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The Key Role of the European Defence Agency in the Enhancement of European Defence Research and Technology

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Abstract:

The paper in the introductory part underlines the importance of the defence research and technology (R&T) as a decisive factor of the defence capabilities development and strategic pillar of the Armed Forces transformation. Authors inform on functions and tasks of the European Defence Agency (EDA) in R&T area in accordance with the Joint Action and consolidated version of the Treaty on European Union, as it results from the amendments introduced by the Treaty of Lisbon. The authors are focusing on the explanation of the Capabilities Technology (CapTech) as a basis for both generation of cooperation projects and network of experts (Governmental and non-Governmental) in the R&T area and the key operating rules specified in R&T Operational Concept. The information on EDA defence R&T projects categories are also introduced. The part of paper is dealing with European Defence Research and Technology Strategy as a principal strategic document (aim of this document and main considerations). The authors inform on the technology priorities in the EDA framework. The last part of paper is focused on selected challenges in the European R&T area.

Keywords:

Defence Research and Technology (R&T), European Defence Agency, Capabilities Technology, cooperation, programmes, projects.

1. Introduction

Research and technology is perhaps one of the most important issues in the European Union framework. Defence related research has principal importance within the context of development of both the defence capabilities and Armed Forces,

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improvement of defence systems as well as from the enhancement of defence technological and industrial base point of view. Defence research is the key pillar during the Armed Forces transformation process. Research and technology (R&T) activities comprise basic and applied research for the purpose of expanding knowledge and acquiring technology that may be applicable to future weapons systems.

From the above mentioned facts it can be concluded that defence research and technology is a key element for both the filling of the European ambitions in the defence area and Common Security and Defence Policy of the European Union. The European Security Strategy endorsed by the European Council identifies the establishment of a Defence Agency as an important element towards the development of more flexible and efficient European military resources. The European Council at Thessaloniki in June 2003 tasked "the appropriate bodies of the Council of the European Union to undertake the necessary actions towards creating an intergovernmental agency in the field of defence capabilities development, research, acquisition and armaments" [1], [2]. Subsequently through a Joint Action by the Council of the European Union (2004/551/CFSP) of 12 July 2004 the European Defence Agency (EDA) was established [1].

The European Defence Agency (EDA) has executed a very important role in the improvement of European capabilities for the Common Security and Defence Policy (CSDP). The Lisbon Treaty has reinforced the Agency central role in this mission. The European Defence Agency was established with the aim to carry out the following main functions [1-3]:

- development of defence capabilities in the area of crisis management,
- development and improvement in the European armaments cooperation, particularly through the development and proposal of new multilateral cooperation projects and promotion of effective acquisition and contracting procedures,
- improvement in the European defence research and technology (R&T) effectiveness, especially to be an impulse for a joint defence R&T, to minimise redundancy and maximise synergies by dual use programmes,
- creating the European Defence Equipment Market (EDEM) and strengthening the European Defence Industrial and Technological Base (EDTIB).

2. Main EDA Functions and Tasks in the R&T Area

Main functions and tasks of the European Defence Agency are specified in the article 5 of the Joint Action document. As we mentioned, the key function is enhancement of the effectiveness of European defence research and technology (R&T), in particular by [1, 2]:

- promoting, in liaison with the Community research activities where appropriate, research aimed at fulfilling future defence and security capability requirements and thereby strengthening European industrial and technological potential in this domain,
- promoting more effectively target joint defence R&T,
- coordinating and planning joint research activities,
- catalysing defence R&T through studies and projects,
- managing defence R&T contracts,
- working in liaison with the Commission to maximise complementarity and synergy between defence and civil or security related research programmes.

Importance of the R&T is underlined also in the Consolidated versions of the Treaty on European Union (TEU) with the annexes and protocols thereto, as they result from the amendments introduced by the Treaty of Lisbon (which was signed on 13 December 2007 and which entered into force on 1 December 2009). In accordance with Article 45 of consolidated version of the TEU, EDA is tasking to "support defence technology research, and coordinate and plan joint research activities and the study of technical solutions meeting future operational needs" [4].

