In Brief

Next ESA Science Programme Director Appointed

At its 147th meeting, at ESA Headquarters in Paris on 19 and 20 October, the Council unanimously elected Prof. David Southwood (UK) as the Agency's new Director of Science from 1 May 2001 for the subsequent four years. Prof. Southwood will take over from Prof. Roger Bonnet (F), who has been ESA's Director of Scientific Programmes since 1984.

Prof. Southwood (aged 55) holds a BA in Mathematics and a PhD in Physics from Imperial College, London. He has spent most of his professional career at Imperial College, apart from two periods at UCLA (University of California, Los Angeles), first as a post-doctoral Fellow and later as a Visiting Professor. He joined ESA for the first time in 1997 as Earth Observation Future Programme Strategy Manager, after which, since April 2000, he has been Regent's Professor at the University of California.

Prof. David Southwood

Prof. Southwood has received numerous awards and honours and has held many Chairmanships during his career, including those of the ESA Science Programme Committee (SPC) and the ESA Space Science Advisory Committee (SSAC). He has also been active both in Europe and in the United States over the years in Public Outreach on Space Science. He has some 200 publications and 100 invited papers to his name.

"David Southwood is certainly one of the most prominent space-science experts Europe has the privilege to have", said ESA's Director General Antonio Rodotà in welcoming Prof. Southwood to his Board of Directors, ……*"and I am sure that, like his predecessor Prof. Bonnet, he will do a really good job for the excellent scientific community that we have in all our Member States"*. esa

Ulysses Encounters Blustery Weather at the Sun's South Pole

Just as solar storms are brewing, the European-built space probe Ulysses is venturing over the Sun's south pole for the second time in its 10-year life. The intrepid spacecraft passed 70°S on 8 September, shortly before the Sun's 11-year activity cycle is due to peak. Solar storms are already numerous and the high-latitude solar wind (the stream of charged particles blowing away from the Sun) is chaotic and blustery.

Conditions are now very different from those that Ulysses encountered during its first south polar pass in 1994 when solar activity, which is related to the magnetic behaviour of the Sun, was very low. Then, the solar wind at high latitudes was fast, but steady. This latest polar pass gives scientists the opportunity to learn just how different the polar regions of the Sun are at solar maximum compared with solar minimum.

After spending four months above 70°S, Ulysses will swing towards the equator early next year to turn its attention to the northern hemisphere, beginning its passage over the north pole on 3 September 2001. Although it will be travelling the same path that it followed six years ago, conditions will be quite different and new discoveries are eagerly awaited.

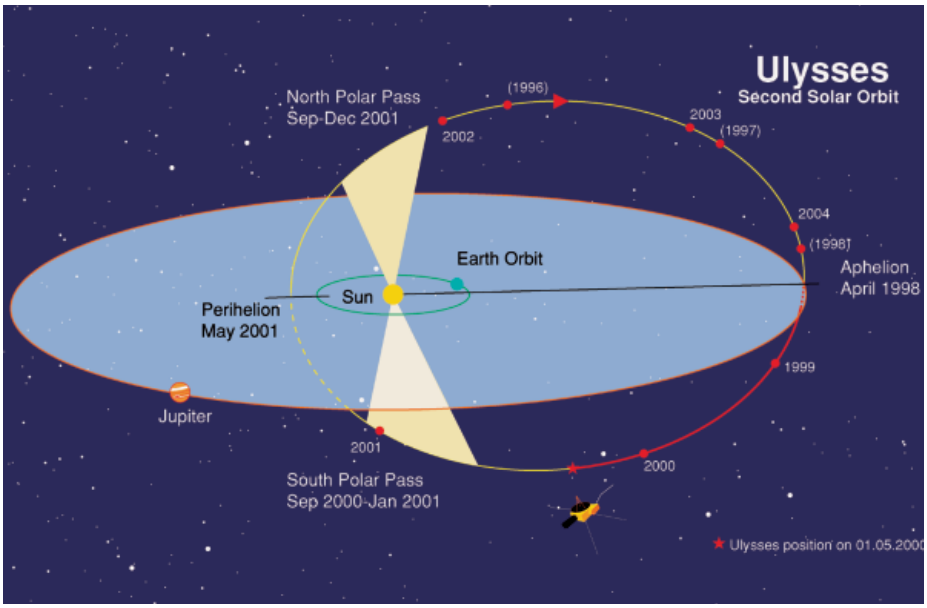
Since its launch in October 1990, Ulysses has already proved to be one of the most successful interplanetary missions ever. A joint ESA/NASA undertaking, it is the first spacecraft ever to be launched into an orbit outside the ecliptic, the plane in which the planets orbit the Sun. From this unique vantage point, it has changed our view of the heliosphere, the region of space filled by the solar wind and over which our Sun exerts its influence.

