FRAMEWORK FOR
A EUROPEAN DEFENCE RESEARCH & TECHNOLOGY STRATEGY

Table of content

[1] *For the purpose of this document, R&T means (using the EDA Indicators and Strategic Targets definition) expenditure for basic research, applied research and technology demonstration for defence purposes. This covers broadly six Technology Readiness Levels: TRL 1-6. It does not include expenditure for demonstration or development of products and systems for which a decision to procure has been taken and a service date has been envisaged.*

FRAMEWORK FOR
A EUROPEAN DEFENCE RESEARCH & TECHNOLOGY STRATEGY

A- Introduction

► Why an EDRT Strategy?

1. The on-going work on the "Capability Development Plan" (CDP) and the "Strategy for the EDTIB", endorsed by the EDA Steering Board on 14 May 2007 set the wide framework which will enable the achievement of the primary objective of improving European defence capabilities. Harmonisation of military requirements and the resulting enhanced collaboration among pMS are seen the principal ways to meet European defence needs and ensure autonomy as required: collaboration in R&T is singled out as an important element contributing towards the level of capability required, as well as towards the generation of larger scale, and where beneficial more interdependent co-operation in the development of defence systems.

2. These recent developments reinforce the need for an EDRT Strategy, supported by the following driving trends:
   - *Political impetus and will***.** Recognising the need for more and better research and technologies to face the new challenges, policy-makers have increased their attention in this area, not confined to the defence sector but also across the closely related security spectrum, as reflected in the Joint Action establishing the European Defence Agency.
   - *Introduction of capability-driven programming*. R&T collaboration has historically been predominately (but not only) characterised by bottom-up direction and programming. By means of an EDRT Strategy the link between capability requirements and R&T initiatives can be promoted.
   - *Changes in the supply side*. The European defence industry has amplified significantly its restructuring since the early 1990s. Cross-border ownership of companies adds to the complexity of the industrial scene, whereas small and medium-sized companies still look for their place in the supply-chain next to prime contractors.
   - *Multi-lateralisation.* Although bilateral co-operations still are important to pMS, multilateral collaboration has grown.

3. In that context, the definition of an EDRT Strategy is a means to implement those broad principles and trends, in order to guide the different Defence R&T stakeholders with objective of fulfilling defence capability requirements through contribution to the EDTIB Strategy. In line with the High Representative for CFSP policy headlines on R&T from the Hampton Court summit in late 2005, the Strategy should:
   - a. ("*Investing more*…") substantiate the level of spending required to fulfil the needs of pMS, reflected in the targeted EDTIB characteristics which apply to a large extent to the defence technology base, namely: capability driven, competent and competitive;
   - b. ("*Investing better*…") help to focus Defence R&T investment at European level on areas not already covered by civil investment, and therefore influence the convergence and alignment of national policies; it should also promote best practice, improving efficiency in collaborative Defence R&T;
   - c. ("*Investing more together*…") help to make European R&T activities more transparent, supporting a step change in R&T collaboration, identifying where interdependencies among the pMS would aid the development of the required capabilities and the strengthening of the EDTIB.

► Position and scope of an EDRT Strategy?

4. The EDRT Strategy will stand as one of the four major strategic documents implementing the wider objectives assigned to the EDA: the Capability Development Plan, the EDTIB Strategy, the R&T Strategy and the Armaments Strategy. They are all interlinked with no formal hierarchy between them; in particular, the R&T Strategy maintains a mutual influence (push & pull) with each of the other three.

5. There is a shared understanding that an EDRT Strategy shall cover both:
   - **"Ends":** into which technologies should investment be directed (and at what level) to serve the ambition of pMS for European defence operational and industrial capabilities?
   - **"Means":** what other objectives must be pursued in terms of framework, mechanisms, processes and structures to help improve performance in delivering the "Ends" through various forms of collaboration, including fulfilling the complementary needs for autonomy and national operational sovereignty, as well as through co-operation with other international institutions?

   This provides the evidential foundations upon which the EDRT Strategy is based.

► What can the different stakeholders expect from an EDRT Strategy?

