European Defence Agency

Study on the innovative and competitive potential of the defence-related supplier base in the EU12

Final Report

Part 1: Text of the Study

EDA contract reference: 08-I&M-005

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This document is Part 1 of Final Report: "Study on the innovative and competitive potential of the defence-related supplier base in the EU12" and contains the Text of the Study. The development of the Study has been undertaken by a consortium of PricewaterhouseCoopers EU Services EESV, Swedish Defence Research Agency, Netherlands Organization for Applied Scientific Research and ProCon Ltd., under a Contract No. 08-I&M-005 with the European Defence Agency.

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List of acronyms and abbreviations

ADS	Aerospace, Defence & Security
APC	Armoured Personnel Carrier
C4ISR	Communications, Control, Command, Computers, Intelligence, Surveillance, Reconnaissance
CEE	Central & Eastern Europe
CoC	Code of Conduct
CIS	Commonwealth of Independent States
cMS	Cooperating Member State
DG	Direction General
DTIB	Defence Technological Industrial Base
EC	European Commission
EDA	European Defence Agency
EDEM	European Defence Equipment Market
EDTIB	European Defence Technological and Industrial Base
EEA	European Economic Area
EEIG	European Economic Interest Grouping
ESDP	European Security and Defence Policy
ESRAB	European Security Research Advisory Board
ESRIF	European Security Research and Innovation Forum
EU	European Union
EU12	12 states that joined European Union on and after 1 May 2004
FOI	Swedish Defence Research Agency
HCSS	Hague Centre of Strategic Studies
ISSN	International Standard Serial Number
IT	Information Technology
LOI	Letter of Intent
MBE	Member of the British Empire
MENA	Middle East and North Africa
MoD	Ministry of Defence
NAD	National Armaments Director
NDIA	National Defence Industry Association
NATO	North Atlantic Treaty Organization
OCCAR	Organisation Conjointe de Coopération en matière d'Armement (Organisation for Joint Armament Cooperation)
pMS	Partner Member State
PwC	PricewaterhouseCoopers
R&D	Research & Development
RTO	NATO Research & Technology Organization
SALW	Small Arms and Light Weapons
SME	Small & Medium Enterprises
TNO	Netherlands Organization for Applied Scientific Research
WE	Western Europe

I. Executive summary

This study was mandated by the European Defence Agency (EDA) under contract 08-I&M0005 and entrusted to a Consortium, composed of TNO, FOI, ProCon Ltd. and PwC, acting as a leader.

The project was conceived as a part of efforts undertaken by the European Union, and EDA as its instrument, to create a full, equitable, and effective participation of all EU Member States in the European defence market, both on its supply as well as its demand side. The success of these efforts depends on the ability of the "new" member states, called here EU12, to integrate their technological capabilities with the rest of the Union's members. This, in turn, hinges on their innovative and competitive potential in the area of defence-related supply-chain and their ability to link that potential with on-going technological developments in European defence market. Such a link may be decisive for creation of the EDTIB and hence for EDEM, both adding to the integration processes on the larger scale.

The study was developed over the six months period. It adopted as a main method of work to gather, validate and analyse data from questionnaires and interviews, addressed to all relevant enterprises, institutions, and organisations active in the defence-related industry of EU12. All in all, 450 questionnaires were sent to all the "target groups" (see p. 13). The main purposes of the study were to map the geographic, quantitative and qualitative competences of EU12 supplier base, to describe the modalities in which the innovative and competitive potential of this supplier-base is exploited, to analyse the competitiveness of the EU12 defence industry within the wider European market, to elaborate possible measures for facilitating and increasing the integration between EU12 and the rest of member states.

The report is developed along the following main parts:

- Methodological aspects;
- Status and trends in the EU12 defence-related supplier-base;
- Mapping of the EU12 defence-related supplier-base competencies;
- Modalities for cooperation of the EU12 defence industry with the EU-wide defence market;
- Policy recommendations on ways to improve competitiveness and innovativeness of the EU12 defence-related supplier-base.

