alternative) project continued to provide the focus for the developments in advanced life-support that are essential for long-duration missions to remote locations such as Mars.

A Carbon-Dioxide Concentration System



The Mechanical Systems Laboratory has provided support to ESA projects and outside customers particularly for CTE (Coefficient of Thermal Expansion) and CME (Coefficient of Moisture Expansion) measurements and performance measurements on Multi-Layer-Insulation (MLI) blankets. A special calorimetric test set-up has been developed for the Rosetta scientific spacecraft to verify different MLI design concepts.

Propulsion and Aerothermodynamics

In the chemical-propulsion domain, development of a general-purpose propulsion system analysis tool was initiated with industry and co-ordinated with national agencies. In electric propulsion, two major technology developments were initiated with European Industry: a high-thrust Hall-effect ion thurster for use on large geostationary satellites and for satellite constellations in low Earth orbits; and the definition and selection of an electric-propulsion system to be used as a primary source of propulsion for ESA's SMART-1 technology-demonstrator project. Significant advances were made in the development of both caesium and indium field-emission electric propulsion systems, to be used in ultra-precise attitude and orbit control systems for several new science missions. Preparations for the flight testing of the caesium system on the NASA Orbiter are in progress.

In aerothermodynamics, major efforts were devoted to evaluating aerothermodynamic issues for ESA's new Ariane-5 launcher: safe venting of unused propellants from the attitude control system and from the upper stage; and both theoretical and experimental investigation of the complex mixing of free stream and propulsion system flows around the base of the vehicle. Good progress was made in the development of analysis tools for rocket plume impingement effects, and of a general-purpose aerodynamics analysis tool.

Product Assurance

European Cooperation for Space Standardization (ECSS)

The continuing effort with the national space agencies and industries to establish a single and unified system of space standards made significant progress in 1998 with the release of several new standards and the setting up of dedicated working groups for new documents.

A first batch of ECSS standards was submitted to the European Committee for Standardisation (CEN) and, having recently passed the voting procedure by the national normalisation institutes, they will now be issued as European Norms (EN). With the CEN's assistance, two ECSS standards were also submitted to the International Standardization Organisation (ISO), with a view to their conversion to ISO norms.

ISO 9001 Certification for ESOC

Following the decision In September 1997 to implement a quality system to have ESOC's products and services certified to ISO 9001 standard by the end of 1999, a Working Group composed of ESOC staff, with support from Product Assurance Department at ESTEC, is currently completing the documentation of the Centre's organisation, procedures and activities, under the direction of a Steering Group chaired by the Director of Technical and Operational Support.

In the first quarter of 1999, the Working Group will begin working with all staff to implement the ESOC Quality System, including the deployment of the necessary tools and provision of training. The third and final phase, in the second half of 1999, will be an independent audit of ESOC by an internationally accredited registrar to verify compliance with the ISO 9001 requirements.

Space Materials

Research activities have concentrated on new materials and materials testing. Most materials used in spacecraft manufacture are standard commercial materials, properly screened for their suitability for space applications. New materials developments are only pursued when a special need is identified, as in the case of materials used in launcher combustion chamber construction where heat-transfer properties are of crucial importance. A new alloy (Cu_6Cr_6Ag) being developed by Plansee (A) using powder metallurgy and special processing is achieving very good mechanical properties and hydrogen-compatibility testing is currently in progress. Reusable launch vehicles pose unique problems, especially in terms of high temperatures and dimensional stability, and appropriate materials investigations have been started as part of the FESTIP programme.

The ability to be able to detect defects in fibre-reinforced composites or ceramic materials is also a critical necessity. One approach, the so-called 'Probability of Defect Detection' (POD) method, used in the aircraft industry, is presently being applied to an advanced resin transfer moulded composite to assess/improve the utilisation of both ultrasonic and radiographic inspection techniques. Alternative inspection methods using low angle scattering X-rays, a technique developed by BAM (D), are also being investigated, as they offer several interesting possibilities for replacing certain conventional destructive tests, particularly those relating to porosity, fibre lay-up, etc.