6. All stakeholders are to benefit from the establishment of an EDRT Strategy:
   - **National governments,** including defence forces, would be better informed in making their investment decisions. For example when it comes to cooperation with others it would help identify what are the common priorities, who is already working in a particular area, and who is ready to do what, when and with whom;
   - **Industry, research institutes and other R&T stakeholders (including other cooperation fora) will be better informed of pMS expectations and will** be better prepared to meet them directly or indirectly by deciding on allocation of their own investment. They will be in a position to advise on trade-offs, convergence and feasibility aspects in the optimisation of R&T efforts. They will also have improved visibility to help avoid unnecessary duplication and set-up partnerships to contribute to this optimisation, aligning with the pMS in the strengthening of the EDTIB;
   - **The EDA**, helping facilitate the process, will provide for a framework within which pMS will be supported to identify the best opportunities for investment. It will also contribute towards improvement of cooperation mechanisms.

B- "ENDs": what technologies should be developed to support ESDP?

7. **A prioritised European list of technologies** and research themes to invest in to serve the defence operational and DTIB[1] capability needs of pMS is needed to direct pooled investments in defence R&T and give a reference point to national defence R&T investments in the light of agreed priorities. This list is therefore a key element of the EDRT Strategy, all other objectives contributing to the achievement of these.

8. The fundamental process for the development of the list of key technologies remains an engineering-like **translation process** (under development) starting from capability challenges of the CDP, highlighting important items to focus R&T upon in order to maximise value at capability level, showing where the problems are in broad terms and hence where further CapTech efforts are needed.

[1] T*echnologies and skills include those needed to design, develop, produce, repair, maintain, or decommission equipment used by the armed forces*

9. **In the short term**, not waiting for the potentially demanding translation process to deliver R&T goals relevant to specific capability requirements, a European Defence key technologies exercise will provide the main R&T orientations at European level, in an interpretation of the capability challenges.

10. Priorities for R&T investment will derive from an appraisal of **various criteria**, including:
    - The translation from military capability needs into R&T objectives (i.e. direct benefit for the user),
    - The analysis of impact from the technology push: that is identifying where technology (emerging or to be developed) could help "change the capability or industrial game" and make a significant difference to the defence R&T capability,
    - The identification of those scientific and technical skills (providing actually an indirect benefit for the user) needed to support the capability needs of armed forces,
    - The reinforcement of the EDTIB to satisfy needs for autonomy and operational sovereignty,
    - The identification of opportunities for effective collaboration taking into account factors such as:
        - national levels of ambition regarding autonomy in the area,
        - ambition for the technical maturity of a collaboration (e.g. TRL and SRL[1]),
        - whether the area is open to limited or wider collaboration,
        - the terms of a desired collaboration,
        - an assessment of whether the benefits of multilateral collaboration outweigh its inherent difficulties,
        - an appreciation of the asymmetry across Europe in terms of R&T capability, investment and national industrial capabilities,
        - the early involvement of the supply chain.

    Such an appraisal requires an appropriate trade-off between focus of the direction given and flexibility left to R&T providers to offer innovative solutions. Multidisciplinary work of the Integrated Development Teams and Project Teams should play a key role in the process.

11. The scrutiny and verification of such a prioritised list is essential for achieving pMS buy-in into those R&T objectives at EU level, covering the importance of each item for defence, the related EDTIB objective and the preferred option to acquire it. This should take into account not only technical but also wider factors including other partnering strategies, both in the civilian and defence areas,

C- "MEANs": what needs to be done to achieve the "Ends" and support autonomy, and how?

► <u>Improve integration of the defence technology base into the wider technology base</u>

12. Acknowledging there is 'spin-in' and 'spin-out' between the defence and civilian/security arenas (increasingly from civilian to military), several objectives will contribute towards this integration:
    - **a- Establish a strategic dialogue based on partnership**: A critical issue in the EDTIB context is our ability to engage with industry and research providers. There is a necessity to undertake a strategic dialogue with the governments on capability priorities and innovative solutions; and on partnerships in developing technology capabilities through strategic

[1] *TRL : technology readiness level, - SRL : system readiness level*

technology programmes. Indeed, industry and research providers have a pivotal role in shaping partnerships of excellence in technology responding to the expressed needs of the European governments or EU.

- **b- Coordinate efforts with other R&T networks and bodies**: coordinate with other military and civilian networks relevant to R&T at a European level as envisaged in the Joint Action, with a view to aligning efforts and reducing unnecessary duplication. All this should be done in accordance with the EDTIB Strategy objective to allow closer integration with the non-defence European technological and industrial base[1]. Major elements of this will include:
  - The defence exploitation of commercial 'off-the-shelf' technologies and products.
  - Analysis of emerging and disruptive technologies increasingly likely to be emanating from the civil sector funded through national and common research programmes,
  - Promotion of compatible standards and taxonomies, recognising growing civil-defence synergies.
  - The need to raise awareness of the capabilities of the civil sector and find new ways for civil/defence interaction in facing defence technology and programme challenges.
- **c- Broaden the supplier base**: in many areas, R&T capability is in fact no longer restricted to a national supplier base and there is an evolving pattern of international networks and centres of excellence, which incorporates a mix of defence and civil suppliers, including industry, universities, research institutes and others. Increase involvement and possible development of capacities of smaller pMS shall also be considered and included in this process. An appropriate way of interaction within the CapTechs should be established.
- **d- Promote R&T Networks of Excellence**: it will be beneficial to identify which arrangements (e.g. networks of excellence on similar lines to arrangements such as Defence Technology Centres, Towers of Excellence…) could help optimise use of national knowledge, competence and innovation (civil/military) in addressing defence requirements, whilst opening up the possibility of dealing with more complex R&T subjects[2].

► Promote technology push

13. There is a need to balance the capability driven perspective with sufficient technology push: science and new technology often lead to unforeseen and unexpected applications of emerging, sometimes disruptive technologies - in turn driving capabilities. Therefore, capability requirements cannot define the whole R&T spectrum relevant to defence and security. R&T is a valuable source for policy makers, and stakeholders, for identifying challenges in their own missions. The following elements need to be taken into account to improve technology driven programming:
    - **a- Set-up a shared R&T watch mechanism**: an interpretation of the "Ends" section above includes the ability to identify, interpret and assess emerging and disruptive technologies and assess how they impact on defence. A European R&T watch mechanism should rely on national technology activities, albeit some activity may have an added value if performed at European level, for example:
      - Opportunities for experts to network and exchange ideas;
      - Selection and evaluation of R&T watch elements of common interest;
      - The ability to respond to focused requests at European level;

[1] *Cf § 6 of the Strategy for the EDTIB.*
[2] *Cf § 6 of the Strategy for the EDTIB.*

- **b- Promote technology insertion for defence purposes**: civil research should be used wherever possible. In particular the growing area of security-related research will be relevant.
- **c- Develop technology roadmaps**: technology foresight studies and the prediction of probable disruptive technologies are essential as a tool to predict new threats and new technological solutions to military requirements. Technology roadmaps should be formulated and positioned in the wider EDRT roadmap (as exposed in § 15 below).