The questions posed, list of enterprises and institutions addressed, data on responses and other basic information is provided in Annexes to the report.

Methodological aspects

In general the defence-related information, and especially any more specialized data on defence-industry, is sparse throughout the EU12 area. What is available is often not systematic, collected in various methodological ways, often contradictory and not credible. That is why the authors of the study addressed all known defence-related enterprises and institutions of EU12. The questionnaires sent out were quite extensive and pertaining to the issues of competence, innovativeness and competitiveness (see Annex). The level of intrusiveness was to be checked and decided upon by the enterprises themselves. The questionnaires were written in English and in five national cases translated into native languages to assist the respondents in digesting them. The answers were collected via web-address or via normal mail. All information obtained was selected by various categories of data and analysed.

After the first stage of response period passed and the response rate was not very promising, several enterprises were addressed again, both by the consortium and by EDA through the national authorities, to encourage them in the full participation in the endeavour. Moreover, in order to raise the volume of response, a number of entities were visited personally and interviewed along the lines developed for the questionnaires.

Regrettably, the result of this effort was only moderately successful: only some 15% of the addressed firms and institutions responded to the questionnaires, making the available data base rather restricted. The consortium was forced to rely in its analyses more on the other sources of information: open literature, information from defence fares, research reports, official pronunciations and publications. In result the conclusions of the report are valid as "learned insights" but not in terms of statistically sound findings.

The moderate success in building an adequate data-base for the study, stemming from a systemic lack of transparency and a legacy of "secretiveness" of the old political system of the CEE states, prevented the study team to realize some of the more ambitious objectives of the study, like "discovering the best examples of transformation" (part of objective "a"), or "areas of best competencies… with attention to the disruptive technologies…" (part of objective "c").

Status and trends in the EU12 defence-related supplier base

The present situation of the EU12 defence industry is a legacy of the past few decades, during which the majority of states concerned were heavily militarized and developed large defence industrial base. Once the political conditions in Europe improved at the end of the "cold war" and at the beginning of integration of these states with NATO and the Union, these production capacities were by far too large for the diminished needs of the respective national defence structures. The armed forces of EU12 were reduced substantially (to one third or one forth of the historical top levels), the defence budgets shrunken in real terms diminishing the investments in military equipment and technology.

Moreover, the defence products of EU12 could not compete on the world or regional defence market to enable them to sustain the production base. The EU12 defence industry collapsed to some 30% of its peak capacity of the 1980s. Several measures were undertaken by the state authorities, including first a conversion to civilian production, and later by "commercialization" and privatization of the industry, as well by massive lay offs of the manpower and subsidizing the slow-going production lines, to keep the defence supplier-base in existence. A number of enterprises were liquidated or ceased to produce defence-related equipment. Only in the mid-1990s and only in some of these countries, particularly in Poland, Romania, and Bulgaria, the industry has been put on a more stable keel but nowhere this part of the national economy plays any serious role.

Together with the betterment of political relations between EU12 (especially in case of the post-Warsaw Pact or post-Soviet states), associated with the desire of these states to joint the European Union and, in majority of cases, also the North Atlantic alliance, the international co-operation in defence production, commenced already in the early 1990s, has increased quantitatively and qualitatively. Several joint ventures were created, a number of EU12 defence enterprises entered cooperative production agreements based predominantly on the Western firms' licenses. The EU12 defence supplier-base entered the world-wide and Europe-wide defence supply chain, though its place in the chain is by and large at its lower end. The Western primes found in the EU12 defence producers convenient providers of cheaper labour to produce some of the basic components.

Mapping of the EU12 defence-related supplier base

This report contains a detailed information of geographical spread of technological and production competencies, embodied in the defence-related supply chain.