3. CapTech

The CapTech (Capabilities Technologies) comprise the basic pillar the EDA relies on to generate cooperative R&T projects. Conceptually, they are two things at once [5, 6]:

- Technology area focused on a particular defence capability and the technologies associated with it,
- Network (Group) of experts from the participating Member States (pMS), industry, research institutes and universities.

There are 12 CapTech assembled in 3 major groups to reflect the major Capability domains (see Tab. 1 – the CapTechs structure):

- IAP: Information Acquisition and Processing ↔ Knowledge,
- GEM: Guidance, Energy and Materials ↔ Engagement,
- ESM: Environment, Systems and Modelling ↔ Manoeuvre.

Tab. 1 The CapTechs structure

Main domains of capabilities		
KNOWLEDGE Inform and Command	**ENGAGEMENT** Engage and Protect	**MANOEUVRE** Deploy and Sustain
CapTechs Blocks		
IAP Information, Acquisition & Processing	**GEM** Guidance, Energy & Materials	**ESM** Environment, Systems & Modelling
CapTechs Technology Areas		
IAP01 Components	**GEM01** Materials & Structures	**ESM01** Naval Systems & their Environment
IAP02 RF Sensors Systems & Signal Processing	**GEM02** Energetics, Missiles & Munitions	**ESM02** Aerial Systems & their Environment
IAP03 Optical Sensors Systems & Signal Processing	**GEM03** Ground Systems & their Environment	**ESM03** Systems of Systems, Space, Simulation & Experimentation
IAP04 CIS & Network	**GEM04** Guidance & Control	**ESM04** Human Factors & CBR Protection

The CapTechs are comprised of the following members:

- Moderator: An EDA staff member, who promotes and moderates discussion and exchange of opinion, monitors and reports on the activities,
- CapTech National Coordinators: National governmental experts in the corresponding technology areas,
- CapTech National Governmental Expert designated in specific technologies,
- CapTech National non-Governmental Experts from industry, research centres and universities.

4. R&T Operational Concept

It is one of the key documents concerning defence research and technology in the EDA framework. The R&T Operational Concept established the work methods and procedures to be implemented in order to carry out R&T activities. This operational concept is based on the seven key operating rules (KOR) as follows [7]:

- Capability orientation,
- Network centric management,
- Transparency through monitoring and reporting,
- Embracing valuable existing cooperation and networks,
- Effective interface with dual-use and civil research,
- Involvement of industry,
- Using EDA contracting capacity for R&T.

Implementation of the above mentioned key operating rules (due to limited space for the paper we do not deeply specify the relevant KOR) leads to the adequate organisation of the EDA R&T Directorate, structured internal dialogue between this EDA Directorate and other three EDA functional Directorates (for defence capabilities, armaments, defence industry and market), good visibility from the decision-making level, identification of defence R&T priorities based on capability needs, active but controlled participation of industry in the R&T process and structured and constructive dialogue with the European Commission on dual-use and security research.

5. R&T Project Categories

There are three project categories for initiating R&T activities in the EDA framework [1, 2, 8]:

- EDA - funded projects,
- Ad hoc category A projects (also referred to as *opt-out*),
- Ad hoc category B projects (also referred to as *opt-in*).

EDA -funded projects are proposed by the EDA and financed under its operating budget. All the pMS receive information on the project and share the results.

An ad hoc category A project is proposed by the EDA or by one or more pMS for involvement by all the pMS and the European Commission (known as an "Open Project", i.e. it is open to participation by any interested country).The specific guidelines are set by the EDA Steering Board as proposed by the participating countries, which share the results of the projects.

An ad hoc category B project is proposed by one or more pMS for execution by themselves (known as a "Closed Project"), but a two-month period is given for the remaining countries to express an interest in participating, hence the alternative name

"opt in" for these projects. The countries proposing the projects have the power to accept or reject the participation of those pMS that have expressed an interest.

