ESRE
ASSOCIATION OF EUROPEAN SPACE RESEARCH ESTABLISHMENTS

Supporting Strategic Infrastructures for Applied Research

A need for achieving strategic autonomy and bring back home critical technologies

The EU Space industry, an acknowledged asset for defence and security, and for competitiveness

Policy framework

EU recently realized that its position as global player is now under threat. Major developments such as the COVID crisis or Russia's aggression war against Ukraine revealed how vulnerable both our security and our economies are and how they are overwhelmingly depending on foreign countries.

In order to address the situation, the Council therefore launched several political initiatives and endorsed accordingly many strategies proposed by the Commission. As for **Defence and Security**, the EU arranged a four-pillar portfolio (act, secure, invest, partners) under the umbrella of **the Strategic Compass**[1] initiated in 2022. As for **Competitiveness**, the so-called **Draghi report**[2] *on the future of European competitiveness* provided an insightful analysis of the current obstacles hindering the European capacity to innovate and to strengthen its economy.

In particular, the Draghi report explicitly proposes "*to establish a multi-purpose Space Industrial Fund that would allow the European Commission to act as an 'anchor customer' to jointly purchase space services and products and fund critical technologies, helping the EU industrial base to increase its capacity. Similarly, joint strategic priorities for space research and innovation should be supported by increased coordination, funding and the pooling of resources for the development of new large EU joint programmes. Finally, as for the defence sector, the growth of innovative EU space SMEs, start-ups and scale-ups should be enabled by improved access to finance and the introduction of targeted European preference rules*".

Critical technologies considered, not the strategic infrastructures to support them

There are three important messages in this conclusion:

1. The report favours the European mutualisation and integration through a possible future "**Space Industrial Fund**" that could mimic for space what is the **European Defence and Industry Programme (EDIP)** for security and defence,
2. The report insists on producing and funding **critical technologies** for upgrading the EU industrial base and the EU autonomy,
3. The report focuses on **SMEs and start-ups** for ensuring innovation and production of disruptive solution in Europe.

[1] https://www.eeas.europa.eu/eeas/strategic-compass-security-and-defence-1_en

[2] https://commission.europa.eu/topics/strengthening-european-competitiveness/eu-competitiveness-looking-ahead_en

These messages uttered from an economic perspective are fully in line with the ones expressed from the defence perspective as the **European Defence and Industry Strategy (EDIS)** put forward by the Strategic compass and its associated EDIP programme also claim:

1. To provide support to SMEs (including start-ups and scale-ups) and small midcaps across the Union through **Fund to Accelerate defence Supply chains Transformation (FAST)**
2. To strengthen the competitiveness and responsiveness of the **EU's Defence Technological and Industrial Base (EDTIB) through a new** legal framework – the **Structures for European Armament Programme (SEAP)** – with the aim to defragment and harmonise European demand while targeting some quantitative objectives[3]

In this overall context, space has been duly identified as a dual-use sector imping both Defence and Security, and Competitiveness: the Strategic compass led to a new **EU Space Strategy for Security and Defence (EU3SD)**[4] while the Draghi report significantly considers "**strengthening industrial capacity for defence and space"** within the same header and under the same pitch.

There are however at least two blind spots that are disregarded by these high-level EU policies and strategies, **the role of Research and Technologies Organisations (RTO) on the one hand and the role of strategic infrastructures for applied research** on the other hand. These points are clearly related one to the other and can be seen - to some extent – as the respective counterparts for SMEs and start-ups, and for critical technologies.

The Space X syndrome

Space X has succeeded in a few years to conquer a wide share of the satellites' launch market. Several factors led to such a success among which the delay taken for Ariane 6 to entry into service, the shift of the market to low earth orbits with constellation of satellites – a largely self-induced shift as Star link is the main customer of Space X – and above all the "new space" method endorsed by the company.