► Improve the effectiveness of R&T collaboration

14. Based upon an objective analysis of the obstacles to collaboration in defence R&T and on the need to strengthen the EDTIB, the following objectives should be considered:
    - a- Establish a **stronger pMS commitment** for R&T collaboration, through for example:
        - Guidance and approval of EDA R&T collaborative programmes by the Steering Board in R&T composition;
        - Innovative cooperation mechanisms at governmental and industrial levels;
        - The setting of R&T expenditure benchmarks/targets[1], as benchmarks or targets can support pMS in their efforts on capability development, including through reallocation of defence spending aimed at spending on R&T, and can also help at encouraging greater efficiency and effectiveness through international collaboration over a longer period and contribute towards a better balancing of effort between the pMS.
    - b- Provide **better management of R&T**: planning process, definition and sharing of best practices, monitoring of projects mainly towards delivery and timing, monitoring of the overall R&T performance in order to regularly re-align the Strategy (on both "Ends" and "Means") and the planned efforts through the definition and implementation of measures, including: fulfilment of technological capability needs, TRL progression, insertion into procurement programmes, coverage of disruptive areas with impact on defence capabilities, improvement of cooperation mechanisms…).
    - c- Create an **effective and enabling environment** for defence[2] R&T collaboration in order to optimise the use of resources and avoid unnecessary duplication[3]. This large objective embraces numerous topics which will perform only if enough of them are active, considering their mutual influence:
        i. Invest in the translation of capability needs into R&T objectives, at the appropriate level of effort. The role of the CapTechs and their interaction with IDTs and PTs are crucial in delivering R&T capabilities; organisation and processes should be continually improved, both in terms of technology but also in terms of understanding capability needs;
        ii. Promote visibility of R&T activities at all levels;
        iii. Develop a process of identifying commonalities and synergies between national plans (e.g. through consideration of the "Ends" part of the joint EDRT Strategy in national R&T planning);
        iv. Further develop new cooperation mechanisms, based on e.g. the experience of the Joint Investment Programme on Force Protection (on-going), allowing: evaluation of the right price to pay to join an on-going cooperative programme at various stages, wider participation (universities, research centres, SMEs…), and flexible financing mechanisms adapted to various modes of cooperation;

---

1 *Cf also § 9 ("increasing investments") in the Strategy for the EDTIB. Ministers will consider adopting specific benchmarks at the November '07 SB meeting.*

2 *And even broader: see § 12.*

3 *Which is contributing, directly or as a catalyst, to objectives listed in §9 of the Strategy for the EDTIB: consolidating demand, ensuring security of supply or increasing competition and cooperation.*

v. Promote collaboration as a means to enable the European defence R&T Strategy, aiming at a strong defence research base in Europe that provides best value for money for pMS;
vi. Define modalities for the sharing and exploitation of R&T results, considering topics such as: IPR management, technology export regulations, R&T licensing, R&T results tools for sharing (with managed access rights);
vii. Develop networking skills of R&T managers and activity in the networks of experts.

- d- Define a common way to **accelerate new technology insertion** into programs: depending on situations, this may be about:
  - Applying spiral development (maturing the technology once inserted tentatively at first);
  - Improving the responsiveness of R&T programmes (both national and collaborative) to changing customer needs, and understanding how technology is transitioned into defence solutions;
  - Re-balancing investment of R&T beyond equipment (e.g. decision support, recruitment and training), leading to a better use of defence R&T resources.

► Implement the R&T Strategy into roadmaps

15. When correctly used, roadmaps can be an important tool in transitioning from the technology strategy level, through to the "make it happen" level. Roadmaps will organise more detailed objectives implementing the Strategy objectives – both from the "Ends" and the "Means" areas, allowing for better application of R&T resources, as well as a closer and sustainable coordination with adjacent roadmaps in the Capability, Armament and DTIB areas.

16. The implementation of the Strategy into roadmap(s) is best seen as a concurrent process contributing to de-risking investments. In helping to identify the possible paths to meet the strategic goals, road mapping can inform strategic choices. A good roadmap highlights the advantages and disadvantages of various possible "paths", leaving to the strategic level to choose between them.

17. Road mapping is however a very complex and time-consuming task and needs to be carried out by experienced personnel working within a coherent and mature organisational framework. This can limit its application at a multilateral level. Moreover it requires consensus between participants as to not only the general objectives, but also as to keeping open future options. Roadmaps will therefore need to be applied, on a case-by-case basis, very often in variable geometries of pMS rather than at a European level.

D- Conclusion

18. There will be a necessary prioritisation between the above strategic objectives in both "Ends" and "Means" areas for their implementation, as they all together require a substantial effort to be solved, and as a balance between addressing short term and longer term objectives is needed. The EDRT Strategy will be therefore incremental, benefiting progressively from iterative and successive developments, aimed at providing the level of scrutiny and verification needed to achieve the buy-in of the pMS and allow for effective collaborations, also implementing priorities from Capability plans (e.g. the EDA's Capability Development Plan), Armaments plans and EDTIB strategies. While influencing them.

-§-