5.1. Category A Programmes – Defence R&T Joint Investment Programmes

The most important EDA R&T programmes in the category A programmes are Joint Investment Programmes (based on joint funds, hence this name).

The first EDA Defence R&T Joint Investment Programme (JIP) launched at the end of 2006 with fulfilment period of three years, was the JIP on Force Protection (JIP-FP) [9].

It focused on technologies for protecting Armed Forces against threats such as snipers, booby traps and improvised explosive devices. The JIP-FP Programme covered 18 specific research and technology goals grouped under five capability areas:

- Collective (units, platforms, infrastructure) survivability through enhancing detect, identify and response performance,
- Individual protection,
- Data analysis including data fusion from various sources,
- Secured tactical wireless communication systems in urban environment,
- Mission planning/training in an asymmetric environment.

The funding commitment of 20 European contributing governments received totalling € 54.93 million for three years period.

The second EDA Defence R&T Joint Investment Programme category A is the JIP on Innovative Concepts and Emerging Technologies (JIP-ICET) [10]. It was agreed in May 2008 with the aim of research into emerging technologies which might have a disruptive effect on the battlefield. The 11 European countries contribute to this programme, which is funded by a common budget of € 15.58 million. The JIP-ICET covers 8 specific research and technology goals grouped under three technological clusters:

- Improved autonomy,
- New solutions for materials and structures,
- Data capture and exploitation.

5.2. Category B Programmes/Projects

The implementation and management of the category B defence research and technology projects is a key aspect of the EDA in support of pMS and essential factor for enhancement of co-operation in the R&T field. There are several tens of projects in this category (they are not mentioned in this paper). The EDA is implementing a series of measures focused on increasing the number of cooperative projects and activities in this category of projects.

Among these measures the following matters can be highlighted [2, 11]:

- Action Plan for the Means identified in the European defence research and technology strategy (selected information on this Strategy is listed in the next part of paper),
- Strategic Research Agenda (SRA), which serves to provide a shared vision among governmental and non-governmental CapTech members and includes identified actions for European defence R&T technology push aspects,
- Report by the Nations on accelerating the generation of category B projects,

- Implementation of the Innovation and Technology Partnership (ITP) Model, which was first time implemented in the framework of SIMCLAIRS project - Studies for Integrated Multifunction Compact Lightweight Airborne Radars and Systems – in 2009. The main aim of the ITP is to achieve the best technological solutions in the relevant technological domains with receiving and exploitation of new technologies from the industry (especially from SMEs) and universities and to provide the free cross-border flow of technologies and information among the participating subjects.

6. The European Defence Research & Technology Strategy

This strategy is a part of the four EDA strategic documents, which create the Strategic framework for the EDA activities. The other EDA principal strategic documents are as follows [2, 12]:

- Capability Development Plan (CDP),
- European Armaments Co-operation Strategy,
- European Defence Technological and Industrial Base (EDTIB) Strategy.

The fundamental goal of this strategy is to improve and to more efficiently develop cooperation on defence research and on technology demonstrators, the goal being to supply adequate technologies in support of developing short-, medium- and long-term military capabilities [13].

From this point of view the investment in defence research and in technology is vital for EDA participating Member States to maintain their future defence and industrial capabilities. In this regard, it is needed to underline that European Ministers of defence have supported an aim of "spending better and more together on Defence R&T" and they agreed on collective benchmarks to increase Defence R&T spending to 2 % of all defence expenditure and to bring European collaborative Defence R&T spending to a level of 20 % in November 2007 [14].

As for its structure, the strategy has (after the short "Vision" part) two main considerations:

- ENDS or technologies requiring investment in order to meet capability needs,
- MEANS or the mechanism, processes and structure for most efficiently achieving the ends.

The strategic aim "The ENDS" defines a list of key technologies for European Defence R&T. The "Ends" are the technologies to which investment should be directed to serve the ambitions of pMS for improved European defence operational and industrial capabilities. The strategy specifies that the definition of the ends must be accompanied by R&T projects, with a suitable balance between capability-driven projects and projects of a more scientific and technical nature. The goal is to be able to anticipate new threats and to be at the forefront of advances in technology.

The purpose of the strategic aim "The MEANS" is developing the right tools to achieve the ends. In this regard it was established that they must [13]:

1. ***Improve integration of the defence technology and industrial base into the wider supply chain.***

This means to maintain the European security of Supply by strengthening the competitiveness and increasing the efficiency of the European defence industry through improvements in the R&T base. In particular, they must be aimed at:

- Establishing a strategic dialogue with industry and research providers, including civil research,

- Ensuring appropriate coordination with other R&T networks and bodies,
- Broadening the supplier base,
- Promoting R&T Networks of Excellence.

2. Promote technology push as a complement to the capabilities component

These means are aimed at ensuring that EU has appropriate tools in place to identify emerging or disruptive technologies. Main recommendations in this area include:

- Improving the shared R&T watt mechanism,
- Promoting awareness of civil technologies for defence purposes,
- Developing technology roadmaps.

3. Improve the effectiveness of R&T collaboration

These means are aimed at improving the speed and efficiency of delivering the "Ends" whilst at the same time ensuring that already delivered "Ends" will have a direct benefit for EU defence capabilities. This requires:

- Encouraging a stronger pMS commitment to R&T collaboration and budget alignments,
- Providing better R&T management,
- Creating an environment for R&T collaboration,
- Accelerating new technology insertion into programmes in priority areas.

7. Technology Priorities

In parallel with the European Defence Research & Technology Strategy, the process of the definition of key technologies was started. This process resulted in 22 functional areas corresponding to R&T strategy headings [2, 15]. A listing of these key technologies is provided below (see Tab. 2).

Tab. 2 List of EDA key technologies /priority functional areas

	European R&T Strategy Heading	**Functional Areas (The key technologies)**
1.	RF technologies	RF generic technologies (components, processing, systems, integration) and multifunction RF technologies.
2.	Electro-optic technologies	EO Systems & Integration.
3.	Electronic components and devices	Electronics Hardware.
4.	Materials & Structures	Structural Modelling Design & Through Life Support.
5.	Command & Battle Space Management and Mission Systems	Networked sensor control, management and cueing.
6.	Command & Battle Space Management and Mission Systems	Command and control technologies (campaign/ops/mission planning and mgt, battle space mgt, Shared situational understanding, data fusion/mining/ reduction, image exploitation, innovative Sensors for Urban Warfare, including acoustic and

	European R&T Strategy Heading	Functional Areas (The key technologies)
		seismic sensors).
7.	Communications, Networks, Information Systems & Computing	HF, VHF and UHF communication technologies.
8.	Communications, Networks, Information Systems & Computing	Waveform design, spectrum and bandwidth management.
9.	Communications, Networks, Information Systems & Computing	Network management in NEC operations (Fault, Configuration, Administration, Performance & Security management).
10.	Communications, Networks, Information Systems & Computing	Technologies for secure and robust information management, information exchange and communications.
11.	Human Factors	Human integration and interoperability.
12.	Complex Weapons, General Munitions and Energetics	Energetics & energetic materials.
13.	Ground Systems & their Environment	Soldiers systems (incl. integration into Systems of Systems and NEC).
14.	Ground Systems & their Environment	Counter-mine, gap-crossing and counter-mobility systems.
15.	Ground Systems & their Environment	Power source and supply technologies.
16.	Ground Systems & their Environment	Ground platform technologies (structure, mobility, …) and mounted platform systems.
17.	Ground Systems & their Environment	Uninhabited systems.
18.	Aerial Systems & their Environment	Aerial platform technologies (airframes, propulsion, aerodynamics, structures, control …), incl. helicopters, UAS, incl. high altitude platforms.
19.	Naval Systems & their Environment	Environment definition (oceanographic & hydrographic techniques and analysis).
20.	Naval systems & their Environment	Uninhabited systems, especially underwater systems.
21.	CBR Protection	Physical protection.
22.	Systems of Systems and Architectures	Concepts, design, integration, simulation & modelling.

