

## The technology management process at the European space agency

M. Guglielmi<sup>\*</sup>, E. Williams<sup>1</sup>, P. Groepper<sup>2</sup>, S. Lascar<sup>3</sup>

European Space Agency, Keplerlaan 1, PO Box 299, 2200 AG Noordwijk, The Netherlands

### ARTICLE INFO

#### Article history:

Received 15 January 2009

Received in revised form

2 July 2009

Accepted 13 September 2009

Available online 6 October 2009

#### Keywords:

Technology management

Technology tree

### ABSTRACT

Technology is developed at the European Space Agency (ESA) under several programmes: corporate and domain specific, mandatory and optional, with different time horizons and covering different levels of the TRL scale.

To improve the transparency and efficiency of the complete process, it was felt necessary to establish an agreed end to end process for the management of all technology R&D activity that could:

1. Include all ESA programmes and consider the requirements of European users
2. Lead to coordinated multi-year work plan and yearly procurement plans
3. Prepare and enable future European space programmes
4. Be harmonized with national initiatives in Europe

Thereby establishing the basis for a product policy to reduce risks to technology users, reduce costs and delays, and enhance industrial competitiveness and non-dependence.

In response to the above needs, ESA has developed a technology management process called the ESA End-to-End process (E2E), from establishment of the strategy to the monitoring and evaluation of R&D results.

In this paper, the complete process will be described in detail including a discussion on its strengths and limitations, and its links to the wider European Harmonization process. The paper will be concluded with the introduction of the ESA Technology Tree: a basic tool to structure and facilitate communication about technology issues.

© 2009 Elsevier Ltd. All rights reserved.

## 1. Introduction

Mastering technology in due time is mandatory to limit project development risks, improve the competitiveness of European industry in commercial markets and minimize European dependence on products procured

from sources outside Europe. Furthermore, technology developments are an important instrument for structuring the European industrial landscape.

Technology is developed in ESA under several corporate (TRP, GSTP) and domain specific programmes (EOEP, CTP, etc.). Some are mandatory (TRP, CTP), the rest are optional. Only TRP addresses all service and technology domains. GSTP addresses all domains but telecommunications. Technology programmes in ESA address different stages of development/maturity, as illustrated in Fig. 1, where programmes are shown against the TRL scale.

As technology is developed in ESA under several programmes, it was felt necessary to establish a clear and unified End-to-End (E2E) process, spanning from

<sup>\*</sup> Corresponding author. Tel.: +31 715653493; fax: +31 715655184.

E-mail addresses: [Marco.Guglielmi@esa.int](mailto:Marco.Guglielmi@esa.int) (M. Guglielmi), [Edmund.Williams@esa.int](mailto:Edmund.Williams@esa.int) (E. Williams), [Peter.groepper@esa.int](mailto:Peter.groepper@esa.int) (P. Groepper), [Stephane.Lascar@esa.int](mailto:Stephane.Lascar@esa.int) (S. Lascar).

<sup>1</sup> Tel.: +31 715653212; fax: +31 715655184.

<sup>2</sup> Tel.: +31 715654566; fax: +31 715655184.

<sup>3</sup> Tel.: +31 715655161; fax: +31 715655184.

definition to evaluation of technology development activities, and covering all of the existing R&D programmes.

**2. The ESA technology end-to-end process**

The E2E process was implemented for the first time in 2005. The process has been refined in 2007 based on the lessons learned. The process has been developed through an extensive consultation with all ESA parties involved. It aims at the coherent definition, implementation, monitoring and evaluation of all technology R&D activities in the Agency. It is intended to optimize the use of resources and provide complete visibility to all actors.

The main objective of the E2E technology process is to undertake well planned coordinated developments in answer to user requirements (i.e. missions needs, industry competitiveness, non-dependence) in order to have technologies ready at the maturity level required at each stage as needed by the users.

The process is guided by the following main principles:

- Integrating the different types of technology programmes within an overall technology plan
- Securing the funding at the right time and in the right programme
- Rendering the ESA technology process fully transparent, well coordinated and efficient
- Leveraging on and reinforcing the technology harmonisation process

- Setting a real product policy
- Developing a systematic monitoring and evaluation process of the technologies developed
- Exploiting synergies with non-space sectors, favouring the spin-in of non-space technologies.