The results of the study in its "mapping" effort show that EU12 possess competences in the majority of technologies and production areas listed in the EDA Technology Taxonomy (see Annex C in Part 2: Annexes). The three states of the EU12 group of states, namely Cyprus, Latvia, and Malta do not possess any defence-related competencies. Two of them, Estonia and Hungary, have only a very limited defence-related production capacity. Lithuania possesses viable defence-related research capacity. The remaining six countries represent the bulk of defence-related capacity of EU12, with the Czech Republic strong in the self-engineered production, Slovenia having small but competent niche potentials, and the remaining four – Bulgaria, Romania, Slovakia and, in particular, Poland – representing substantial defence production capacity in a large number of fields.

Modalities of cooperation of the EU12 defence-related industry with the Europe-wide defence market

In order to be more specific on what makes the defence industry in EU12 sustainable within the wider European market, with a particular reference to their potential in innovativeness and competitiveness within that market, the study team analysed the national defence environments and defence companies approach to specialisation and cooperation with foreign companies as well as their position in the supply chain. And thus among the modalities of cooperation with a wider European production base, the report identified six main types of strategies and approaches of the EU12 defence production firms: the niche competitor, the aspiring prime, the intermediary, the flexible-high-tech company, logistics service provider, and low cost company. Of course, the division of this type is not clear-cut; number of defence enterprises adapts to the dynamic market environment and perform several of these roles.

This section describes a number of companies in all six categories. They represent a successful range of cases, indicating how wide is the room for adaptation of the EU12 defence-related supply base to the realities of Europe-wide market. We have found that only a few of the companies described in the report can be considered "best cases", that is, as enterprises contributing to the strengthening of EDTIB or being able to compete with the Western defence companies on an equal footing. Most of them exemplify a functioning model, albeit with limitations on effectiveness and efficiency.

Policy recommendations to improve competitiveness and innovativeness of the EU12 defence-related supplier base

Our recommendations, which constitute the implementation of the objective d), formulated in the "purpose of the study" (see p. 12), depart from a set of identified policy challenges:

- EU12 today have defence-related industries that are not fully competitive in a European setting (or in some cases more or less absent). With some exceptions, notably Poland, the competitiveness on other markets is also going down. There exists, however, a relatively high level of competence in component niche technology.
- As a whole the EU12 defence investments have grown considerably over the last decade. Currently this means that EU12 are opening up their markets to EU15 industries in particular and that developments in the EU12 DTIBs is to a large degree driven by offsets on import deals. If done without due concern for the overall EDTIB situation there is a risk of undue duplication of competencies leading to more fragmentation at European level.
- Most EU12 represent considerable commonality in defence equipment legacy as well as geographic proximity. This suggests great scope for collaboration particularly in logistic support and upgrading, which seems to be realised only to a limited degree, if at all.
- The defence industry managements in the EU12 countries are in many cases used to old-fashioned "top-down" decision-making and planning based in the legacies of the former political and legal system. This means for the perspective of EU12 participation in EDTIB, on the government side, more responsibility in leading the industry into the framework of EU

regulations and practices, and on the enterprise side, more efforts to learn and acquire skills to cope with the new ways of operation and competition within a more demanding market.

Based on the above challenges and general principles of competitive industrial strategy, we draw the following recommendations for each of the six modalities of cooperation, which we have identified in the study, according to the objective "b" of the study (see p. 12)

