

Technology

The ESA Ministerial Council in Edinburgh (UK) in November reaffirmed the need for a strong technology base and the Agency's central role in technology coordination and harmonisation, and invited the Director General to put special emphasis on technology innovation. During the year, the ESA Technology Master Plan (ESA TMP) had been consolidated as the core of the technology planning in preparation for the Ministerial Council, and innovation was the subject of several events and milestones. The harmonisation process, which constitutes the basis for building the European Space Technology Master Plan (ESTMP), matured through the running of a second set of cases and widespread encouragement was given to its enlargement. Technology Transfer is complementing its success stories with the setting up of a business-incubator network.

Technology Programmes

As documented in the ESA Technology Master Plan and reported to the Ministers, ESA invests about 250 MEuro per year in technology R&D through contracts with industry, research centres and universities. This effort constitutes the cornerstone of the Agency's technology harmonisation, innovation and transfer activities. ESA now plays a central role in the coordination and harmonisation of European space-technology policy and strategy with the Member States, the European Commission, Industry and relevant partners, to serve Europe's short- and long-term needs. Strategic harmonisation and innovation are fundamental to increasing the efficiency of public investments in technology R&D and to improving the competitive position of Europe in space.

Innovation

In line with the directives set in the ESA TMP, the Basic Technology Research Programme (TRP) allocates 50% of its budget to innovative/prospective technologies. To properly serve the innovation policy, a whole set of different approaches and initiatives are being proposed and implemented. In the top-down part of the process, an ESA Innovation Task Force (ITF) – composed of representatives of all relevant Directorates – identified nine technology themes that are of strategic priority, and these were the subject of discussions and of recommendations in a dedicated workshop. Besides these targeted developments, open calls to industry and academia – in the form of Announcements of Opportunity – constitute the bottom-up complement that ensures that no good ideas are overlooked. In another area, a pilot project known as 'Startiger' to explore a new way of performing technology R&D has been launched.

Copenhagen Workshop

Co-organised by the ESA Technology Programmes Department and the Danish Ministry of Information Technology and Research, a Space Technology Innovation Workshop was held on 6–7 September in Copenhagen (DK), with participants from ESA, the European Commission, National Agencies and Industry. The objectives were to:

- provide an overview of the technology-innovation processes of the major players in the world
- present the results of ESA's ITF on targeted innovation and gather comments on proposed contents and priorities
- make recommendations on how to strengthen technology innovation.

The participants acknowledged that innovation is a key element in preparing for and enabling future European space programmes, and to support the worldwide competitiveness of European industry. Following the workshop, a list of potential activities to be funded, based on the ITF's work, was drafted.

Announcement of Opportunity (AO) for Innovation

74 proposals were received in response to a 'Call for Innovative Technology Proposals' focussing on software, microgravity, and 11 technology topics as part of the LET-SME initiative. Every proposal (limited to 200 kEuro) was required to document adequately its innovative content, to discuss the application perspectives for the product proposed – compared with the current alternatives – and, as applicable, a strategy for further development or marketing. The budgetary assignment was 5.25 MEuro from the TRP and 0.75 MEuro from the LET-SME initiative.

Startiger

Another initiative, also within the TRP, aims at facilitating innovative and breakthrough research by addressing specifically the way in which R&D is conducted and implemented. By co-locating the right team of experts to address a challenging technology issue, the Startiger project targets significant advancement, and a dramatic reduction in turnaround time, for state of the art technology development.

Startiger is designed to explore a new way of performing technology R&D, and to prove the concept as a framework for future similar initiatives. The technology selected, with potential applications ranging from science and Earth observation to medicine, is in line with ESA's policy geared towards space serving European citizens.