At solar minimum, instruments on board Ulysses found that the fast solar wind, emanating from the Sun's poles, blows at a steady 750 km/s and fills a large fraction of the heliosphere. The state-of-the-art instruments were also able to show that the boundary between the fast wind and the slower, more variable wind from the equatorial regions, is surprisingly sharp. Another surprise was that the effects of collisions occurring at low latitudes

between fast and slow wind streams continue to be felt all the way up to the poles.

Ulysses' discoveries, however, have not been confined to the Sun and heliosphere. Instruments on board the spacecraft have also made the first ever measurements of dust particles and neutral helium atoms originating outside the Solar System. These findings have contributed to a major increase in our knowledge about the gas and dust clouds surrounding the heliosphere. Other measurements have led to a better understanding of processes occurring even further away, in distant supernova explosions.

During the relative simplicity of solar-minimum conditions, Ulysses made many surprising discoveries – during the relative chaos and unpredictability of solar maximum, many more are expected. Exciting times therefore lie ahead in our quest to understand the Sun and its heliosphere.



Orbital schematic of Ulysses' south polar pass

A Brochure (ESA BR-168) issued to celebrate Ulysses' first ten years in orbit, and which contains further details on the mission's exciting discoveries to date, is available from ESA Publications Division.

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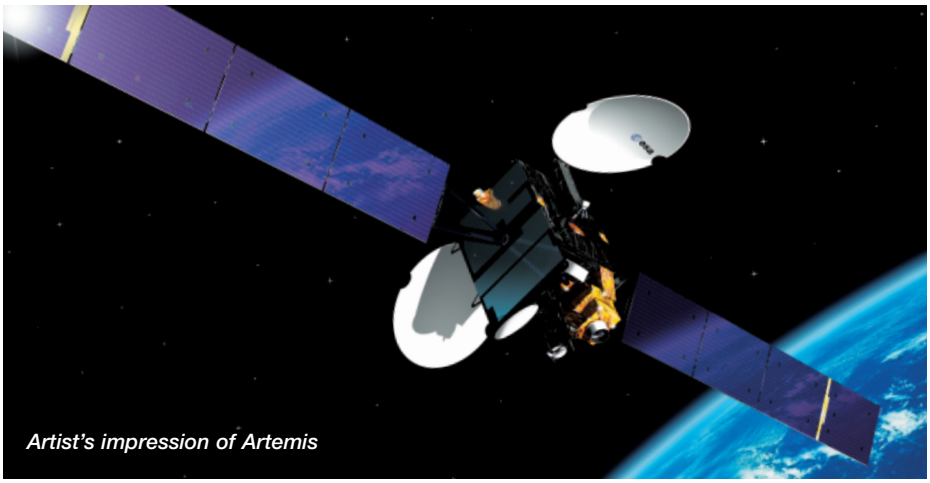
Artemis, Europe's Latest Communications Satellite, on Display at ESTEC

ESA's advanced communications satellite, Artemis, is currently undergoing a final series of functional checkout tests at ESTEC in Noordwijk (NL).



Artist's impression of Artemis

Artemis is not the conventional type of communications satellite. In particular, it differs in one very important aspect: none of its payloads connects a fixed point on the Earth with other fixed points on the Earth. Instead:

- Artemis will connect users on the ground with satellites in orbit via its radio-frequency data-relay payload. This dramatically increases communication time with spacecraft in low Earth orbit (LEO). For instance, a scientist anywhere in Europe will be able, via Artemis, to monitor the status of an experiment on the International Space Station in real time and actively intervene. This payload will also enable ESA's next Earth-observation satellite Envisat, slated for launch in June 2001, to transmit its data to the ground in real time.
- Via its optical data-relay payload, SILEX, Artemis can receive and re-transmit in real time images taken by Earth-observation satellites such as the French Spot-4. Data communication between satellites using an optical link (laser pulses) is a novelty in space and offers great advantages over conventional radio-frequency systems.
- With Artemis, a mobile user will be able to link up from anywhere in Europe, North Africa or the Middle East to any fixed user in the same area at very competitive prices. Large ocean areas are included in Artemis' coverage zone, allowing voice or data connections to land from the Mediterranean, the North Sea or the eastern part of the Atlantic Ocean.
- The navigation payload will enable users to determine their position with higher accuracy and 24-hour availability. Artemis will add corrections and health checks to the existing GPS signals, thus supporting the first phase of Galileo, Europe's new navigation programme.

In addition to these many novel communication services, Artemis will provide European industry with opportunities to gain in-orbit experience with advanced technologies. The most prominent of these is the ion propulsion system, the very high power-to-mass ratio of which helps to reduce launch costs and increase satellite lifetime.