The planning of all ESA Technology activities developments is channelled through the E2E process, while the detailed programme formulation, the funding and the interface with the respective Programme Board remain within each ESA Directorate.

**3. Process organization**

All activities in the E2E process are performed by a single network of experts called TECNET. TECNET is organized in seven Service Domains (SD), six of them application driven: Earth Observation (EO), Science (SCI), Human Spaceflight and Exploration (HSE), Space Transportation (ST), Telecommunications (TEL), Navigation (NAV) and one for generic Technologies and Techniques (GEN) covering multi-use technologies and technology innovation. An additional Service Domain with focus on Security is currently being added. Each application driven SD is chaired by a representative of the relevant Programme Directorate. The GEN domain is chaired by a representative of the Directorate of Technical and Quality Management (TEC).

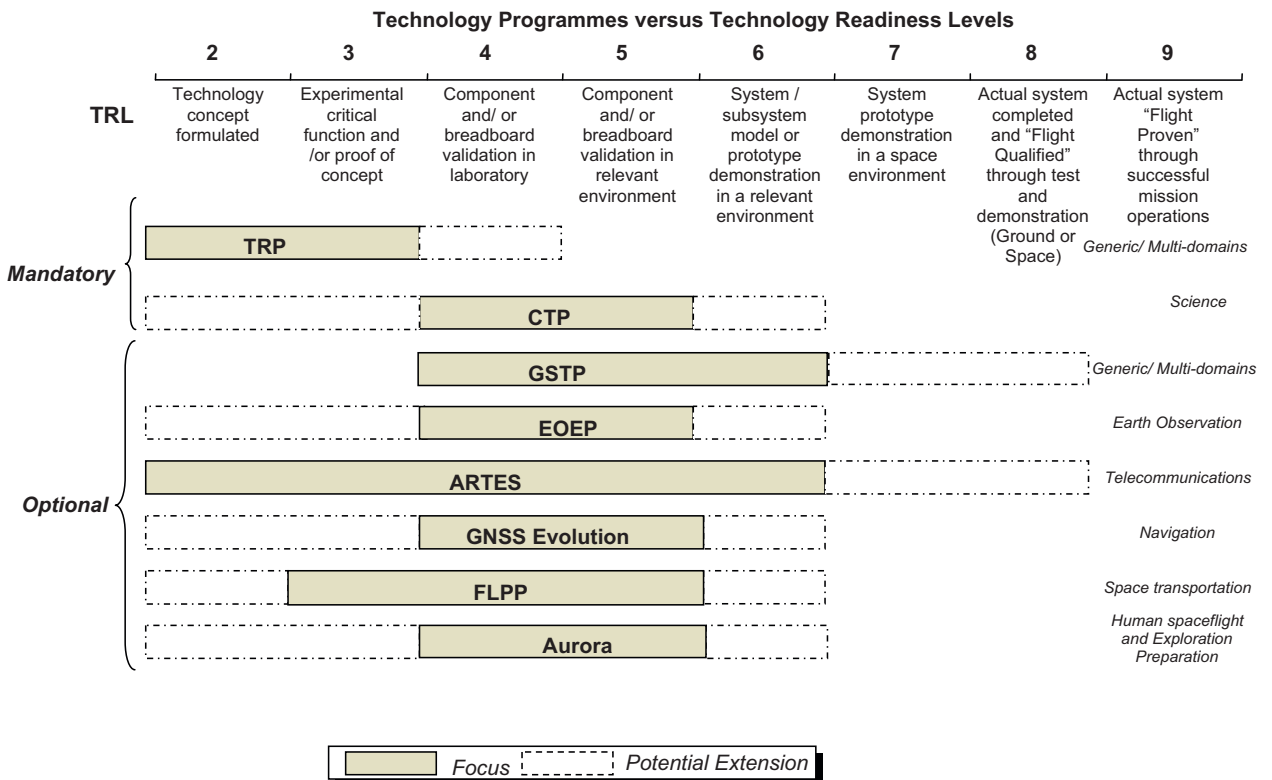


Fig. 1. The various ESA technology R&D programmes.

متن کامل مقاله

دریافت فوری ←

**ISI**Articles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات