

TECHBREAK

Technological Breakthroughs for Scientific Progress

The past experience in space research has demonstrated that a conservative approach to technology is often followed, resulting in gradual evolution and infrequent breakthroughs. In proposing missions, scientific teams tend to rely on gradual technological innovation, which can force space agencies to deal with obsolete technologies, thus losing competitiveness and leadership. Science and technology breakthroughs shall be targeted by this Forward Look exercise and blocking factors will be identified.



This activity was initiated as a request from the European Space Agency (ESA). In space as well as mainstream sciences, the development of innovative technologies opens new fields of research and provides sophisticated new tools for scientists. However, the experience of the past decades of space research demonstrated that a conservative approach to unproven technology is too often followed. This may be partly due to the very long development times in that domain, but the result is that evolution is gradual and breakthroughs do not happen as frequently as they could.

ESA's end-to-end process for technology development is user driven. Work plans for technology development are identified from the needs of the candidate missions. Though specific efforts are devoted to breakthrough innovation, most of the effort goes into enabling those specific candidate missions. Feasibility and level of maturity are key criteria for selection. Therefore in proposing missions, scientific teams tend to rely on gradual technological innovation. As a result, ESA may have to deal with obsolete technologies in a fast developing field, losing competitiveness and leadership, while Europe looks to ESA for innovation in space. It is thus necessary to look forward and in parallel to the desired breakthroughs in science and in enabling technology. Breakthroughs in science shall be targeted and the blocking factors in terms of availability of technology need to be identified. Enabling technologies capable of removing the blocking factors must also be identified.

In many domains, technology is evolving faster than in the space sector. A way of removing

blocking factors and enabling scientific breakthroughs in space could be spinning-in advanced technologies not developed for space. The infusion of the best technology to achieve scientific breakthroughs requires interaction the establishment of partnerships between space and non-space communities. The general objectives of this ESF Forward Look supported by ESA will be to:

- Take stock of breakthrough science objectives
- Foresee the evolution of the technologies, in space and non-space domains
- Forecast the development of technologies for the achievement of scientific breakthroughs
- Characterise risks and propose mitigation
- Identify partnership schemes, space and non space

Working Groups

4 Work Groups were established during the kick-off conference and will lead to the organisation of thematic workshops.

- WG1: Advanced materials & nanostructures
- WG2: Nanosystems and microelectronics
- WG3: Photonics, Energy and Propulsion
- WG4: Biotechnologies

A specialist survey will help structure the work of these Work Groups.

ESF Forward Looks

ESF Forward Looks provide medium to long-term authoritative visions on science perspectives in broad areas of research bringing together ESF Member Organisations, other research organisations and the scientific community in creative interaction.

Forward Look reports and other outputs such as ESF Policy Briefings assist policy makers and researchers in defining optimal research agendas and in setting priorities. Quality assurance mechanisms, based on peer review where appropriate, are applied at every stage of the development and delivery of a Forward Look to ensure its credibility and impact.

www.esf.org/flooks

Timeline of activities

- **1st Management Committee Meeting**
ESA Paris, 9 November 2009
- **2nd Management Committee Meeting**
ESTEC Noordwijk, 8 January 2010
- **1st Scientific Committee Meeting**
ESF Strasbourg, 22 February 2010
- **2nd Scientific Committee Meeting**
ESF-COST Brussels, 25 March 2010
- **Interview Meeting with ESA executives & 3rd Scientific Committee Meeting**
ESTEC Noordwijk, 30 June 2010
- **Launch Conference**
Brussels, 29-30 November 2010
- **4th Scientific Committee Meeting**
Frankfurt, 31 March 2011
- **4 thematic Work Group meetings**
WG1, Obernai, 27-28 September 2011
WG2, TBD, 17-19 October 2011
WG3, Brussels, 26-27 October 2011
WG4, TBD, 14-16 November 2011
- **Specialists survey**
online, September – December 2011
- **Consensus conference**
location TBD, December 2011

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For the latest information on this Forward Look consult the following website: www.esf.org/techbreak