## Recommendations: Strengthening the European space technology policy

**Pursue Technology readiness and maturity**

⇒ Industry recommends to support global competitiveness by making available cutting edge technology for European products; through innovation and spin-in.

⇒ Industry recommends to ensure the technological maturity of European technologies and products before implementation in programmes.
- Push the developments within technology programmes (especially mandatory) towards TRL 5-6 before their insertion in phase C of application programmes.
- Organise a consistent IOD programme to validate the key technologies prior implementation.

**Improve coordination and harmonisation efforts**

⇒ Industry recommends to further strengthen the coordination processes for European space technology development:
- Expand the Technology harmonisation process to involve all stakeholders,
- Increase the political support for a larger institutional commitment to technology programmes
- Ensure timely and correct implementation of the Harmonised R&T Roadmaps approved at European level.
- Commitment to funding is essential

**Increase the level of available resources**

⇒ Considering the funding gap accumulated since 2005, industry recommends to increase the existing Technology R&D funding available to industry by at least 250 million annually.

**ESA C-MIN2008 and technology support**

Since 2005 ESA and industry have put great efforts in coordinating their strategies for technology development, trying to identify together the critical technology issues and proposing programmatic and budget roadmaps to solve them.

At the Ministerial Council of November 2008, Ministers in charge of space will have to decide on the increase of technology support within ESA programmes.
Two main proposals address the TRP, a mandatory programme, and GSTP, an optional programme.

TRP Resources increase

⇒ Industry welcomes the proposal to increase the ESA level of mandatory resources with the objective of increasing the TRP level. This will contribute to improving the technology efforts and to enhancing the coordination of activities. Indeed, experience shows that pursuing technological readiness and excellence requires taking advantage of the best comptences available in Europe, disregarding national considerations, and this has proven easier within a mandatory programme such as TRP, than in optional programmes where the origin of funds potentially introduces a bias in the development strategies.

GSTP extension (Newpro objectives)

⇒ Since Newpro was introduced in 2005, the programme objectives have progressively evolved to embrace the major issues associated to technology development programmes, such as funding level, technology maturity, non dependence, spin-in and, more recently, security, and in-orbit demonstration (IOD). **All these objectives are supported by industry.**

⇒ Today ESA proposes the implementation of the main Newpro objectives (security, maturity, and IOD) through GSTP (rather than an envelope programme). Industry now hopes that GSTP budgets will be supported by all member states with funding levels commensurate with the programme enhanced ambitions and scope..

⇒ Industry stresses, however, that the implementation of Newpro objectives through GSTP will require giving particular attention to coordination and harmonisation goals to ensure that programme objectives are met in full and with optimised efforts.

⇒ Industry notes, in conclusion, that despite the good European consensus to recognise the importance of technology development and preparation for space, it is still very difficult to propose ambitious programmes and secure appropriate funding sources. **The ESA Council at Ministerial level of November 2008 could establish a new benchmark in European commitment to appropriate technology development for space programmes.**

1. Military space technology funding is difficult to evaluate. It can be estimated at a few tens of M€.
2. Source: European Space Technology Master Plan 2007
3. With the technology harmonisation process, ESA made a significant step towards appropriate coordination of activities. But even within ESA the implementation of approved technology roadmaps is insufficiently supported (since 2001, only 30% of the activities in the approved roadmaps have been implemented).

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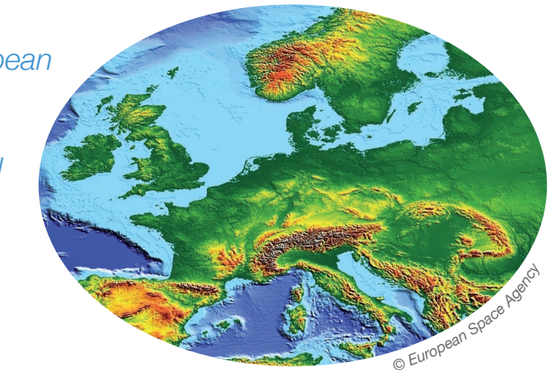
# ASD-EUROSPACE

The Space group in ASD

*The objective for industry is that the European space technology policy ensures the availability of needed technologies – with the appropriate maturity, the required level of non dependence, and at competitive conditions – for risk free implementation in the European (institutional) and global (commercial) programmes.*





The space manufacturing industry is one of the most RTD-intensive sectors in Europe. This is due to the high technological constraints of space systems (spacecraft and launchers).

