Telecommunications

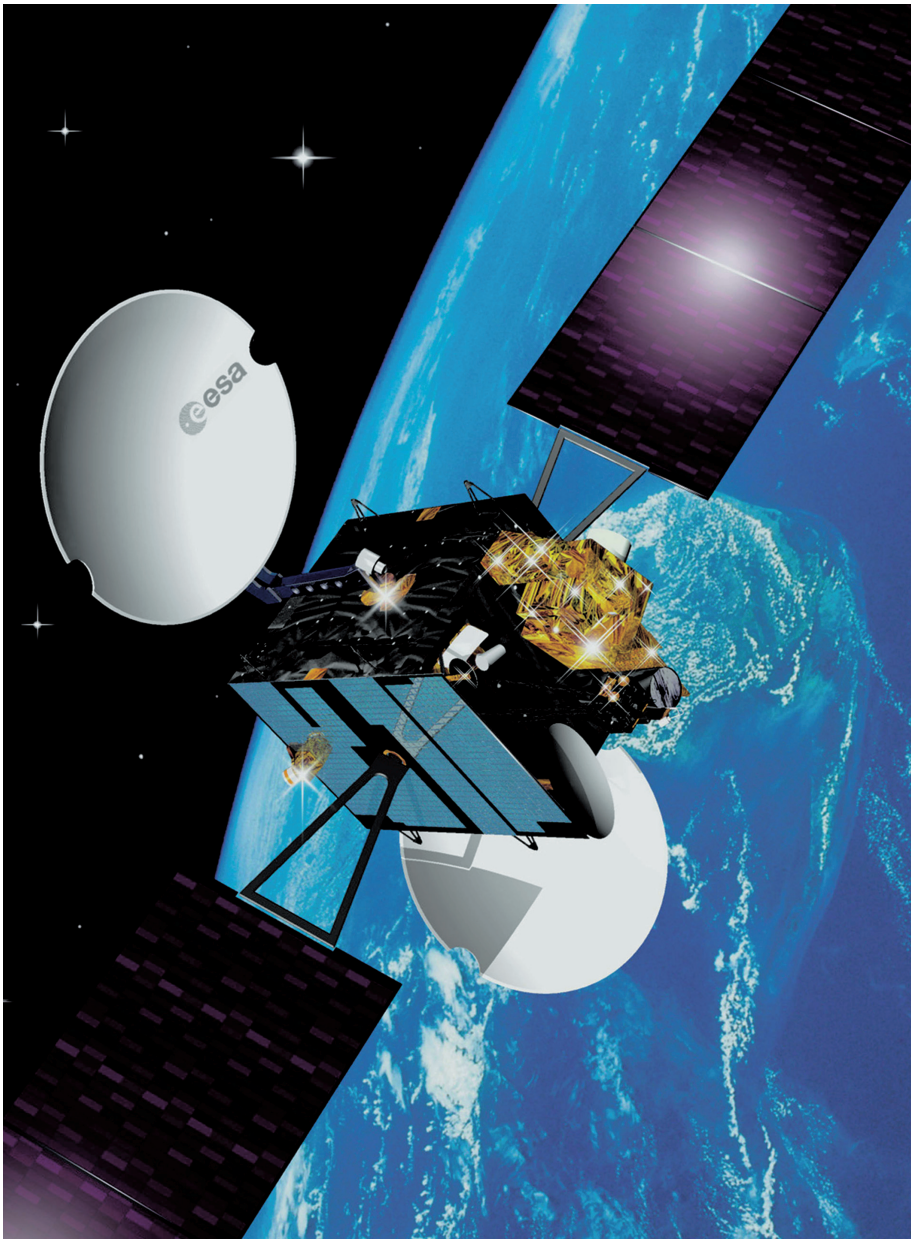
Artemis

In 2002 Artemis used its experimental ion-propulsion system to complete the long orbital transfer to geostationary orbit – a remarkable satellite recovery operation that lasted a total of 18 months.