8. Selected Challenges in the R&T Area

The EDA is seen as a vital component of the EU Common Security and Defence Policy, as a result of which it has an important presence in the future of defence capabilities development. There are a lot of challenges with influence towards defence R&T. Regarding this fact we would like to mention the following challenges [2, 8, 16]:

1. ***Reduction and stagnant of the defence budgets and impact of the current economic crisis, which have the negative impact towards defence R&T activities and European cooperation in this area.***

In this regard it is interesting to see the following facts. In December 2010 the European Defence Agency published the defence data for the 2009, which have been collected on an annual basis. The Ministries of Defence of the Agency's 26 participating Member States (all EU Member States except Denmark) provide the data. The total defence spending of these 26 pMS represents the amount of € 194 billion [14]. In November 2007 the EDA Ministerial Steering Board approved four collective benchmarks for defence investment [14]:

- Equipment procurement (including R&D/R&T): 20 % of total defence spending,
- European collaborative equipment procurement: 35 % of total equipment spending,
- Defence Research & Technology: 2 % of total defence spending
- European collaborative Defence R&T: 20 % of total defence R&T spending

These benchmarks are collective: they apply to the total sum spent by all participating Member States together. They are voluntary; in the sense turning them into national targets is optional. There are no timelines for realising these benchmarks. The comparison of these benchmarks with the reality received in 2009 in the context of EDA published information [14] is introduced in Tab. 3.

Tab. 3 The benchmarks in the relevant areas of the defence investment in the framework of the total defence spending of 26 EDA participating Member States

The collective benchmarks for defence investment of 26 EDA participating Member States	**Collective benchmarks for defence investment approved by the EDA Defence Ministers at the EDA Steering Board in November 2007**	**Values/Results received in 2009**
Equipment procurement (including R&D and R&T)	20 % of total defence spending	21.1 % of total defence spending, thence 16,8 % on equipment procurement and 4.3 % on R&D (thence 1.16 % on R&T)
European collaborative equipment procurement	35 % of total equipment spending	22 % of total equipment spending
Defence R&T	2 % of total defence spending	1.16 % of total defence spending
European collaborative Defence R&T	20 % of total defence R&T spending	12,8 % of total defence R&T spending

2. ***The use of emerging and highly disruptive technologies would be closely watched through EDA R&T projects (very good example is the JIP-ICET Programme). In the case of disruptive technologies, the role of the pMS and their knowledge of national affairs and readiness to take part in collaborative R&T projects is of considerable importance.***

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3. ***Contributions from small and medium enterprises (SMEs), universities and non-governmental research and development institutions are essential in some technology areas. From this point of view, it is very important to enhance the mechanisms for their involvement in the EDA R&T projects and activities.***
4. ***The theatre of operations and EU missions is wide ranging and subject to rapid variations. It is necessary to consider these factors and it is a very flexible way to provide the adjustment to changes in the defence capabilities area. The role of Concept, Development and Experimentation (CD&E) is vitally important in these situations.***
5. ***The key role of technology innovation for the time and in the future of defence R&T, by which we mean the generation and exploitation of new technologies or the novel applications of an existing technology, process or service for achievement the relevant defence capability.***

9. Conclusion

The defence research and technology (R&T) is a decisive factor of the defence capabilities development and a strategic pillar of the Armed Forces transformation. The authors' aim was to briefly inform and to introduce selected information focused on the key role of the European Defence Agency in the enhancement of European defence research and technology. The EDA projects, activities and mechanisms in the R&T area offer an excellent opportunity for the defence industry, research institutions and universities to play an active role in the defence R&T processes in the EDA framework and to be considerable contributors in the European cooperation in the defence R&T and defence capability development areas. A very important factor in this regard is the national level of cooperation coordination with the EDA and the proceeding of information on these possibilities and related conditions for this cooperation to relevant national subjects.

References

[1] Council Joint Action 2004/551/CFSP of 12 July 2004 on the establishment of the European Defence Agency. [cited 2011-02-08]. Available from: <http://eurlex.europa.eu/LexUriServ/site/en/oj/2004/l_245/l_24520040717en00170028.pdf>.