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Caring for Planet Earth: Europe's Latest Space Capabilities Presented in Gothenburg

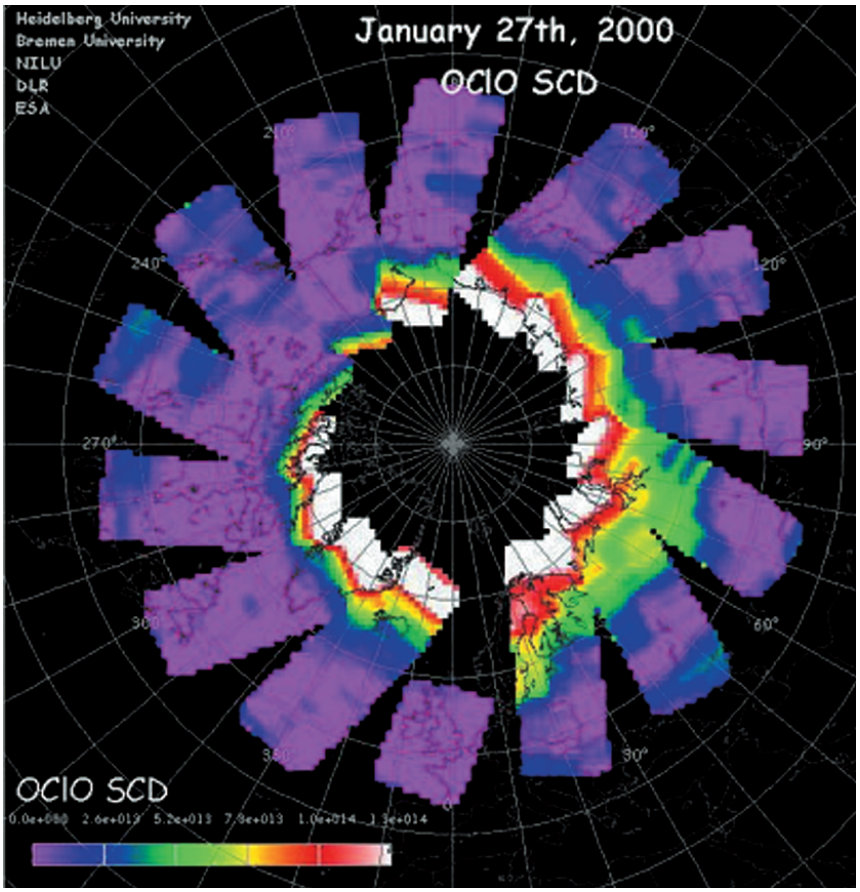
The ozone layer, protecting our planet from potentially harmful ultraviolet sunlight, is threatened by human activities, in particular the steady release of chlorofluorocarbons (CFCs) into the Earth's atmosphere. In 1987 the leading industrial countries signed the Montreal Protocol in which they agreed to phase out the products responsible for ozone depletion. In April 1995, with the start of operation of the GOME instrument, an optical sensor on board its ERS-2 satellite, ESA opened a new chapter in ozone monitoring. GOME's higher spectral resolution and broader wavelength coverage enable it to measure the levels of ozone, and several other trace gases also, much better than previous instruments. A 50% ozone loss in the lower stratosphere was observed over the Arctic for short periods this spring, and a record increase in the size of the ozone hole over the Antarctic has been detected in recent months.

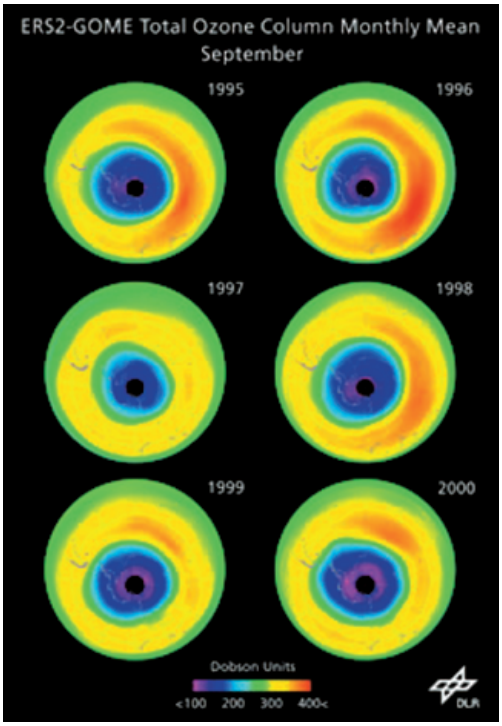
The latest scientific results and possible future applications based on GOME measurements were presented at an international gathering organised by ESA and Chalmers University – 'The ERS/Envisat Symposium -Looking Down to Earth in the New Millennium' – in Gothenburg, Sweden, from 16 to 20 October. It included more than 400 presentations (talks and posters) by World experts – scientists, remote-sensing experts and industry representatives – in more than 40 sessions covering the scientific results and applications of ESA's ERS missions.

It also presented the Agency's Envisat mission, to be launched in June 2001, which is designed to build on the ERS groundwork and to make a major contribution to global environmental monitoring. ESA has already received some 700 project proposals from the World's scientists designed to exploit this unique and valuable data source. In Gothenburg, ESA also presented its in-orbit commissioning plan for the calibration of Envisat's instruments and the validation of the derived data products. Over 100 scientific groups are supporting ESA in the preparation and execution of this commissioning phase. ESA's new commercial distribution policy for Earth-observation data was also presented, along with the Agency's overall strategy for Earth-observation activities and future mission plans.