Artist's impression of Proba in orbit

Proba

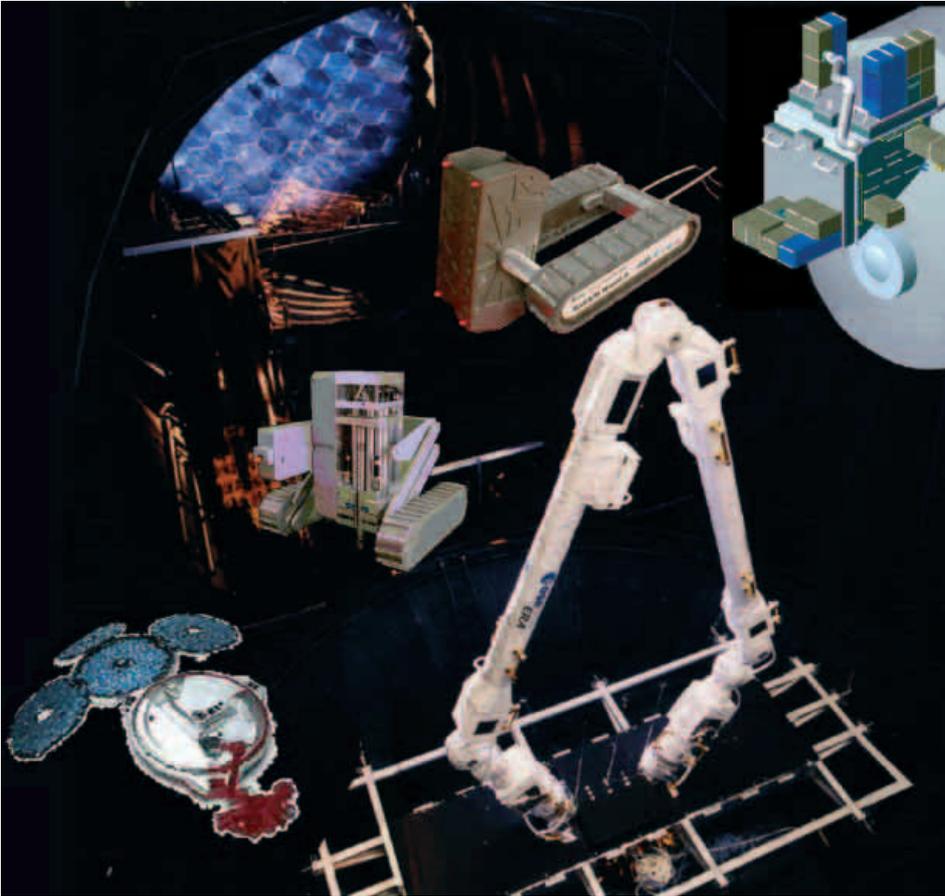
The Project for On-Board Autonomy (Proba), ESA's first small satellite for technology demonstration, was launched successfully on 22 October and is operating nominally. It is a 100 kg low-cost satellite designed to validate new spacecraft-autonomy and three-axis-control and data-system technology. Being ESA's first fully autonomous spacecraft, it is specifically aimed at reducing the cost of space mission operations, and it offers the opportunity for rapid flight-testing of technologies. A core of technologies to demonstrate autonomy functions is accommodated in

the attitude-control and avionics subsystems as an integral part of the satellite's design. Proba was funded by the General Support Technology Programme (GSTP).

Technology Strategy and Harmonisation

Technology Strategy and Dossier 0

Under the overall coordination of ESA, the European space sector agreed to elaborate a technology strategy based on missions and market requirements, mapping of European developments and competences, and harmonisation of technology activities, thereby leading to a coherent European Space Technology Master Plan (ESTMP). This plan takes into



Harmonisation: robotic technologies for space applications

account Europe's technology needs, industrial capacity and funding sources, with the objectives of enhancing the complementary role of the various partners, filling any gaps identified, reducing unwanted overlap and improving European competitiveness.

The first element of this strategy is a document collecting all of the European space-technology requirements (Dossier 0), which contains a brief description of all of the envisaged missions and activities, together with the technology developments required. Dossier 0, the first issue of which was prepared by ESA in 1999, was updated in 2001 for release early in 2002.