[2] GONZÁLEZ, AC., MEIRIŃO, AA. et al. *European Defence Agency: Past, Present & Future*. Ministry of Defence, Spain, 2010. ISBN 978-84-9781-548-2.

[3] KOBLEN, I. The Mission of Establishing the European defence Agency (Agency for Defence Capabilities, Development, Research, Acquisition and Armaments) and its Significance [Poslanie zriaďovanej Európskej obrannej agentúry (Agentúry pre oblasť rozvoja obranných spôsobilostí, výskumu, akvizície a vyzbrojovania) a jej význam]. In *IDEE 2004 EXCLUSIVE*, p. 94-99.

[4] Lisbon Treaty. [cited 2011-02-08]. Available from: <http://europa.eu/lisbon_treaty/full_text/index_sk.htm>.

[5] EDA – Research and technology: CAPTECHs. [cited 2011-02-08]. Available from: <http://www.eda.europa.eu/rtcaptechs.aspx>.

[6] EDA Communication on Roles of CapTech Members. No 05/21/R&T, 16 December 2005.

[7] Steering Board Decision on Key Operating Rules for the R&T Operational Concept. [cited 2011-02-08]. Available from: <http://www.eda.europa.eu/genericitem.aspx?area=Reference&id=143>.

[8] EDA: R&T Studies and projects. [cited 2011-02-08]. Available from: <http://www.eda.europa.eu/rtstudiesprojects.aspx>.

[9] EDA Defence R&T Joint Investment programme on Force protection (JIP-FP). [cited 2011-02-08]. Available from: <http://www.eda.europa.eu/genericitem.aspx?area=Organisation&id=184>.

[10] EDA Defence R&T Joint Investment programme on Innovative Concepts and Emerging Technologies (JIP-ICET). [cited 2011-02-08]. Available from: <http://www.eda.europa.eu/genericitem.aspx?id=368>.

[11] De CORDOUE B. Research and Technology for Europe's Security. Berlin, 28 November 2005. [cited 2011-02-08]. Available from: <http://www.daten.euro-defence.eu/2005/2005cordoue.pdf>.

[12] EDA brochure on European Defence Agency's Strategy Framework. [cited 2011-02-08]. Available from: <http://www.eda.europa.eu/WebUtils/downloadfile.aspx?fileid=651>.

[13] European Defence Research and Technology Strategy. [cited 2011-02-08]. Available from: <http://www.eda.europa.eu/documents/2009>.

[14] Defence Data 2009. [cited 2011-02-08]. Available from: <http://www.eda.europa.eu/defencefacts>.

[15] European Defence Agency. [cited 2011-02-08]. Available from: <http://www.eda.europa.eu>.

[16] Framework for a European Defence Research & Technology Strategy. [cited 2011-02-08]. Available from: <http://www.eda.europa.eu/genericitem.aspx?area=Organisation&id=117>.

[17] KOBLEN, I. European Defence Agency [Európska obranná agentúra]. Part (1). *Obrana*, 2004 no. 10, p. 26-27. ISSN 1336-2910. [cited 2011-02-08]. Available from: <http://www.mosr.sk/data/files/380.pdf>.
Part (2). *Obrana*, 2004 no. 11, p. 26-27. ISSN 1336-2910. [cited 2011-02-08]. Available from: <http://www.mosr.sk/data/files/381.pdf>.

[18] KOBLEN, I. Possibilities of involvement in defence research in the frame of RTO and EDA, innovations and offsets – chosen information in the context of

support in development of subjects in Slovak aircraft industry [Možnosti zapojenia sa do obranného výskumu v rámci RTO a EDA, inovácie a ofsety – vybrané informácie v kontexte podpory rozvoja subjektov slovenského leteckého priemyslu]. In *Proceedings of International Conference AERONAUTIKA 09*. [on CD], Technical University, Košice, 2009, ISBN 978-80-553-0258-4.

[19] European Commission. [cited 2011-02-08]. Available from: <http://ec.europa.eu>.