The data gathered by the ERS missions continue to make important contributions to environmental monitoring and our understanding of the physical and chemical processes underlying Earth's systems, on both the global and the local scale. By integrating ERS data with local information from other sources, national authorities and operators have a powerful tool for environmental monitoring, and valuable information for planning and preventive actions. The transition from ERS to Envisat is being managed in such a way as to ensure continuity in the provision of this key environmental information; once it is completed, a stream of new data will become available for oceanographic and atmospheric studies, with particular emphasis on marine biology and atmospheric gases and aerosols

The Gothenburg event was attended by some 550 participants, representing the scientific community, operational and commercial users, and service providers, who relished this unique opportunity to appraise the state of the art in ERS applications and explore the imminent potential of Envisat. esa





Changes in the ozone hole over the Antarctic during the last 6 years, measured by GOME

GOME measurements of chlorine activation over the Arctic

Luxembourg Strengthens Its Ties with ESA

On 12 September, Mrs Erna Hennicot-Schoepges, Minister for Culture, Higher Education and Research of the Grand Duchy of Luxembourg, and Mr Antonio Rodotà, ESA's Director General, signed an Agreement that will enable Luxembourg to participate in ESA's ARTES telecommunications programme.

A member of the European Union and the Council of Europe, Luxembourg has already acquired experience in space matters through its involvement in Intelsat, Eutelsat and EuroControl, and through its national activities linked to space. With this Agreement, the European dimension of the Grand Duchy's space activities has been further reinforced.

The Advanced Research in Telecommunications Systems programme ARTES consists of several elements covering particular areas of telecommunications, such as on-board processing, multimedia/global information infrastructures, advanced mobile systems, tele-education, tele-medicine, tele-conferencing, and data exchange. Its overall aim is to improve the competitiveness of European industry on world markets for communications missions, and to promote new services for advanced communications systems. ARTES also provides support to other applications programmes, such as navigation and Earth observation.

After the signing ceremony, Mrs Hennicot-Schoepges and Mr Rodotà held a Press Conference for the assembled journalists.

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Towards a European Strategy for Space Technology – *The Joint ESA/CDTI/Eurospace/EC Workshop on European Strategy for Space Technology*

The ESA Technology Programmes Department, in cooperation with the European Commission, Spain's Centro para el Desarrollo Tecnológico e Industrial (CDTI) and Eurospace (representing the interests of European space industry), were the joint organisers of a 'Workshop on European Strategy for Space Technology', which took place in Seville, Spain, on 21-23 May.

The opening session provided an overview of the space-technology scene in Europe and the strategy for European Space Technology, as an integral component of the European strategy for space. Among the speakers, A. Rodotà, ESA's Director General, presented the development process for and current status of the European space strategy, and H. Allgeier, Director General of the European Commission's Joint Research Centre (ISPRA), elaborated on the interests and role of the European Union in space.

The four main sessions of the Workshop focussed on:
- The Role of Technology
- Establishing the Strategy
- A European Space Technology Master Plan
- European Plans and Activities in Space Technology.

There was also a Round Table to solicit and discuss the views of industry. A general overview by the Chairman of Eurospace's R&D Group prepared the way for a lively discussion on industry's perception of and interest in space technology research, development, procurement, alliances and related issues.

The Workshop concluded with a Panel Discussion chaired by H. Kappler and H. Allgeier. The participants made a number of recommendations and proposals on technology-related issues, to be included in the ESA policy document.

Some 150 participants, including ESA Industrial Policy Committee (IPC) delegates, representatives of the European Commission, operators, and industry, and representatives from the ESA Directorate of Industrial Matters and Technology Programmes and other ESA Directorates, took part in the various sessions.

The participants agreed that Europe has to unify and coordinate its space-technology activities through a coherent European policy, and endorsed a position paper on a European strategy for space technology, the principal objectives of which should be:
- implementation of a technology specialisation policy, supported by networks of centres of excellence and targetting innovative products
- increased synergy with and application of highly innovative non-space technologies from other areas, such as the defence sectors and information technology
- greater involvement of industry in the R&D decision-making process for public technology programmes, and increased R&D emphasis on new markets and new users by co-funding activities with industry where commercial potential exists
- closer collaboration between industry, academia and research centres in the area of pilot development work, in partnership with space agencies, commercial companies and financial institutions
- preservation and reinforcement of skills, experience and know-how at individual-company level, and
- re-appraisal of the technology objectives of industry in the wake of the major

The Panel Discussion on the Role of Technology in progress in Seville (E)

industrial restructuring taking place throughout Europe.

