Telecommunications

Artemis

Artemis reached its final orbital position on 31 January 2003, and soon began delivering its planned data-relay, land-mobile and navigation services. In particular, its L-band land mobile payload is being used to complement and augment the European Mobile System, its data-relay payloads are providing operational services to Envisat and SPOT-4, and its navigation payload forms an operational element of the European Geostationary Navigation Overlay Service (EGNOS).

After Artemis was launched, in July 2001, into an abnormally low transfer orbit, all of this seemed far beyond reach. For any conventional communications satellite, this would have resulted in loss of the mission. Thanks, however, to the combination of advanced technologies that Artemis has on board, and the innovative recovery procedures devised by the spacecraft control team, the satellite could still be slowly and carefully coaxed over a period of 18 months, using the satellite's novel experimental ion-propulsion system together with an

innovative attitude-control strategy, into its intended operational position in geostationary orbit. In all, about 20% of the original spacecraft control software had to be modified by uplinking software patches to accomplish the new mission scenario, making it the largest reprogramming of flight software ever attempted for a telecommunications satellite. The result was that Artemis rose in a spiral towards geostationary orbit at an average of 15 kilometres per day!

Until the arrival of Artemis, Earth-observation missions and other low-Earth-orbiting satellites have had to send their data to ground whilst in sight of an earth station. Since contact with such stations usually lasts only a few minutes per orbit, data has had to be stored onboard the satellites and several earth stations have had to be used. This leads to a need for complex planning, delays in delivering and processing data, and costly satellite operations. Now, thanks to the data-relay links provided by Artemis at Ka-band, S-band and optical frequencies, greater visibility is provided and large volumes of data can be delivered directly to the processing centre or control centre, avoiding bottlenecks and delays, and reducing operating costs.

Since April 2003 Artemis has been routinely providing high-data-rate links to France's SPOT-4 and ESA's Envisat missions. The latter uses five links per day on two channels for its ASAR and MERIS image data, which Artemis transmits directly to the Envisat Processing Centre at ESRIN in Frascati (I). Previously, when data had to be retrieved and processed at the remote Envisat earth stations, there could be a delay of 7-8 days.

The most dramatic potential of space-based data relay, however, lies in assisting emergency services when there is an environmental disaster, such as a volcanic eruption or a major forest fire, by transmitting real-time imagery. The first such emergency support was provided on 7 August, when Artemis supported an Envisat Earth Watch data-acquisition campaign in response to a request from the Portuguese Civil Protection Authority for help in fighting major forest fires northeast of Lisbon.

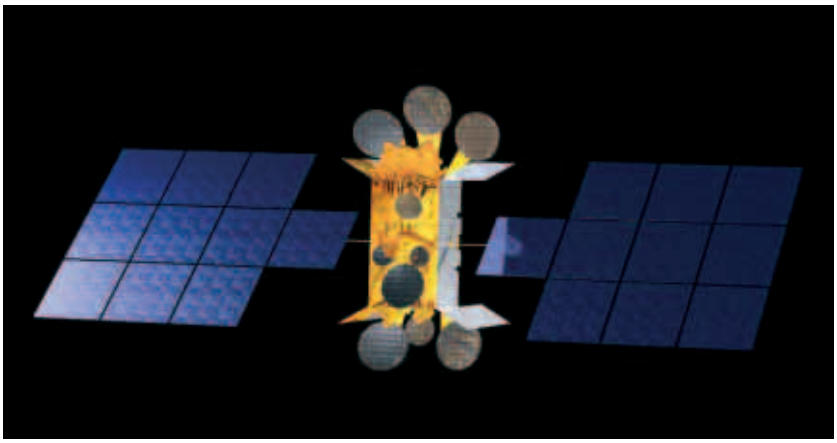
The SILEX optical data-relay link between Artemis and SPOT-4

Under the Artemis programme, ESA also supported the development of an optical ground station at Tenerife, in the Canary Islands. In its first few months, this station made some 60 links with Artemis in conducting atmospheric attenuation and characterisation experiments for furthering science applications.

Not only has Artemis clocked up a number of unique firsts – first optical inter-orbit satellite link, first major re-programming of a telecommunications satellite in orbit, first orbital transfer to geostationary orbit using ion propulsion, longest operational drift orbit ever - but it is also providing the promotional opportunity and stimulus for future European data-relay services.

AlphaBus

In June, a new perspective for satellite telecommunications became a reality during the Le Bourget Air and Space Show when Europe's two main satellite manufacturers, Alcatel Space and Astrium, announced a joint marketing strategy for AlphaBus, the new European contender in the large space telecommunications platform market. The sector has been evolving continuously, from telephony to direct TV broadcasting, and is now getting ready to meet demand for a new generation of multimedia and mobile services.



Artist's impression of the AlphaBus platform

AlphaBus will be an innovative and competitive European product line, augmenting the current Spacebus and Eurostar platforms. It will initially offer payload powers of 12 to 18 kW, with substantial growth potential. This will make for still lower service costs for users, and the platform will also be able to handle new types of missions, such as those needing to fly the very large antennas associated with the coming generations of payloads.

A true European industrial product, AlphaBus will use a combination of high-tech equipment supplied by European companies under the joint prime contractorship of Alcatel Space and Astrium. It represents a major step in the consolidation of the European tele-communications industry.

AlphaBus, which is an ESA/CNES cooperative programme, is a key component of the ESA Telecommunications long-term plan. The first phase of the programme was given the go-ahead at the Ministerial Council in Edinburgh in November 2001, and the current definition phase, which began in September 2002, focuses on predevelopment of the most critical technologies. An integrated CNES/ESA project team, based in Toulouse (F), is in overall charge of the development effort for AlphaBus, which will offer a unique opportunity to fly innovative payloads with enhanced capabilities and new satellite communication missions. The first AlphaBus launch is planned for 2007.

Future Satcom Improvements

ESA Telecommunications intends to improve the efficiency of using satellites through the introduction of innovations in both the space and ground segments. Consequently, two contracts were signed in 2003 which will directly improve the future use of satellite technology, one with SES-Astra and the other with Inmarsat.

The development contract with SES-Astra, signed on 27 January, responds directly to users' needs with SatMode, a satellite return-link system providing an always-on connection between the TV digital set-top boxes and content providers. This interactive terminal, which should add less than 50 Euros to the cost of a receive-only system, is just one example of the increased attention that ESA is devoting to user terminals and applications. SES-Astra has also committed to an 'open system' that can be freely adopted to allow other industries and broadcasters to benefit from new interactive applications.

The agreement signed on 16 December by ESA and Inmarsat brought the reality of reliable mobile broadband communications services a step closer. For the first time, global mobile broadband services will be available for those at sea, in the air, or travelling on land virtually anywhere in the World. This agreement marks the first collaboration between ESA and Inmarsat on system engineering activities and will extend the capabilities of the new Broadband Global Area Network System (BGAN) to be offered by the Inmarsat I-4 satellite constellation.

Following the launch of the first of these fourth-generation Inmarsat satellites in 2004, BGAN is expected to become operational for land services in 2005. The system is designed to meet the growing demand from business and private users for high-speed Internet access and multimedia connectivity, as well as a wide range of tele-services, including tele-working and distance learning. Applications will include video-on-demand, web TV, videoconferencing, fax, e-mail and LAN access at speeds of up to 432 kbit/s with notebook-sized terminals from almost anywhere in the World, thereby exploiting the natural strength of satellites for delivering multicast services at the global level.