Such uncontested success of Space X literally mesmerized the EU industry and policy-makers who mainly noticed that it has be allowed by the "licence to fail" – something radically new for the space industry – as well as by the agile method of "learning by doing" getting rid of the duplication, certification and security processes traditionally used in this sector. This "new space" method has been quite rightfully considered as a spill-over of the "new economy" which eventually gave birth to the GAFAM in the United States. Indeed, launch market shares gained by Space X are just marginal (expected) benefits to the actual target of Elon Musk's endeavour, which is communication and therefore IT services as for the GAFAM. Such a perspective favoured a stronger support from the EU

[3] By 2030, the value of intra-EU defense trade should represent at least 35% of the value of the EU defence market. By 2030, at least 50% of Member States defense procurement budget should be devoted to procurement from the EDTIB, and 60% by 2035. By 2030, Member States should procure at least 40% of defence equipment in a collaborative manner.

[4] https://defence-industry-space.ec.europa.eu/eu-space/eu-space-strategy-security-and-defence_en

and from its Member States to their start-ups and SMEs with the quite inflated hope to give birth at medium term to some European Space X.

Untold narrative for New Space

This narrative however neglects important parts of the story that could lead Europeans to deception. First, the existence in the United States of several States agencies as anchor customers that are justifying to some extent a high rate of launches. This point is now rather acknowledged, for instance in the section of the Draghi report quoted above. However, there are two other important points:

1. One cannot see the wood for the trees: Space X success has covered countless failed start-ups. In the United States, it is estimated that 10% of the start-ups will not survive the first year and that only 10% will survive on the long run. Eventually, only 1% becomes unicorns and in most of the case (34%) the failure is due to a poor product-market fit or to an inappropriate market strategy (22%)[5]. It is not the place in this paper for an in-depth analysis of the start-up approach but it is seemingly unreasonable to pin all our hopes in start-ups and SMEs (with possibly high shares volatility), especially when strategic autonomy is at stake.
2. Beyond the agile method, the New Space approach takes ground on a new management of space tech development based on a massive transfer of institutional procurements to the private sector and a put at disposal of State-owned agencies' and RTOs' expertise and facilities to the private sector. Said it otherwise, governmental customers kept on specifying what they need but delegated to the private sector choices for the best value for money technological solutions and opened their expertise and infrastructures for applied research to these private actors.

So far, such an articulation between RTOs expertise and facilities and private needs for development have not been addressed by the aforementioned European policies. As it raises delicate questions, it has not achieved yet, neither at Member States level, not at EU levels

Applied research: Infrastructures to assess critical technologies not acknowledged at EU level

Further to the awareness of EU dependency, critical technologies are now widely considered by a large breadth of initiatives. It is noteworthy that space sector pioneered such considerations with a **Joint Task Force (JTF)**[6] commonly set as early as 2008 by the European Commission (EC), the European Defence Agency (EDA) and the European Space Agency (ESA). The objective of the JTF is "*of ensuring autonomous and unrestricted access to these technologies"*. From 2023 onward, because of the increased security concerns, the JTF have received a new impetus from its patrons with a greater political focus and top-down approach, a greater focus on closing technological gaps and a greater and coordinated interaction with Member States and industry.

[5] For statistics, check for instance https://explodingtopics.com/blog/startup-failure-stats or https://www.failory.com/blog/startup-failure-rate

[6] https://defence-industry-space.ec.europa.eu/joint-task-force-jtf-evolution-powering-strategic-autonomy-space-2023-05-10_en

This effort eventually led the European Commission to set a **recommendation on critical technology areas for the EU's economic security for further risk assessment with Member States**, which lists of the ten topmost critical technologies, with the first four of them – advanced semiconductors, artificial intelligence, quantum technologies and biotechnologies – to be addressed in priority. It is notable the three first of these four priorities are tackling space technologies at large.