Space technology development thus require important investments in industrial equipment (including test equipment), software, design and modelling tools and protocols development and maintenance, not to mention the scientific and technological competences required within industry, agencies, research centres and laboratories.

Space technology is also particularly sensitive. It is dual use (military and civil) by sheer nature, and as a result, space activities and space technology exports are highly regulated by the governments of all space fairing nations, and by inter-governmental agreements. For instance, all space technology is still excluded from the WTO (World Trade Organisation) agreement; and more specifically, launcher technology exports are strictly regulated by MTCR (Missile Technology Control Regime).

Space technology itself is on a constant evolution path, achieving growing levels of complexity and integration, with some applications requiring space systems to grow in size and capability, and others pushing them towards miniaturisation.

This can only be achieved with the appropriate funding effort, and with a stronger commitment of all stakeholders to the coordination of activities.

## Background

Space Technology in the European context

With a 4.8 B€ space budget (from public institutions), Europe is a medium size space power.

The majority of European investment in space is supported by civil budgets (approx. 85%), military space budgets are still marginal (approx. 15% of total).

Europe pursues a complete space programme:

- With satellite applications, in the areas of telecommunications (Inmarsat, Eutelsat...), Earth observation & meteorology (Eumetsat, GMES...), and Navigation (EGNOSS, Galileo...).

### *About ASD Eurospace*

*Eurospace was created in 1961 to foster the development of space activities in Europe, and to promote a better understanding of space concerns. The 46 EUROSPACE Members cover the whole span of the Space industrial chain, are present in 13 European countries and represent more than 90% of the total European space industry activity.*

### *The ASD-Eurospace Working Group on Research and Technology*

*Eurospace R&T activities are organised within the Eurospace R&T Panel. The main focus of the R&T Panel is to organise and convey European space industry views on European space technology strategy. Eurospace is the official industry representative to the European Space Technology Harmonisation process and ESTMP. The Eurospace R&T Panel is currently composed of 187 industry representatives representing 97 European space companies in 14 countries. It is currently co-chaired by Jean Portier (Thales Alenia Space) and Serge Flamenbaum (EADS Astrium) .*

## *Space technology policy goals*

*The European technology policy shall pursue technological excellence and technology readiness, to ensure availability of cutting edge technologies and products required by the worldwide commercial and European space programmes.*

*The European space technology Policy should aim at:*

- ***Improving the competitiveness** of European space systems and technologies on the European and global markets*
- ***Ensuring the readiness of European solutions** for a European space programme, with appropriate maturity for risk mitigation.*
- ***Ensuring the development and the preservation of competence and know-how in industry** to preserve technology heritage and keep technology options open for the future*
- ***Ensuring non dependence** of European space policies and programmes, and of European systems for the global market*

***The European space technology policy must be coordinated with all partners** to ensure:*

- ***The accurate information on the readiness level** of the European space sector (technology capabilities in industries, laboratories, technology centres, readiness levels, benchmarking etc.)*
- ***The understanding of system related issues** and technology interaction*
- *The implementation of a **long term vision** within short and medium term planning consistency*

*The European space policy shall be implemented with the appropriate funding and programmatic tools, achieving full coordination of all funding entities, from the public and private sector.*

- With foundations and heritage activities, in Science (Earth science and astronomy), Exploration and human spaceflight.
- With a space transportation policy with the Ariane and Vega launchers.

**In all areas, Space technology preparation is a pre-requisite for a successful and non-dependent European space programme.**

### *Civil Space technology Funding[1]*

**Budgets for technology: 380 M€ (government funding) and 150-200 M€ (industry funding)**

Space technology development in industry is carried out under contracts financed by ESA, nations, and third parties (e.g. European Union, Eumetsat), and is also funded internally:

1. ESA and civil national space agencies (such as CNES, DLR etc.) have specific programmes devoted to technology development activities. These programmes can be generic (such as ESA's TRP and GSTP programmes) i.e. targeted at developments with potential use with a wide variety of space applications, or specific to certain applications needs (such as ESA's ARTES, for telecommunications). Together ESA and national agencies budgets for space technology development are in the range of 380 Million Euro a year[2]. ESA alone has a budget for technology development in the order of 200 Meuro/year, roughly 7% of ESA expenditure for programmes.
2. The European Commission with the FP7/Space Foundations programme also provides support to technology development with the Space Foundations budget. This represented a budget of roughly 10 M€ in 2007.
3. The European space industry co-funds with space agencies and the EC a number of technology developments (within FP7 programmes for instance), and, of course, funds internal efforts in research, development and technology. The amount invested annually by the European space industry in technology and development activities is in the order of 150-200 M€.