European Space Components Co-operation

Under the auspices of the Space Components Steering Board (SCSB), efforts directed at cost reductions for components and procurement systems have been further pursued. At the recommendation of an independent study, the procedures for the transfer of ownership of the ESA/SCC Specification System from ESA to the SCSB have been drawn up. Under this new structure, the system would be operated as an agency/industry partnership.

Major emphasis has also been placed on the preparation of a five-year strategic component technology programme. It defines the research priorities for strategic and advanced components and has been derived from the translation of projected needs for future space programmes into component performance criteria and their mapping to expected technology trends in the components sector. The programme involves critical enabling technologies for medium- and long-term applications and is being offered to all partners in the SCSB initiative for co-operative implementation.

Initiatives directed towards global recognition of the joint European space components policy were pursued during the year. Initiatives with the USA, for example, for the creation of mutual confidence in each other's components via greater information exchange, comparison of requirements, and the performance of joint audits, have already been found to be very beneficial.

External and Media Relations

The ESTEC PR office organised many visits for interested groups, media representatives and VIPs throughout the year. Noordwijk Space Expo was able to field many of the requests for general visits, whilst those of a more technical or political nature were dealt with individually within ESTEC.

The year started with a visit by the NASA Administrator Mr Daniel Goldin to ESTEC in January. In May, the British Minister of State for Science, Energy and Industry, Mr John Battle, visited ESTEC for a full day, during which he also met the British staff. Several Ambassadors from several ESA Member States also visited the Centre, to learn more about the present status of the Agency's activities and the recent developments on the site. Nine so-called 'VIP visits' were organised during the year and some 30 other visits for special groups from all over the World.

ESTEC itself celebrated its 30th birthday in June. On the afternoon of 6 June, there were two staff-organised social events, with the cultural and sports clubs showcasing their activities and an international food festival catered by the nationals of all of the Member States. Some 1800 staff members, contractors and their families took part. In the evening, there was a dinner party in the ESTEC Conference Centre and Restaurant.

Many special media events were also organised throughout the year, such as the Press Days for XMM, Meteosat Second Generation, the STS-90/Neurolab Mission, Integral, the Ariane-503 launch, the STS-95 launch with ESA Astronaut Pedro Duque and the first assembly flight for the International Space Station.

Aside from these ESA-initiated events, many media representatives requested visits to ESTEC (60 in total) to film, take photographs and conduct interviews with ESA staff for television and radio programmes and for newspaper and magazine articles. ESTEC is well known to Europe's general and specialist press, resulting in many requests from the media for additional information on space-related issues.

ESOC also attracted the media's and the public's attention on several occasions during 1998. Starting with several Press Breakfasts at which the Director General and Director of Science set out their policies and targets for the coming years, the ESA establishment in Germany also welcomed Spanish-born ESA Astronaut Pedro Duque shortly before he left for the United States for the STS-95 mission in March. In April, the German Press was invited to a presentation on ESA's strategy, given by Mr Jean-Jacques Dordain, in the context of the next Council Meeting at Ministerial Level scheduled for spring 1999.

ESOC's doors were also opened to the general public for lectures on the History of Space and Spacelab in March and April. To reach out to a wider space-interested audience, ESA/ESOC staff made presentations to: an international group of students at the University of Heidelberg, Frankfurt International School, and the Association Internationale des Etudiants des Ecoles de Commerce. Two Workshops on 'Women for Space' were organised within the framework of the ILA international aerospace exhibition in Berlin in May, and as a cooperative effort with the Technical University of Munich in November. Both generated a positive response in Germany. Like the other ESA centres, ESOC staff were proud to witness the successful flight of Ariane-503 in the company of 300 VIPs and media guests. The night of the Leonids on 17 November also attracted live media coverage from ESA's Operations Centre.