Technology Harmonisation and the ESTMP

Technology harmonisation is the prime activity for building a solid common European R&D plan for key space technologies. Roadmaps and work plans for these technologies are defined and agreed at European level with all stakeholders participating. Meetings have been conducted by ESA in co-operation with national Delegations and industry to validate the concept of harmonisation in pilot cases. A second set of cases covering AOCS sensors, cryogenic systems and robotic technologies for space was successfully completed in 2001. As a continuation for the coming two years, an ESA inter-Directorate team has identified a set of technology themes to be harmonised.

The results of technology harmonisation constitute the basis for building the ESTMP. The November Ministerial Conference reaffirmed the central role of ESA in the coordination and harmonisation of European strategy and policy for space technology and welcomed the good progress demonstrated in the pilot cases. Furthermore, it invited the Director General and Member States, together with the other players in the space sector, to pursue the programmatic coordination and harmonisation of technology programmes in Europe and prepare the ESTMP.

Concerted Programmes: Solar Sailing

In March, the ESA Industrial Policy Committee (IPC) approved a procurement proposal to develop and launch a solar-sail in-orbit deployment demonstrator, together with DLR. This concerted programme based on joint funding and shared responsibility is one example of more cohesive and harmonised technology development on the basis of common interests.

A comprehensive work statement was elaborated in 2001 and an industrial development contract is to be awarded at the beginning of 2002 with the aim of carrying out the demonstration mission within the next two years. The demonstrator will be Europe's first attempt to validate the functioning of a deployment mechanism for a relatively large lightweight structure in space. The deployed sail will be 20 x 20 m², from a stowed launch configuration of just 60 x 60 x 80 cm³.

Co-operation between ESA and EC on Technology

Based on ESA's established and recognised central role in the coordination and harmonisation of space technology policy and strategy in Europe, the ESA-EC Joint Task Force recommended, in its 2001 report, a closer co-operation between ESA and the Commission on technology, with full EC participation in the ESTMP and harmonisation process and ESA taking a larger role in the preparation and implementation of the New Framework activities.

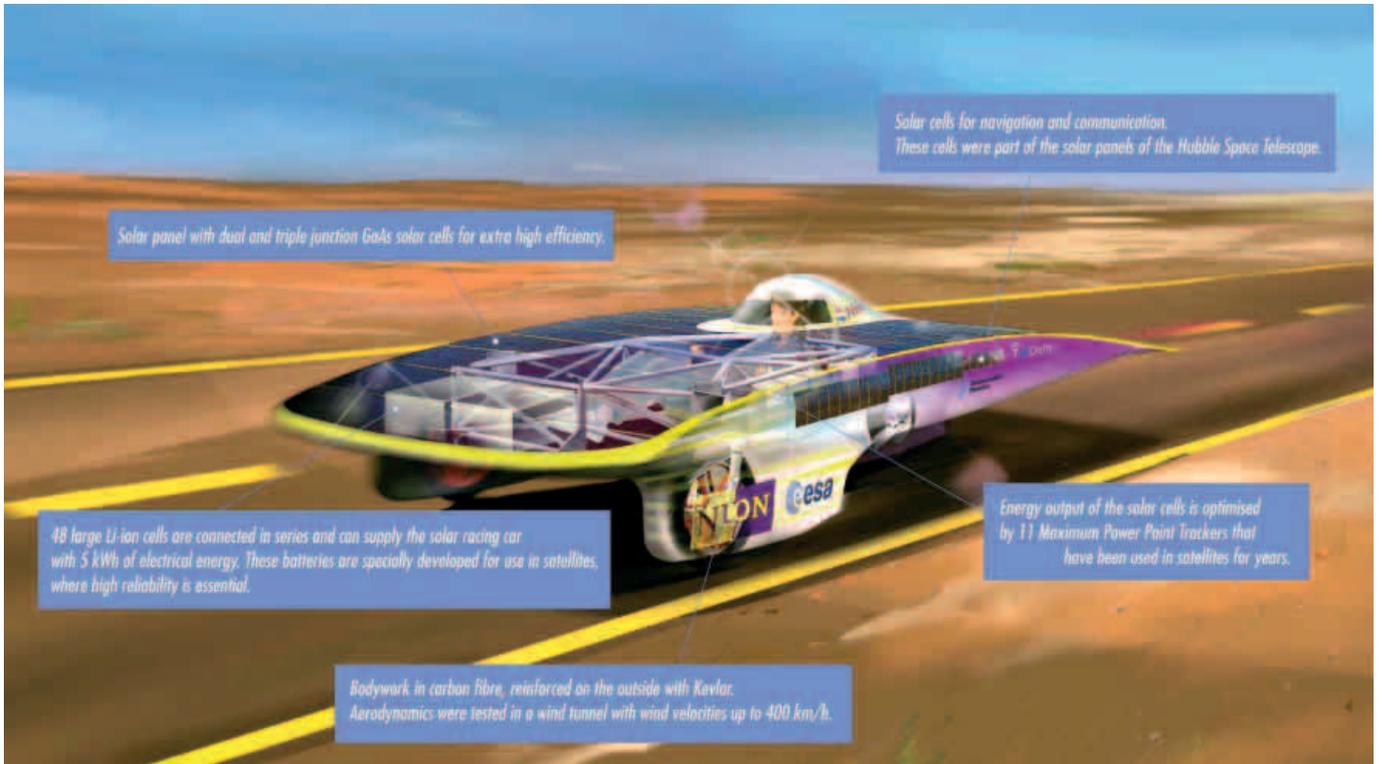
Moreover, space technology being part of a wider technology development, synergies will be identified through continuous dialogue and closer co-operation between terrestrial-technology and space-technology R&D. The co-operation between ESA and the EC in identifying and launching R&D activities benefiting both terrestrial and space applications will also allow promising fields for targeted innovations to be identified.