Led by ESA, the current approach to the European Strategy for Space Technology designed to achieve the above objectives is based on:

– Identification of technology needs and priorities for European programmes, strategic areas for European independent capabilities and leadership, and the competitiveness of European industry in the short and long term (Dossier 0).
– Acquisition of a complete overview of all relevant technology-development activities in Europe and the relevant skills, specifically at European and national level, and including industry and academia (Mapping, ESA Technology Master Plan and National Technology Master Plans).
– Definition of implementation guidelines and joint funding for the necessary technology R&D activities, harmonised through a coherent and co-ordinated European Space Technology Master Plan (ESTMP), which will include selected concerted development programmes.

Technology harmonisation is a basic prerequisite for the preparation of the ESTMP. The principal purpose of this harmonisation process is the specialisation of skills and the strengthening of industrial cooperation. Pilot cases for harmonisation are being discussed for selected technologies (such as synthetic aperture radar, solar arrays and electric propulsion). Items for discussion include the identification of possibilities for sharing skills, expertise, capacities and resources by networking between specialised centres, and opportunities for sharing objectives and risks with potential partners. An assessment is being conducted for each technology included in the ESTMP. This is directed in particular at such issues as maturity, target readiness, competitive impact and competitive position.

As a conclusion to the Workshop, the participants expressed their strong support for the European strategy on technology R&D as implemented by ESA. They expect this strategy to produce a significant improvement in the efficiency and effectiveness of European space-technology R&D.

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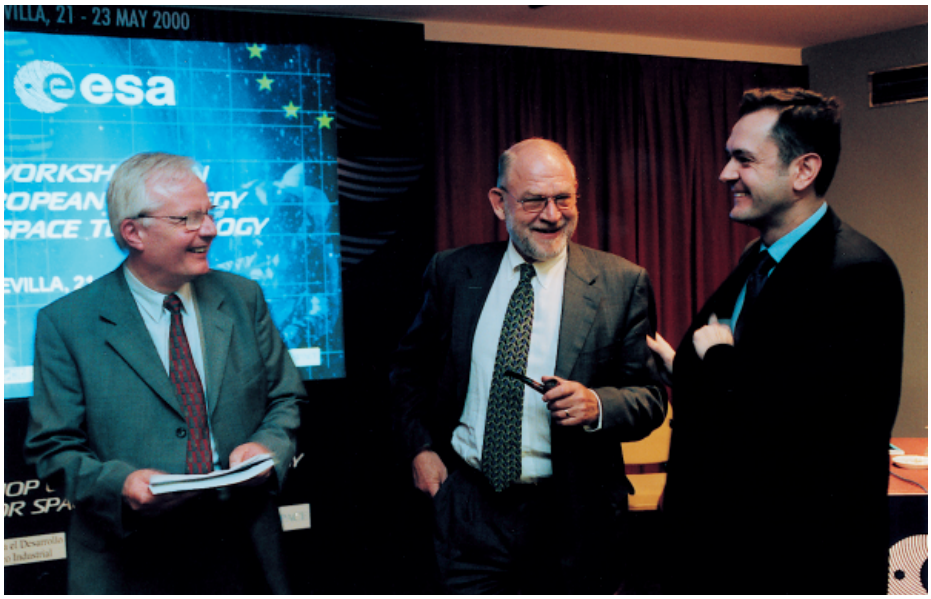


From left to right: H. Kappler, ESA's Director of Industrial Matters and Technology Programmes; H. Allgeier, Director General EC Joint Research Centre; and and J.M. Leceta, CDTI, discussing Technology Strategy

ESA's Virtual Campus for the International Space Station

ESA inaugurated its Virtual Campus for the International Space Station on 8 September at ESTEC, in the presence of leading European scientists and industrialists, ESA's Director General, Antonio Rodotà, and the Director of Manned Spaceflight and Microgravity, Jörg Feustel-Büechl.

The Virtual Campus will be the main European source for validated information on the International Space Station (ISS) and its utilisation. It will be a forum where present and future users of the Station can share their knowledge and find new partners. The 'campus' is managed and operated by the ISS User Information Centre, located at ESTEC. It is open to the whole European space community.

As a resource centre, the Virtual Campus will provide ISS information and advice. It will explain the various experiment facilities of the Station's pressurised laboratories available to European scientific researchers, development engineers and service providers. It will not only focus on the technical aspects of Station utilisation, but also help interested users to find scientific, operational, financial and political support for their experiments.

Through the Virtual Campus, users can build contacts with the engineers in European industry and space agencies who are working on the development and operation of the European research facilities. They will also be able to establish links with the programme managers and scientists at ESA and at the national space and research organisations in Europe who are involved in the strategic planning and the attribution of resources and access rights for Station utilisation.

The Virtual Campus will bring the ISS closer to the European space community at large and to political decision-makers, the media and the general public in Europe. Video and audio live transmissions from the Station, the launch and landing sites, and the astronaut training centres will be broadcast via direct satellite TV and Internet streaming video. Interactive information sessions will involve the audience via telephone and Internet. The information programme will be complemented by Internet chat sessions and by interactive virtual-reality tours of the Station via satellite television and Internet.