- "The Niche Competitor" modality (typically internationally competitive mid-tech firms) seems sustainable to the extent that companies stay focused and continue to combine their traditional strengths with sizeable investments in R&D and innovation. While this modality cannot be seen as integration into EDTIB per se, successful niche competitors strengthen the European defence technological and industrial base and may provide robust equipment well-suited for international Crisis Management Operations also for the EU15 countries.
- "The Aspiring Prime" is considered 'national champion' and enjoys privileged relationships with national defence establishments. To be sustainable, this mode of operation requires considerable national investments in new technologies and equipment. For medium-sized countries such investments cannot be made across the board but have to be focused. Such companies may cooperate with Western primes – in joint R&D and procurement projects or as Tier-2 and Tier-3 contractor. This could be in the context of the country participating in collaborative procurement projects in the EU framework, or as part of offset arrangements.
- "The Intermediary" specialising in legacy systems is not viable in long-term. However, companies that function in this modality have an important role in the transfer of business practices, technologies, and know-how, and the interim period may provide further opportunities to deepen their relationships with Western primes, understand in depth cooperation requirements, and become part of their supply chain. The capacity of current "intermediaries" to cooperate with Western primes and their competitiveness may be enhanced through participation in direct and/or indirect offset programmes and projects.
- "The Logistics Service Provider" builds on the advantages provided by geographical proximity, language and cultural compatibility, and lower costs of service. When the national defence environment is conducive to the procurement of sizeable numbers of weapon systems and other platforms, these advantages will continue to provide opportunities for sustainable defence business. This modality can develop across national borders and through military outsourcing. Such expansion may increase the interest of EU15 primes and service providers to the extent that they decide to acquire—fully or partially—local companies functioning in this modality.
- "The Low Cost Company" utilises the advantages of relatively low (compared to EU15) costs of skilled labour, moderate national requirements on the environment and other factors specific for the current stage of development of EU12. Many of these specifics will diminish in importance or disappear in the process of the full integration of the EU12 countries in the European Union but like "the Intermediary" this modality can at least have a useful transitory role.
- The Flexible High-Tech Company" – be it incumbent or, more typically, aspiring – must invest increasing amounts in R&D and innovation. Their integration in the supply chain of Western primes would be facilitated by transfer of technologies and know-how through participation in collaborative international R&T and procurement projects and programmes. This can also be achieved within offset arrangements. It is an important challenge to transform Intermediaries into High-Tech Companies. Another is widening the scope of civil high-tech companies to also encompass defence (sub-)systems. In both cases such transition processes should typically be in the context of emerging technologies, since entering well-entrenched niches is always very difficult. The high-tech companies should strive for Centre of Excellence (CoE) status, typically in networked CoE:s containing both EU15 and EU12 members.

Thus, to translate these observations in to a more general level, and implementing objective “d” of the study (see p. 12), we recommend on an enterprise perspective:

- the critical issue is the assurance of technology transfer to the enterprises. This can be achieved by increased R&D efforts (local, corporation, national) or through offsets agreements.
- a chance for enterprise’s survival and development is an intensive investment in a niche capability, especially those having a potential competitive edge over a prospective competitor. Such niches can be found out best by a close interaction between the research centres and the industry entities. The focus of attention and effort in this regard should turn to: a/ emerging technology areas where established (Western) defence industry does not have a strong position already, and b/ where the national authorities are willing to create proper supporting conditions and institutions.
- centres of excellence, so practical and effective in the civilian domain of economy, could be created either by government purposeful actions or by the industry itself.
- moreover, centres of excellence could be organized jointly across borders hence helping to avoid duplication of efforts and to foster a synergy of the effort.
- one of the more traditional, but certainly effective, way of improvement in the competitiveness and innovativeness of any defence industry is the engagement in a collaborative project with the technologically more advanced partner, once both sides take it as mutually advantageous.
- a less attractive but, perhaps, more practical approach could be engage in a low-cost manufacturing of defence products with a view of positive consequences of such approach for the labour market and, best of all, with a strategy to develop more competitive position later on.

From a wider perspective, we recommend:

- policy aimed at increasing the competition on the defence market requires a restriction on the dubious interpretations of Art. 296 provided by the national authorities.
- transparency in procurement processes has to be strengthened as a wide-range of deals and engagements among the main producers escape the open public tenders. Several valuable deals are not within the public procurement regulations but are executed within the prime producers sourcing decisions.
- an important hindrance to lower-tier producers are the requirements on information security and on technology transfer, present on both sides of the potential deals. On a prime’s side it is a matter of protection of intellectual and business property, on the sub-contractor side the same applies to even greater extent. It will be a role of the EU and its agencies to foster more trust and to create legal framework for better exchange of relevant information.
- one of the most promising recommendations seems the one considering a growth in number of collaborative procurement. EDA’s initiatives in this respect may help to strengthen such approach to the construction of EDTIB. More thorough analysis of well know obstacles to such procurement (security of supply, security of information, *juste retour* practices) should be subjected to a wider debate and amelioration.
- the governments and the EU institutions should facilitate dialogue between member states in the process of finding joint investment opportunities. One way in this regard would be to build a common data base on new defence projects; another one would be an increased and systematic sharing of experience between different collaboration projects between member states.

