

Space Transportation

The highlight of the year was bound up with the decisions taken at the ESA Ministerial Council in Edinburgh (UK) in November. After several months of preparation and interaction with the Member States, the meeting of the Ministers was a key milestone in the future of the launcher programmes in Europe.

Among the important decisions was the full funding release for completion of the Ariane-5 Plus Programme, including the development of a new ESC-B stage and the development of its new Vinci cryogenic engine. These improvements will make Ariane-5 capable by 2006 of launching a 12 000 kg dual payload into geostationary transfer orbit. The Technology Accompaniment Programme ARTA-5, which is closely associated with the Ariane-5 vehicle, was extended for four years. It will help maintain the launcher's level of qualification and reliability by providing testing and inspection activities throughout the production phase.

Another major factor of Europe's competitiveness in the launcher sector is the Guiana Space Centre (CSG). The Ministers approved funding of the spaceport's fixed costs for the next five years, as well as the related agreements with France concerning CSG and the ELA Ariane launch complex. In addition, the Infrastructure Programme was extended for three years, putting Arianespace closer to its competitors in terms of launch-base funding.

Governments recognised the need for evolution and structural change in the launch sector by giving ESA a clear mandate to develop, in consultation with all parties concerned (industry, Arianespace, national centres and Member States), a long-term perspective in the European launcher sector that will substantiate the detailed proposals for restructuring to be submitted to the ESA Council in June 2002. Underlining the need to prepare at European level for the future development of launchers, to be decided in the 2004-2007 timeframe, Ministers also gave a mandate to propose a Future Launcher Preparatory Programme which should be ready to start by mid-2002.

Ariane-5 Plus and the new launch-zone tower (artist's impression)



Ariane Operational Launches

Ariane-4 successfully lifted-off six times in 2001, making a total of 65 consecutive successful launches and starting its last year of operation in 2002 with a success rate of more than 97%. Its successor, Ariane-5 ran into difficulties on its tenth flight, in July, when a combustion instability occurred during the ignition of its storable-propellant-stage Aestus engine. As a result, the Artemis and Bsat-2b satellites were not delivered to their intended orbits. During the latter part of the year, therefore, industry conducted 78 Aestus engine ignition tests in vacuum and 53 under atmospheric conditions. These tests led to the definition of a new ignition sequence for the engine, which, along with new acceptance testing procedures. Ten acceptance tests will be conducted on the next flight engine in Germany in January 2002, before its shipment to Kourou.

Flight No.	Date	Mission	Performance (kg)	Launcher	Payload
V137	10-01-01	GTO	3577	AR44P	Eurasiasat-1
V139	07-02-01	GTO	4552	AR44L	Sicral and Skynet-4F
V140	08-03-01	GTO	5304	AR5	Eurobird and Bsat-2A
V141	09-06-01	GTO	4765	AR44L	Intelsat-901
V142	12-07-01	GTO	5317	AR5	Artemis and Bsat-2B
V143	30-08-01	GTO	4765	AR44L	Intelsat-902
V144	25-09-01	GTO	3191	AR44P	Atlantic Bird
V146	27-11-01	GTO	4328	AR44LP	Direct TV-4S

Ariane Development Programmes

The Ariane-5 Evolution Programme progressed towards completion in 2001 with the last phase of qualification testing of its upgraded main-stage Vulcain-2 engine and the final technical tuning of the welding of its solid-rocket-booster segments. These two major improvements will be among a number applied to the lower composite of the future Ariane-5 Plus launcher, which will fly for the first time in mid-2002. This new version of Ariane-5,

with its new cryogenic upper stage, will offer a performance increase from 6 to 10 tonnes into geostationary transfer orbit.

Developed within the framework of the Ariane-5 Plus Programme, the first version of the new cryogenic upper stage, known as ESC-A, underwent a series of tests during the year, including full-scale structural testing (acoustic, dynamic and vibration modelling).

Throughout the year, engineers from industry, CNES and Arianespace made a concerted effort to keep the development programme on schedule. The next full-scale test will be performed with the electric and fluidic model, which was ready for

The new Ariane-5 launch tower



delivery to Kourou at the end of the year. This 'propellant model' of the ESC-A stage, positioned on top of a metallic frame and two dummy boosters representative of the Ariane-5 main stage, will be filled with liquid hydrogen and liquid oxygen through the newly developed cryogenic arms mounted on the Ariane-5 launch tower in 2001. The purpose of this test campaign is to validate all cryogenic fluid fill and drain operations, together with the associated software.

Ariane Research and Technology Accompaniment (ARTA) Programme

The primary objective of the Ariane-5 complementary programme ARTA 5 is to maintain the Ariane-5 qualification standards during the launcher production phase, which includes the full-scale testing of its solid-propellant boosters on the booster test stand in Kourou (BEAP). On 20 November, a 125 second static test - the same burn duration as during an actual Ariane-5 flight - was performed to validate improvements aiming at both increasing the motor's performance and simplifying the manufacturing processes.



The 125 second booster static firing in progress on the BEAP test stand in Kourou

Ariane Ground Facilities

The Ariane ground infrastructure is now ready to host production of the new Ariane-5 Plus launcher in Europe and its operation campaigns in French Guiana. One of the most visible examples is the new launch zone tower, which houses the cryogenic propellant feed lines and was completed in 2001. On the satellite side, the new Ariane-5 payload preparation complex (EPCU-S5), designed to cope with very large spacecraft, was officially inaugurated in July to receive its first customer, ESA's Envisat environmental satellite.



Envisat in the new EPCU S5 Ariane-5 payload preparation complex





Artist's impression of the new Vega small launcher

The Vega Programme

The development of a small launcher is an essential element of Europe's launcher strategy, aiming at developing a family of launchers able to service a wide range of mission sizes. It will reinforce the European capabilities in the critical area of independent access to space, making it more flexible and more affordable. Several programmatic milestones were achieved in the Vega small launcher and P80 development programmes during the year.

The main event was the Vega System Preliminary Design Review (SPDR), conducted during the months of June and July by a review team including members from ESA, ASI, CNES and Arianespace, as well as selected independent experts. Nothing critical was identified in the preliminary design of the vehicle and the green light was given to release the Request for Quotation for the launcher and ground-segment development contracts. These contracts will be awarded to industry during the first quarter of 2002.

An industrial contract for the P80 stage's development was signed at the end of the year, ensuring that the first flight unit will be ready for Vega's maiden flight, scheduled for the end of 2005.

On the ground-segment side, the first half of this year was dedicated to revisiting the programme's Step-1 technical results in the light of the new situation in terms of the interaction with Ariane-5 launches. A joint ESA-CNES-Arianespace-ELV working group tasked with making this assessment recommended a new baseline, using the ELA-1 site rather than ELA-3 for Vega launches, thereby decoupling them from Ariane-5 launches.