The Virtual Campus will broaden the audience for the research conducted aboard the Station, with other spacecraft and in ground facilities. It will organise regular lectures on scientific, technological and application-

Inauguration of the Virtual Campus at ESTEC in September

oriented aspects of Station utilisation, presented by scientists who have proposed experiments for the Station. They will also be transmitted live via direct satellite TV and as streaming video on the Internet. Initially, these lectures will be held in the auditorium of the User Information Centre at Noordwijk, which is equipped for TV recordings, satellite transmission and Internet communications. Over the coming months, the User Information Centre will acquire the equipment and expertise for transmitting lectures as streaming Internet video directly from the various research institutes and industrial laboratories involved in Station utilisation.

Particular efforts will also be made to distribute the knowledge already gained by scientific experimentation and technology demonstration in other projects such as Spacelab, Spacehab, Foton, sounding-rocket flights, parabolic aircraft campaigns, drop towers and ground laboratories. ESA's Microgravity Data Base (accessible at *http://www.esa.int/cgi-bin/mgdb*) is the starting point. It will be made more user-friendly for the general public and will evolve into a general database on scientific results from Station research.

The Virtual Campus will offer its infrastructure for establishing Virtual Institutes in scientific disciplines that can benefit from the Station research facilities. The Virtual Institute for Health Care is the first planned; others might follow.

Using the campus, ESA will publish the announcements for space research opportunities and for ground research opportunities that could be used for preparing future Station experiments. Users can receive additional information and advice to help them in responding and in developing their experiments.

The campus will play an important role in building up joint research teams by giving users access to the information available at ESA on planned and intended research and applications themes of other users. Within the Microgravity Applications Programme, ESA has already introduced the idea of 'Topical Teams' in which fundamental researchers from academia are teaming up with more application-oriented researchers from industrial laboratories to work on topics of common interest which often have a commercial perspective. A significant number of Topical Teams have already been created and more are expected.

The Internet site of the Virtual Campus is at: *http://www.spaceflight.esa.int/virtualcampus*

Ariane Launches

The 131st Ariane launch (V131) took place successfully on Thursday 17 August 2000 at 8:16 p.m. Kourou time (11:16 p.m. GMT). An Ariane-44LP equipped with two liquid-propellant strap-on boosters lifted off from the Guiana Space Centre to put two telecommunications satellites, Brasilsat-B4 and Nilesat-102, into geostationary transfer orbit (GTO).

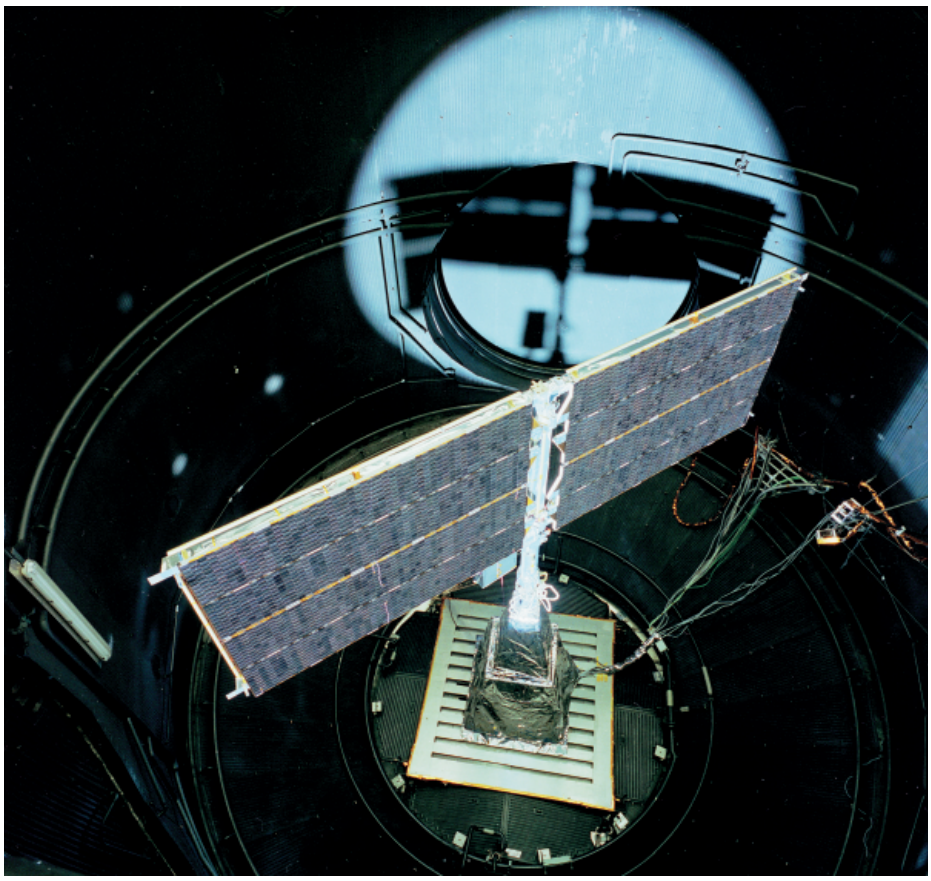
The 132nd launch (V.132) took place successfully on Wednesday 6 September 2000 at 7:33 p.m. Kourou time (10:33 p.m. GMT), when an Ariane-44P, with four solid strap-on boosters, put the Eutelsat telecommunications satellite W1 into orbit.