- to avert the legacy of old habits and the persistent lack of knowledge of the general as well as specific issues, linked to EDTIB and EDEM, there should be organized training events or conferences for the management boards of the EU12 enterprises, focused specifically on them and/or organized together with the managements of the EU15 companies.
- In order to organize a wider international cooperation based on a solid “bank of information” a detailed statistical date base on the European defence industry should be created. This would require the development of reporting standards finding a compromise between market monitoring needs and the confidentiality requirements (e.g.: periodical submitting of standardized reports via a customized internet data gateway).

Summarising, we conclude:

- Many of the defence industry policy initiatives taken by EDA and EC (e.g., CoC, CoPSC, and the defence package) are useful in creating framework conditions for a good EDTIB development in EU12.
- However, member states and companies – both in EU15 and EU12 – need to use these framework conditions for network building and overcoming cultural hurdles.
- Implementation activities, e.g. regarding security of supply and security of information are of great importance
- Policy measures that promote network building by providing scope for concrete collaboration across traditional boundaries – in particular between EU12 and EU15 – are of particular value. Such measures can be collaborative R&T and procurement and also offset arrangements that contain hands-on collaboration either as direct or indirect offset.
- Cooperation intra-EU12 – now lacking - could be of great importance both in achieving cost-effective in-life support and upgrading capabilities for the future, and in best exploiting the opportunities for using ongoing force modernisation efforts for developing industrial and technological assets of maximum value for EDTIB, i.e. not unduly duplicating assets that already exist elsewhere in Europe.

II. Introduction

1. Background and context of the Study

Developing a strong European-wide Defence Technological and Industrial Base (EDTIB) is a strategic goal of the Union, of great political importance, adding to an integration of industrial potential of the member states, including in particular the new ones. Achievement of this objective will enable better utilization of the full industrial potential existing in the European Union for more efficient implementation of the goals envisaged in the Common European Security and-Defence Policy (ESDP).

The defence-related industries across the European Union are not yet benefiting from what the 12 Member States that joined EU in 2004 and 2007 (EU12) have to offer as human, technological and innovation capacity of both traditional and untraditional sources. To achieve this goal a full and equitable participation of all EU Member States is required, including the "new" Member States (EU12)[1], in the European defence market, both on its supply side as well as on its demand side. Among various aspects bearing on success or failure of bringing the "new" Member States into the full spectrum of participation in the market is the tapping of their innovative and competitive potential and their inclusion into the Europe-wide defence technological developments. These, along with increased cooperation, seem to be the more challenging tasks.

EDA's Code of Best Practice in the Supply Chain has been launched with the purpose to identify subcontracting opportunities for prospective suppliers as soon as practicable, and to encourage their evaluation and selection as suppliers on a fair and equitable basis. Among other possible outcomes the Code should help to facilitate in opening up defence supply chains on EU-wide market, including for EU12 actors. This approach has received pMS support and the 14 May 07 the EDA Steering Board in endorsing the EDTIB Strategy recognised that the future success of the DTIB in Europe will depend upon effective utilisation of potential and innovation wherever these are to be found in Europe - in SMEs, and in suppliers not always associated with defence, and in the EU12. The SB also noted "the slowness of Western European prime contractors to see new Member States as places to invest rather than just sell."

Furthermore, the NADs Steering Board on 25 September 2007 approved the Roadmaps designed to implement EDTIB Strategy. The roadmap on developing depth and diversity of the European defence-related supplier base tasked the Agency to foster the integration of the EU12.