The recommendation clearly says that this list stems out from a kind of "pre-assessment" and that the full-fledged risk assessment should be performed within a dialogue with Member States. It concludes that, at this stage, "*no conclusion can be drawn on recourse to any particular instrument in the EU's or the Member States' toolboxes of measures to promote, partner or protect with others in view of enhanced economic security*". **Therefore, it must be underlined that strategic infrastructures for enabling the assessments or characterisation of such technologies are not mentioned by the recommendation.**

The same remark can be done about the **EU Observatory of Critical Technologies (OCT)**[7] jointly established in 2021 by DG DEFIS and the JRC. The observatory sets a list of criteria to fulfil to determine if a technology is "critical" or not and claims that "*DEFIS will issue the first set of space technological EU roadmaps early 2025".*

Last, in September 2024, the European Commission launched its **Strategic Technologies for Europe Platform (STEP)**[8], a new online portal "*offering a single access point for project promoters, investors, and national authorities to explore EU funding opportunities*". Though this initiative is quite new, it seems that it does not consider exactly the same set of technologies and is vaguer in their definition (Digital technologies and deep-tech innovation, Clean and resource-efficient technologies, Biotechnologies). Anyway, related infrastructures for applied research are not considered here either.

Strategic Infrastructures for Applied Research (SIAR)

Strategic Infrastructures for Applied Research (SIAR) are mostly unidentified as such by the European Union. They are however important assets that are conditioning the capability to develop and assess critical technologies and ultimately to ensure the EU strategic autonomy.

The European Strategy Forum on Research Infrastructures (ESFRI)

A closer look shows that research infrastructures are however encompassed by the EU Framework Programme for Research and Innovation. Since 2002 indeed, the European Council along with the Commission established a **European Strategy Forum on Research Infrastructures (ESFRI)**[9] to support a coherent and strategy-led approach to policy-making on research infrastructures in Europe, and to facilitate multilateral initiatives leading to the better use and development of research infrastructures, at EU and international level.

However, such a forum is clearly oriented toward academic science – pillar I on "Excellence science" in the Commission taxonomy – and not on pillar II on "Global challenges and European industrial

[7] https://defence-industry-space.ec.europa.eu/eu-space/eu-observatory-critical-technologies_en
[8] https://strategic-technologies.europa.eu/index_en
[9] https://www.esfri.eu/

competitiveness". This orientation is coherent with the Commission funding scheme that addresses research infrastructures in pillar I.

As a consequence, ESFRI logically endorses the definition of Research Infrastructures given by article 2(1) of the regulation of Horizon Europe[10], i.e., *"facilities that provide resources and services for the research communities to conduct research and foster innovation in their fields, including the associated human resources, major equipment or sets of instruments; knowledge-related facilities such as collections, archives or scientific data infrastructures; computing systems, communication networks and any other infrastructure of a unique nature and open to external users, essential to achieve excellence in R&I; they may, where relevant, be used beyond research, for example for education or public services and they may be 'single sited', 'virtual' or 'distributed'"*

This inclination clearly excludes strategic infrastructures for applied research (SIAR) intending to support competitiveness of the EU industry. Such SIAR are usually not "intending to promote excellence" per se and they mostly not fitted to provide "education or public services".

As a substantiating evidence, the list of research infrastructures maintained by ESFRI includes very few if not no strategic infrastructures for applied research. For instance, in the category "physical sciences & engineering" (16 facilities), there are mostly telescopes or other facilities dedicated to fundamental physics (spallation sources, synchrotron, neutron reactors…). More generally, this list does not include any facility dedicated to the development of technologies.

AirTN and RINGO as examples of former initiatives

However, **the European Commission paid attention in the past to infrastructures for SIAR**. In 2006, **the AirTN project** started, funded by the ERA-NET instrument within the EU Framework Programme FP6. This programme which was eventually pursued by AirTN FP7 (2009) and AirTN-Nextgen (2013) established a first list of Strategic and Key Aeronautic Research Infrastructures in Europe[11].

It was followed by **RINGO[12] (Identification of Aviation Research Infrastructure - Needs, Gaps and Overlaps, 2017)**, a Horizon 2020 CSA that mapped a comprehensive and public list of infrastructures for aeronautics, discriminating between "common infrastructures", "key infrastructures" (replacement between 10 M€ and 100 M€) and "strategic infrastructures" (replacement cost > 100 M€). The very detailed and documented lists coming out from RINGO identifies more than 350 facilities throughout Europe.

