Launchers

The CSG office and museum complex in Kourou, French Guiana

It was a very remarkable year for launchers-related activities. The Ariane Recovery Plan was completed by successful launches of Ariane-5 ECA and GS, the single-launch and double-launch versions. Also, the Vega and Soyuz at CSG Programmes reached important development milestones, with firing tests at stage level for Vega, and the design review and construction work for Soyuz at CSG. In addition, the Ministerial Council in December approved and subscribed to important activities that will secure the maintenance and development of the industrial and technological capabilities in Europe needed for the development of any future new launcher.

Ariane

After the implementation of the Ariane Recovery Plan during the previous two years, in 2005 Ariane's position in the commercial launch services market was successfully re-established. A total of five Ariane launches took place, all of which were successful. In this framework, it was important to implement new programme elements for completion of the Ariane qualification process (Slice 10) and to prepare Ariane programme proposals (ARTA and ACEP) for activities until end-2010, to be presented at the Ministerial Council. All of these objectives were achieved, making it a very successful year for the Ariane-5 programme and for its commercial exploitation.

For the Ariane-5 ECA heavy-lift launcher, the year started with a flawless qualification launch on 12 February (L521), putting the XTAR-EUR telecommunications satellite into its geostationary transfer orbit (GTO) and also releasing the Sloshsat experimental satellite. Post-flight analysis revealed that critical elements such as the Vulcain-2 engine and the ESC-A upper-stage (never separated and ignited prior to this launch) performed within specification. During a second launch on 17 November (L522), Ariane-5 ECA again performed flawlessly, putting Spaceway-F2 and Telkom-2 into their respective geostationary transfer orbits. After these two successful launches, Ariane-5 ECA is clearly ready for the commercial marketplace and will be Arianespace's launch-service workhorse for the coming years.

The Ariane-5 GS with the Vulcain-1 engine made its successful maiden flight on 11 August (L523) in a single-payload configuration carrying the telecommunications satellite Thaicom-4, the largest telecommunications satellite ever placed in GTO. Two more launches of Ariane-5 GS in

The successful qualification launch of Ariane-5 ECA on 12 February

double-launch configuration were equally successful, putting a total of four satellites into GTO: Syracuse-3A and Galaxy-15 on 13 October (L524), and MSG-2 and INSAT-4A on 21 December (L525). With these flights, Ariane-5 GS is now qualified for single- and double-launch configurations and will be exploited in parallel with Ariane-5 ECA.

The adaptation of Ariane-5 for launching the Automated Transfer Vehicle (ATV) continued on schedule and the related qualification process is in progress. The first flight of the launcher, which will also be the qualification flight for ATV, is scheduled to take place in the first half of 2007.

The first hot-firing test on the new upper-stage, re-ignitable Vinci engine took place on 20 May with a 1 second long ignition and spin-up of the turbines to 50% speed. Engine ignition was flawless and all parameters were within their predicted ranges. Further tests were subsequently performed to gradually increase the firing time, culminating on 27 July in a successful 60 second firing with all parameters at full test conditions. The new P4.1 test-facility at DLR, Lampoldshausen (D) also performed according to expectations and valuable experience was gained for fully tuning the facility for future tests.

Industrial activities on the Slice 10 Programme, aimed at bridging the gap until new programmes are implemented, started on 3 October. This day was also a new milestone in implementing the decisions of the 2003 Ministerial Council, with the signature of the Slice 10 Ariane Development contract, making EADS ST the prime contractor, responsible for all other stages and subsystem suppliers for Ariane launchers.

At the 2005 Ministerial Council in December, two new programmes were approved. On one side, the extension of ARTA for the period 2007-2010 is aimed at continuing the already established Ariane support activities, and dealing in addition with issues concerning the Ariane production facilities. This domain requires particular attention, as the launch and production facilities have now been in service for some 15 years, to ensure their availability for the exploitation of Ariane in the years to come. On the development side, the Ariane-5 Consolidation and Evolution Preparation (ACEP) programme has been proposed, to consolidate the knowledge of the launcher and allow its optimum utilisation. The positive outcome of the December Ministerial Council means that in the coming years the Ariane production-accompanying activities will be continued and the necessary maintenance of the ground facilities will be performed, to consolidate the Ariane launcher's position and to prepare for future evolutions.

In parallel with the Ariane development programmes, the European Guaranteed Access to Space (EGAS) programme is now in place. The envisaged industrial audits have also been initiated by the Agency to achieve an overview of production costs at the various companies involved.

Vega

The first firing test of the Vega Zefiro-9 third-stage solid-rocket motor was successfully conducted on 19 December at the test range in Sardinia (I). This test was particularly important, since the data collected will allow verification of ballistic performances, internal thermal protection efficiency, performance of the thrust vector control system and the induced thermal and dynamic environment. A first assessment of the data showed that the test proceeded according to plan and that the necessary data have been recorded.

The AVUM engine firing test had already been conducted in October, and again the data analyses confirmed performances in line with forecasts.

Fabrication of the qualification model of the case for the Zefiro-23 second-stage solid-rocket motor was completed

Artist's impression of Vega in flight

by the end of the year, and manufacture of the Development model for the first firing test also progressed well during 2005. The vibration tests on the Interstage-2/3 structural model were also successfully concluded in November, as well as the stiffness tests on the full qualification model of the fairing.