Technology Transfer and Incubators

In 2001 the ESA Technology Transfer Programme (TTP) once more demonstrated the economic benefits of adopting and adapting space-developed technologies for various non-space sectors. By the end of the year, more than 120 transfers had been achieved, 18 of them in 2001 - a record - thanks to the ESA-TTP network in Europe and Canada. They have already generated more than 120 MEuro in cumulative turnover, with a projected 1 BEuro by 2004. Many new initiatives were opened and extended involving co-funding, in Finland, Italy, Canada, Norway, Ireland, Austria, etc. The links with EC initiatives such as LIFT, JEV, ASLINK, LOSTESC and IRCs were also reinforced.

Three of the year's TTP success stories that merit individual mention were:

- T4Tech, a pan European portal launched by the TTP, which secured 15 MEuro to fund 10 start-ups.
- Anson, a medical spin-off company created in 1994 with TTP help was sold for 27 MEuro.
- The Dutch car 'Nuna', powered by space technologies co-financed by the TTP, broke three world records in winning the 3000 km World Solar Challenge race across Australia for solar-powered cars at its first attempt.



The year also saw the continuation of the highly successful Harsh Environment Initiative (HEI) started in 1997. C-CORE, the Canadian main contractor, continued its demonstration projects in the areas of pipeline-integrity monitoring, intelligent systems and mining, where since the HEI's inception the industrial investment is in the millions of Euro.

Space-derived technologies used by the race-winning 'Nuna' solar car

A new European node was also initiated, managed by the Norwegian Geotechnical Institute (NGI).

An aggressive publishing programme in 2001 including a colouring book for children, giving them an introduction to space technologies, a hardback book showcasing recent successful transfers of space technology to the non-space sectors ('Down-to-Earth', ESA BR-175), a brochure on 'Innovative Space Technologies from Science Fiction for Space Applications (ESA BR-176), and a book titled 'MegaCities' (co-sponsored by the TTP and a private partner) containing satellite images of major cities around the world.

There are increasing opportunities for entrepreneurs for the creation of new and innovative businesses specialised in space-related technologies, products and services. To reduce the time to market, ESA, fully supported by the EC, is setting up an independent European Network of Business Incubators. Following an extremely positive feasibility study, a second phase has been initiated to prepare the implementation of the Incubator Network, assisting in the development of the business plans, and identifying potential partners and investors, both private and public.

The ESI (European Space Incubator) located near ESTEC will provide operational services and know-how in a state-of-the-art technical environment, including office space and logistic support, finance, access to strategic partnerships and networking, etc.