The Ariane-506 launch (V.130) took place successfully on Thursday 14 September at 7:54 p.m. Kourou time. This time an Ariane-5 lifting-off from the European Spaceport in Kourou placed the two telecommunications satellites Astra-2B, for the Société Européenne des Satellites (SES), and GE-7, for American operator GE Americom, into geostationary transfer orbit.

Hubble's New Solar Arrays being Tested at ESTEC

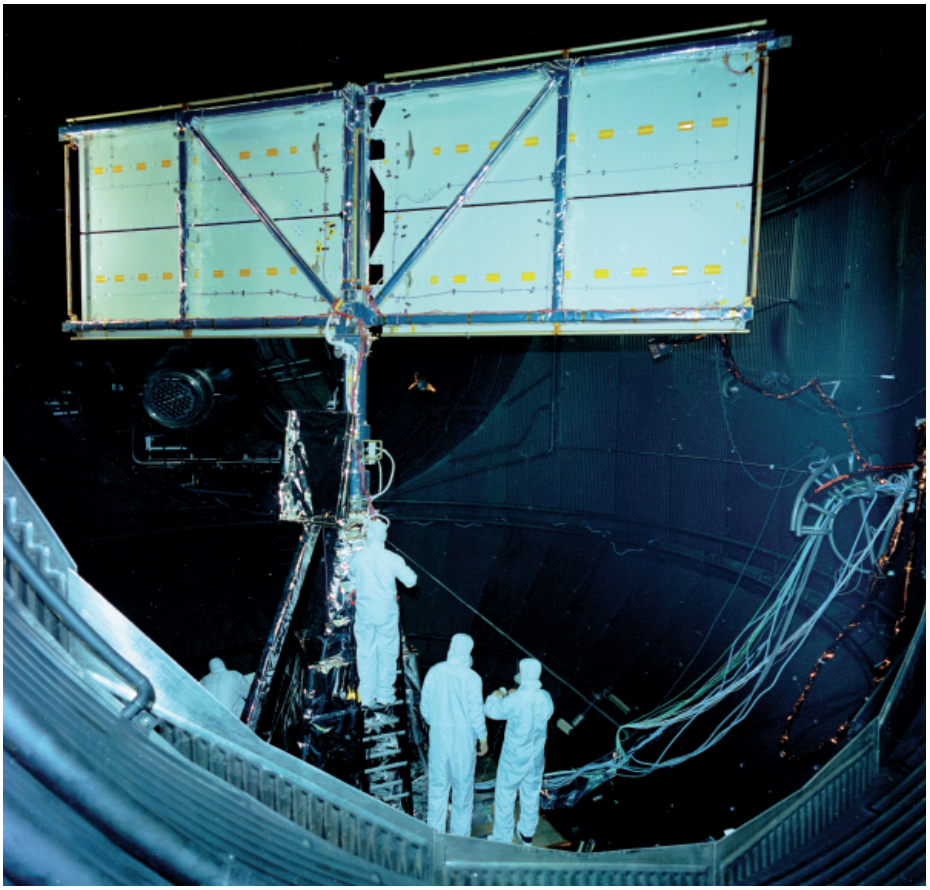
In mid-October, at ESTEC in Noordwijk (NL), a team drawn from ESA and NASA began a unique and difficult test on one of the Hubble Space Telescope's new solar-array panels. Two of these panels will be installed by astronauts in November 2001, when the Space Shuttle Columbia visits Hubble on a routine servicing mission. The test will check the mechanical integrity of the new arrays before they are installed in orbit.

Hubble orbits the Earth once every 90 min, during which the telescope experiences 45 min of searing sunlight and 45 min of freezing darkness. The tests at ESTEC will detect any tiny vibrations, or 'jitter', caused by these dramatic and cyclic changes in temperature. Even a small amount of such jitter can affect Hubble's sensitive instruments and interfere greatly with observations.



Hubble Space Telescope's solar array under test in the Large Space Simulator (LSS), at ESTEC, Noorwijk (NL)

Hubble's first set of solar arrays did experience mild jitter of this sort and were replaced in 1993 with a much more stable pair. Since then, advances in solar-cell technology have led to the development of even more efficient arrays. Despite being smaller, therefore, this new set of arrays generates more power than the previous pairs. Unlike the earlier sets, which roll up like window blinds, the new arrays are rigid, using an advanced structural system to support the solar panels.