**Funds available for technology development in industry: 150-200 M€ (external funding) and 150-200 M€ (industry funding)**

Since technology budgets do not fully translate into funding available to the manufacturing industry alone, of the 380 M€ of funds made available for technology development programmes by European governments, only about 150 M€ can be traced back to industry. With the addition of the 150 M€ of internal funding, there is a total of 300 M€ a year to fund technology development activities within industry (i.e. 6% of industry turnover).

This amount is very small when compared to the level of funding available to European competitors in the USA (e.g. US DoD alone spent 5.5 B$ in 2006 for research, technology & development activities),

Given that technology is a major competitiveness driver, there are serious concerns about the ability of European companies to preserve their competitive position on the global market if technology issues are not given the appropriate consideration.

### *Issues*

**Readiness and technology maturity**

Today's most funds associated to technology development programmes in ESA, National agencies and the EC, target early stages of technology development (from early concept investigation to breadboard models). Later stages of development (all validation and demonstration phases, where less innovation occurs and higher costs are incurred) are still insufficiently covered.

As a result, the European industry space programmes are often required to support the additional development costs, to choose risking the implementation of unproven technologies, or accept de facto dependence situations from non-European sources (and the associated regulatory risk). This contributes to program cost overruns and schedule slippages, detrimental to both industry competitiveness and European programmes effectiveness.

**Coordination and implementation aspects**

With the limited funding available for technology in Europe, the question of its effectiveness is absolutely crucial. Developments should be appropriately targeted and correctly performed, avoiding duplications wherever possible.

Technology harmonisation is a coordinated process aiming at improving the global effectiveness of institutional investment in space technology development in a context of limited budgets. It limits the duplication of efforts and ensures the identification of technology gaps. The process has grown from its pilot phase to full scale, and is now able to deliver sound and agreed technology plans, with detailed budgets and definition of activities.

These plans should be better supported, from both a financial and programmatic point of view, leading to more systematic implementation[3]. This may require increasing the funding level of European space technology programmes in targeted areas. This may also require that recognised and emerging actors of space technology development (such as EC and EDA) contribute more to the technology harmonisation process and that stakeholders are more strongly committed to funding the agreed activities.

**Funding level**

Already in 2005 industry called for an increase of European R&T efforts in the range of 100-150 M€ a year to address critical technology developments identified by Eurospace to support the European space programme. Despite the good political support of technology programmes at ESA Ministerial Council of 2005, spending for technology programmes in Europe remained flat, and as a result only a few areas have really progressed since then.

In 2008 industry counts on a significant additional support for technology development programmes, with new initiatives for technology development proposed for the ESA Council at Ministerial level. However, the expected funding level of Technology programmes is a critical issue and, taking into account the wide range of activities to be covered, it could be well below industry expectations and needs.

**Dependence**

Dependence situation arise when European technologies are not available for implementation in programmes with the appropriate level of maturity and cost. Other technologies are used instead. Dependence situations can vary in risk and criticality, depending on their drivers and the importance of the technologies considered from a programmatic point of view.

The most critical cases are those where European solutions are simply not available, and where there are strong limitations for European industry to access the technologies from abroad suppliers. Other unsettling cases of critical dependence are those where European solutions may be available but are not used for reasons related to maturity, heritage or cost.

Non dependence is now a growing concern of European policies, since technology dependence situations hamper European ability to pursue independently its space programme.

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> *The space sector is confronted with high technological and financial risks and requires strategic investment decisions.*
>
> *Quote from ESP document.*

> *Countries such as China and India are rapidly mastering space technology, becoming challenging competitors on the commercial market.*
>
> *Quote from ESP document.*

> *Europe will be ambitious in terms of innovation, identifying critical technologies and guaranteeing their funding.*
>
> *Quote from ESP document.*

> *The maintenance and development of know-how across the European space industry is essential if systems are to be developed based on European policy requirements and industry is to compete successfully.*
>
> *Quote from ESP document.*

> *The goal of Europe's technology development strategy will be to ensure sustained and coordinated investment while achieving a better balance between technological independence, strategic cooperation and reliance on market forces.*
>
> *Quote from ESP document.*