In 2024, the European Commission also proposed[13], through the directorate DG-RTD C.3 and in close cooperation with European Research Establishments, Academia and industries, an ERA Pilot initiative at EU level to cover the main future needs for updating/constructing technology infrastructures and fostering collaboration in aviation research to make them fit for disruptive aviation technologies.

[10] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32021R0695
[11] https://www.airtn.eu/catalogues/
[12] https://cordis.europa.eu/project/id/724102
[13] ERA pilot initiative on European aviation research & technology infrastructures - Publications Office of the EU

Such initiatives could pave the way to new and more ambitious actions intending to support our EU SIAR for developing, testing and validating critical technologies in the space domain in line with the policy guidance recalled at the beginning of this document.

Recommendations for the space context

Space is a highly strategic sector: most of the other sectors and ultimately the whole EU economy is depending on space assets through communications, positioning and earth observation. Also this sector is dual by nature: it is agnostic toward the type of application – civil or defence – made by the services it proposes. And at last, this is probably one of the most high-tech sector, more and more embedded within the IT overall industry, and for which our dependence on critical technologies are real challenge.

The development, test and validation of these space technologies deeply relies on the existence of SIAR. It must be emphasized that such **space SIAR** are often cross-sectoral. They could be used for testing space and aeronautics devices, space and chips components, or space and communication technologies and even automotive technologies. In this regard, **supporting such space SIAR is also favouring synergies**.

It must be emphasized too that, if they are sometimes owned by private actors, they are more often controlled by governmental institutional players such as space agencies or space-related RTOs. This is not due only to their high operating and maintenance costs but because they are also used for defence purpose. Thus, **if it can certainly not be envisaged to transfer their maintenance and development to the private sector or to the Community level, researching synergies would certainly streamline the most recent European guidance and policies on applied research for competitiveness. As other sector needs may have been already tackled[14], we suggest focusing researching synergies for the space sector**.

For the sake of a better exploitation of these SIARS, it is therefore recommended:

1. **To initiate an action supporting strategic infrastructures for applied research (SIAR)**
2. **To select space SIAR for such an action,** with respect to the high challenges met by the sector

Such an action might be threefold:

1. **Identifying and filling gaps in the EU space SIAR ecosystem**. It implies first to screen the existing EU space SIAR for identifying missing facilities that would be required for the development, the testing or the validation of critical technologies. Such an identification phase could be supported through Common Support Actions (CSA). Then, developing missing SIAR facilities should be considered only while paying the greatest attention to needs and priorities of Member States with respect to their strategic autonomy and associated assets. It

[14] "Towards a European policy for technology infrastructures" and "User needs for technology infrastructures"

particularly means that possible calls for proposals supporting development of new assets should not lead to market distortion in this highly competitive sector.

2. In addition, the EC might **favour financial mechanisms or instruments agreed between the European Commission, Member States and SIAR stakeholders (i.e. agencies and RTOs) supporting the access of EU private actors and especially of SMEs and start-ups to such space SIAR**. The support could materialize both through some EC contributions to the access fees that are often too expansive for small companies and by some tax deductions[15] for research activities of private actors using these instruments. Without anticipating the terms and conditions of such instruments, it could be accompanied by **some guidelines and actual measures intending to audit and secure the shareholding of these SMEs and start-ups that could behold EU critical assets or technologies.**
3. The action might also **set one or several flagship space assets to develop and therefore launch ambitious development projects that will make use and support the evolution of the existing space SIAR in a cooperative way**. Such flagship initiative would revive the virtuous process once triggered by Hermes spaceplane in the early 90's, which led to the development and exploitation of several space SIAR across Europe and which are still decisive nowadays for the competitiveness of the EU industry.

The recently launched **EC portal on Digital EU Space Ecosystem**, which has a section for "test facilities", could for instance be instrumental for hosting such an initiative.

To sum up, such a threefold action should favour the emergence and cross-fertilisation of an EU space SIAR community and its seamless cooperation with SMEs and start-ups. This would adapt to the European actual scene one of the underlying conditions that allowed the emergence of the American New Space sector. Last, the action could ultimately lead to support partly the development of missing space SIAR for the sake of the competitiveness of the EU space industry.

[15] Under condition of an EU legal act.