System activities at the Vega prime contractor progressed towards the System Critical Design Review, with two key checkpoints reached in July and December, when progress on all ongoing analyses and issues was confirmed.

All P80 activities are progressing towards the realisation of the first full-size motor. Manufacture of the case for this motor began in October. All of the key technology problems associated with the manufacture of the components of the first nozzle destined for the first live motor have been resolved.

The contract for the development and qualification of the thrust-vector control systems for the Zefiro and AVUM stages was finalised at the beginning of April. Activities during the year led to production of the two types of control systems, in time for the first Zefiro-9 firing test and in line with the P80 planning, respectively.

The main contract for the ground segment was signed on 21 July. Preliminary Design Reviews for the site's mechanical, civil and fluids infrastructure have already been completed, as well as consolidated analyses of the environment at lift-off and related dimensioning cases. The new design of mobile platform has been accepted, and the design of the mobile gantry has been revised to be compatible with the existing foundations and maximum load factors.

Definition of the Vega Research and Technology Accompaniment (Verta) Programme was a major effort in 2005. Several meetings and discussions were held with potential participating Member States, leading to a final proposal that was accepted at the Ministerial Conference in December. The new Verta Programme consists of five flights of ESA payloads aimed at demonstrating Vega's capabilities and flexibility for different types of missions, as well as of activities to improve customer service and to maintain production quality at the necessary high level. As a prerequisite of Verta, a business plan for the initial and for the mature phases of Vega exploitation has also been defined, in agreement with the launch vehicle prime contractor and Arianespace, the future operator.

Soyuz at CSG

Several major milestones were achieved within the Soyuz at CSG Programme during the year. On 21 March, the Rider to the ESA-Arianespace Convention was signed by the Agency and Arianespace. On the same occasion, the French Government signed the guarantee, to the European Investment Bank, for the loan given to Arianespace. In June, a complementary Preliminary Design Review took place at CNES in Evry (F). All issues raised during the Review were successfully dealt with, with the exception of the safety aspects for the launcher's operation from CSG. A detailed analysis of the safety environment during launch operations was subsequently carried out and several meetings took place with the Russian partners. The final results are expected early in 2006.

Artist's impression of the new Soyuz Launch Site

The System Architect contract was signed on 19 July, along with the contract between CNES and Arianespace for the so-called 'Russian deliveries', giving the final go-ahead to the Programme.

In October, Austria joined the Soyuz at CSG Programme as a Participating State.

In November, CNES secured the contract for the mobile gantry, and in early December the so-called 'Infrastructure contract', which comprises the majority of the European activities, was signed between CNES and a European consortium led by GIE InfraSoyuz.

As far as the technical achievements are concerned, the earthworks at the future Soyuz Launch Site (SLS) have advanced at a more rapid pace than expected, thanks to a very favourable dry season in French Guiana. Completion of the ground works is now expected by June 2006, which is more than six months ahead of schedule.

Following the early arrival of the infrastructure industrial contractor, the construction site was 'officially opened' on 16 November and work on the excavation of the exhaust ducts started immediately.

The Future Launchers Preparatory Programme (FLPP)

After the start of the first industrial activities the previous year, the main objective in 2005 was to accelerate the implementation of the various system and technology activities. The system activities, covering Re-usable Launch Vehicles, a Re-entry (IXV) and a Re-usability (Re-use X) Experimental Vehicle, also allowed the definition of a Technology Development and Verification Roadmap, as one of the cornerstones of the technology activities.

Propulsion activities initiated include the elaboration of reference architectures for re-usable engines, as well as the design and manufacture of key technology demonstrators, including subscale staged combustion assessment. The technology activities related to materials and structures cover a range of hot and cold as well as metallic to composite types of systems. The high-temperature-material activities contribute directly to the preparation of the IXV vehicle. Some contracts have also been placed on issues related to solid propulsion, cryogenic Ariane-5 structural interfaces, and an improved Ariane-5 thrust frame.

A major milestone was achieved in the cooperation with Russia through the signature in May of the Implementing Arrangement between ESA and the Russian Space Agency on cooperation in Research and Technology for future launchers. It includes a comprehensive set of activities in the field of reusable liquid engines, reusable liquid stages and experimental vehicles.

The preparation of the follow-on FLPP Period-2 Step-1 also represented a major achievement, with numerous interactions with Delegations at various levels. The final programme volume and content, as well as its successful subscription, are strong signals that the preparation of Europe's future launchers is a shared major objective.

Europe's Spaceport

After two successive years of low launch rates, in 2005 the Guiana Space Centre (CSG), Europe's Spaceport, witnessed a resumption of operational and development activities, much to the satisfaction of the whole launch base. Five successful Ariane-5 launches and nine flawless satellite campaigns took place during the year. In parallel, the Vega launch pad's construction was pursued according to plan, and the earthworks at the Soyuz Launch Site progressed spectacularly quickly.

The outcome of the CSG reorganisation project started in 2004 was presented to the managements of ESA, CNES and Arianespace on 27 July. The selection process for the awarding of the main service contracts at the launch base was kicked-off at the end of the year. This process will end in 2006 and ultimately pave the way for a new industrial landscape being established at CSG for the coming years, enhancing both the operational efficiency and the economic competitiveness of Europe's Spaceport.