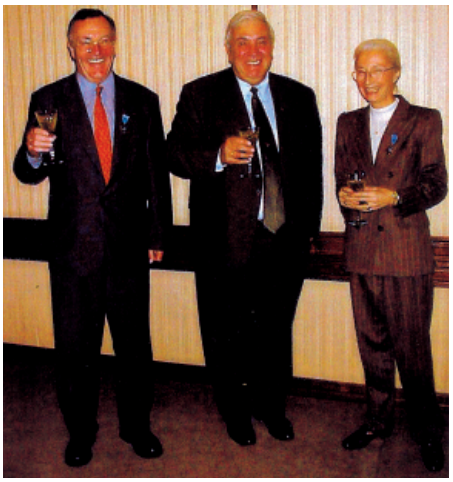


Because of the size of the new arrays and the requirement to conduct the testing on a seismic foundation to ensure a 'quiet environment', the Large Space Simulator (LSS) at ESTEC is the only facility in the World that can perform the tests. ESTEC has long-standing experience with Hubble's solar arrays, in that ESA provided Hubble's first two sets, and has built and tested the motors and electronics for the new set. This latest test is therefore another chapter in an enduring partnership between ESA and NASA on the Hubble Space Telescope.

The LSS facility features a huge vacuum chamber containing a bank of extremely bright lights that simulate the Sun's intensity – including sunrise and sunset. By exposing the solar-array wings to the light and temperature extremes of Hubble's orbit, the ESA and NASA engineers can verify how the new set of arrays will perform in space.

ESA Receives Russian 'Blue Planet Award'

In recognition of the excellent and long-standing cooperation between the Russian space agency, Rosaviakosmos, and ESA, on 17 October in Moscow Mr Yuri Koptev, Director General of Rosaviakosmos, handed over the 'Blue Planet Award' to Mr Jörg Feustel-Büechl, ESA's Director of Manned Spaceflight and Microgravity, and Mrs Karin Barbance of ESA's International Relations Department. esa



From left to right: Jörg Feustel-Büechl, Yuri Koptev and Karin Barbance

One Telephone Call Mobilises Space Facilities for Natural-Disaster Management

From 1 November, countries that have suffered a natural or technological disaster will be able to get emergency assistance from the space facilities of ESA, CNES and the Canadian Space Agency (CSA) by simply calling a single telephone number available now to authorised users. As soon as a natural disaster occurs, they will be able to call an operator at ESRIN (ESA's establishment in Frascati, Italy), who will immediately contact the duty engineer at ESA, CNES or CSA. That engineer will then deploy the appropriate space facilities belonging to the three agencies to assist the country in which the disaster has struck: earth-observation data from ERS (and soon Envisat), Spot and Radarsat, facilities for telemedicine and navigation (e.g. to track buoys marking an oil slick), ground infrastructures and archived satellite imagery. The forthcoming Artemis and Stentor communication satellites will also be available to relay data directly to the country concerned.

When called upon for help in a crisis, the three agencies will designate a single project manager to liaise with the country that is affected. Assistance will not be confined to supplying the satellite data, but will also include its processing and professional interpretation.

The decision to set up this 24-hour hotline was taken on 25 October, at the second meeting of the Board of the International Charter on Space and Major and Disasters. The Charter was signed on 20 June this year by ESA and CNES, with CSA subscribing on 20 October. It is a far-reaching initiative to promote cooperation by space-system operators in mitigating the effects of natural or technological disasters. Under the Charter, which is open for signature to satellite operators anywhere in the World, all partners undertake to cooperate on a voluntary basis, with no mutual exchange of funds. esa

Arrival of First ISS Expedition Crew

The permanent occupation of the International Space Station (ISS) began on 2 November with the arrival of the first 3-man crew. The docking followed the flawless launch of the Soyuz spacecraft at 07:53 UT on 31 October from the Baikonur Cosmodrome in Kazakhstan.

The Expedition 1 crew of Station commander Bill Shepherd (US), Soyuz commander Yuri Gidzenko (Russia) and flight engineer Sergei Krikalev (Russia) will work aboard the Station until their Expedition 2 replacements take over next February.

This first crew's arrival is not only an historic moment for mankind, but also for Europe because their mission success involves elements provided by ESA. For example, they will install the Control Post Computers of the ESA-provided Data Management System, which is the 'brain' of Russia's Zvezda service module and of the entire early ISS.

The astronauts will also unload a Progress supply vehicle, planned for launch on 1 February 2001, carrying the electronic unit for the European Global Time System (GTS) experiment and mount it inside Zvezda. GTS will allow the synchronisation of radio-controlled clocks and watches from space and, in the longer term, the disabling of stolen cars and credit cards.

During their 4-month tenure, the crew will host three visiting Shuttle crews delivering the first large solar arrays, the Destiny US Laboratory, Destiny's first science racks and the first Italian-built Multi-Purpose Logistics Module (Leonardo).

Umberto Guidoni will be the first ESA astronaut aboard the ISS as part of the Shuttle STS-102 mission in April 2001. esa