2. Purpose of the Study

The full participation of the EU12 producers in the defence industry supply chains is undermined by a number of challenges, including a difficulty in translating theoretic scientific achievements and innovative research into marketable products; structural weakness to compete in the European marketplace; exacerbated on part of some West European primes by their failure to exploit the potential of EU12, as underlined in the EDTIB Strategy, and the legacy of restrictions regarding transparency of information.

Based on EDA's task description, the study should:

- Provide the EDA and its stakeholders with knowledge of EU12 and the potential they have to contribute towards the strengthening of the European DTIB.

[1] Bulgaria, Czech Republic, Cyprus, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia

- Assess the success of restructuring the defence-related industrial base in EU12 by comparison with the business processes of the defence sector of the rest of Europe.
- Evaluate how the identified innovative and competitive potential of EU12 could best be fostered to develop measures and practical support for facilitating and increasing cooperation, investment and industrial integration between EU12 and the 'old' Member States.

According to the formulation of the EDA tender for the Study, its aims can be specified in a following manner:

a. assessing the current state and the competence of defence-related supplier base in EU12;

b. finding out the innovative and competitive technological potential of this supplier-base and describing the modalities in which such potential is created, exploited, sustained and accelerated;

c. analysing the potential for competitiveness of the defence supplier base of EU12 within the wider European market and the level of existing and potential integration of this base with the West European defence industry;

d. elaborating - on company, state, and European levels - on possible measures and practical support for facilitating and increasing the cooperation, investment, and industrial integration between EU12 and the rest of the Member States, leading to a robust EDTIB.

Overall, the objective is to make the Western European players in the EDTIB more aware of the potential of EU12 for developing a truly European-wide DTIB.

3. Specific objectives of the Study:

Ad. a) Assessing the current situation of the EU12 defence industries and their competencies.

This includes:

- mapping the geographic, quantitative and qualitative aspects of the EU12 supplier base (including SMEs);
- ascertaining the stage of the transformation (restructuring) of the EU12 defence supplier base;
- discovering the best examples of such transformation, with emphasis on those fostering innovation and competitiveness.

Ad. b) Evaluation of the potential and methods how this potential could be exploited

- assessing the potential in different areas and locations;
- describing the modalities in which such potential is created, exploited, sustained and accelerated.

Ad. c) Assessing the capabilities, competencies and competitiveness of EU12. This part of the Study considers:

- areas of best competencies (key technologies) of the EU12 defence industries, with attention to the disruptive technologies, where appropriate;
- conditions and factors fostering or, conversely, disturbing the process of innovation and competitiveness within the EU12 defence industries;
- competitiveness of the defence-related supplier base by looking into competitiveness, co-operation arrangements between EU12 and other European and non-European parties, inward investments, methods applied to facilitate the integration into the wider European market, quality of the workforce, management of innovative processes, marketing capacity,

national environments fostering/constraining innovation and competitiveness (taxes, creation of centres of excellence, etc.).

Ad. d) Identifying and describing policy measures and actions facilitating the participation of the EU12 defence industries in the EDTIB. Here the study copes with:

- evaluate in general the degree of co-operation of the EU12 defence companies with the rest of the European Union and non-EU partners;
- identify the best examples of such co-operation and integration and discuss the conditions and measures, which led to their success;
- discuss possible practical measures and conditions - social, legal (normative), financial and organisational - which could facilitate co-operation, investment and integration of EU12 within the Europe-wide industrial and technological base, both on the industrial, national, regional, and Union level. The discussion may help to elaborate some practical recommendations in terms of policies (state and European levels), normative regulations (company, state, and European levels) and structural transformations (company level).

III. Methodology

1. Methodology of the Study

The study has been undertaken in four phases.

Phase One involved data collection and, where it already exists, data validation within the limits of the available information on defence relevant companies (both state owned and private), as well as academic and research institutions.