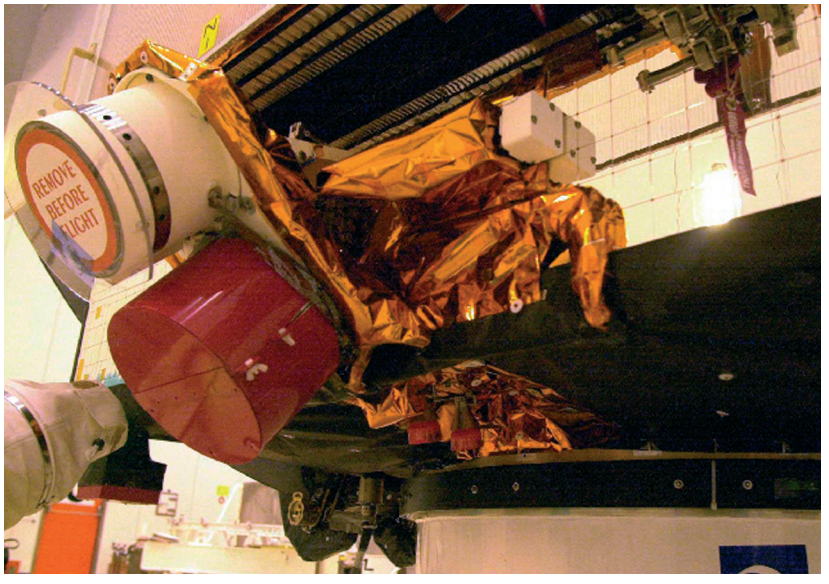
Artemis, ESA's latest telecommunications satellite for the demonstration of new services and technology, was launched on 12 July 2001, but due to a malfunction in the upper stage of its Ariane-5 launcher, was left in a low elliptical orbit. Within a few days, a series of unusual orbit manoeuvres with the apogee engine took the satellite into a circular orbit some 5000 km below geostationary height, using almost all of the available chemical propellant. A new attitude-control mode was then devised to steer the thrust from the ion engines and so provide the impulse needed to expand the orbit over the remaining 5000 km.

After some months of design and testing, the new attitude-control software was loaded into the satellite's on-board computer in February 2002 and the ion-thrusting phase began. As the thrust from the ion engines is very low, increasing the orbit's radius at a rate of about 15 km/day, it was estimated that it would take 250-350 days to complete this phase of the orbital transfer. Indeed, many unforeseen difficulties slowed up the process, but the satellite will finally reach its assigned geostationary position on 31 January 2003. In the following month, it will be commissioned in orbit and made ready to serve its first data-relay user satellites SPOT-4 and Envisat, as well as providing mobile communication services to Eutelsat and completing the EGNOS operational space segment.

Through this dramatic recovery action, Artemis has fulfilled its technology-demonstration function admirably. Above all, the capability of ion propulsion, which has accumulated some 6000 hours of in-orbit operation, has been proven. Many planned



The Artemis spacecraft



The two RITA ion-propulsion engines on the south face of Artemis

missions are dependent on ion propulsion and have been eagerly awaiting the Artemis demonstration. The flexibility of the Integrated Control and Data Handling system concept to re-program the satellite is also a major feature that has been extensively exercised.

The success of the satellite's optical-data-relay payload SILEX was also vividly demonstrated, with the transmission of SPOT-4 images via Artemis – the first inter-orbit optical link between two satellites.

ARTES – Advanced Research in Telecommunications

Large Platform Mission

In terms of European space policy, the ARTES-8 element has a number of very important features. Not least, the programme will unite European industrial prime contractors and suppliers, creating a European leader to compete on the world market for telecommunications satellites.

From mid-2002, ESA and CNES followed the outline of the cooperation agreement and supported European industry in developing the production line for this new generation of commercial platform. The preparatory design phase for this so-called 'Alphabus' platform was begun in September and will be completed towards the end of 2003. In parallel, ESA-funded pre-developments are being awarded to European suppliers to enhance equipment capabilities. The platform will have a payload handling capability of 12 to 18 kW and will complement the present European capabilities with a unique product in the high-power range.

AMERHIS

AMERHIS is one of the most important projects initiated by the Telecommunications Department in 2002. It will result in the first on-board switch to be placed in geostationary orbit, as the result of a joint endeavour by ESA, Spain's Centro de Desarrollo Tecnologico Industrial (CDTI), the Spanish satellite operator Hispasat, and European and Canadian Industry.

Today's telecommunications satellites provide a number of channels that retransmit signals within specific frequency bands exactly as they are received. These so-called 'transparent transponders' provide a wide range of services, including the broadcasting of TV signals directly to homes, data networks, Internet access, telephony, TV news-gathering and many other applications. The next generation of satellites for fixed and broadcast services will need very large capacities to permit the provision of interactive services to the hundreds of thousands of users with small, cheap terminals. These multimedia satellites will use the Ka (20/30 GHz) frequency band and have onboard antennas providing tens or even hundreds of high-power spot beams so that the ground terminals can be kept small.

Based on this, in 2000 ESA initiated three sets of multimedia-system-related developments, known as Domino, Euroskyway and WeB, with teams led by Alcatel, Alenia and Astrium, respectively, to validate the most critical elements of the associated payloads. AMERHIS is the next step in the process, which is demonstration of the system onboard a satellite, namely Hipasat's next satellite 'Amazonas', with spot beams covering Europe, North and South America, and Brazil.

The AMERHIS project is not only very ambitious and innovative, but also represents a novel form of cooperation between the satellite operator, CDTI and ESA, in which a national initiative has been 'internationalised' under ESA's leadership for the mutual benefit of all participants.