Phase Two enabled an enlargement of the data base through questionnaires being distributed across defence-related institutions, firms, and organisations and followed up with visits to enable face to face interviews. The questionnaire and interviews have been designed to ascertain the organisations' ability to integrate with external partners in the wider industrial and research/development base. The questionnaires were written in English but, in case of five cases (Czech. Slovak, Hungarian, Romanian and Polish) translated into the national languages.

The scope of the questionnaires differs depending on the addressee, but in most cases involving primary industrial entities they consist of the following elements:

- basic data on the firm, including technological activity;
- personnel / staff relevant to their innovative potential;
- level of export to international market, especially the Western European;
- level of investment in R&D over the last 5 years;
- number of innovations and the ways they were marketed;
- sources of financing for R&D activities;
- topics / areas under R&D projects;
- areas of R&D cooperation with other national or international entities;
- number of new patents obtained in the last 5 years;
- existing structures for innovation within the firm;
- level of cooperation with industry or end-user (for scientific and/or research units);
- existing processes / procedures facilitating innovation;
- assessment of the national environment for innovation;
- experience in the industrial cooperation, nationally or internationally, having relevance for fostering innovation and competitiveness;
- experience in fielding new technology and innovative products on the EU market;
- ways of marketing the firm's innovative designs and products;
- self evaluation of the firm's position in EDTIB;
- ways the firm would like to better integrate within EDTIB.

Target group for questionnaires and interviews involved:

- government institutions dealing with the defence industry and those responsible for fostering innovation of national industries;
- defence industry companies, those selected within EU12 and some of the leading defence companies from West Europe, which have well-established cooperation with the EU12 companies;
- defence industry associations, both national and European;
- national academic institutions, working in defence-related areas;
- national R&D institutions (not directly related to defence companies);
- relevant EU organisations and institutions.

Phase Three involved the analysis of the findings from Phases One and Two. Once determinants of innovation and competitiveness in EU12 were defined, the consortium analysed, which of these are conducive to integration of these states within the EDTIB and which disturb in such integration.

Finally, ***Phase Four*** involved the production and submission of the final report, a policy-oriented synthesis focusing on conditions, which may foster 12 "new" Member States' innovation abilities in the area of "new" and advanced technologies and the potential they have to contribute towards the strengthening of the EDTIB.

To fulfil the objectives of the study, as described above, the Consortium has thus used the following methods:

- collection, validation, and selection of data on the EU12 defence-related industries and their supplier base, including the non-traditional sources;
- questionnaires, addressed to various types of "targets", with a focus on the innovative potential, innovative processes, factors and conditions leading to, or disturbing the development of innovative capacity of EU12.
- in-place interviews with the respective "targets", be they officials (institutions) or industrial representatives;
- critical analysis of information obtained through the questionnaires and following them up by undertaking relevant, but a limited number, of case studies to identify specific factors and conditions, underlying the activities of the enterprises.
- using the available documentation and publications pertaining to developments in the EU12 defence industry and to the general problems of innovation, as they are debated within the "innovative Europe" non-military programs of the European Commission.

2. Validity of the findings

The questionnaires response rate, in spite of several notifications of the project team, supported by the direct EDA authorities' admonitions, was not very high. Of the 450 questionnaires sent out, only 71 were responded to. This represents approximately 16% (for the detailed information see Annex B in Part 2: Annexes). It should be underlined that the questionnaires were taken at the outset as the main potential source on the supplier-base capacity to innovate and compete on the defence market (for the list of questions, see Annex A in Part 2: Annexes). The existing open literature on the subject of defence production is rare, not systematic or uniform. Thus the difficulty of the consortium to collect a more complete data restricted the depth of analysis on EU12 defence-related supplier base.

The responses to the questionnaires, together with the interviews undertaken at various industrial localities, however, provided the project team with a valuable although rather shallow insight into

various aspects of the EU12 defence industries activities and their own assessment of a given enterprise innovativeness and competitiveness. In order to improve the data base on the EU12 defence industries all other available sources were thoroughly checked in the effort to map the existing capacities of the states involved. The mapping exercise produced quite a comprehensive picture of the production and innovation capacity of EU12, though – again – the data does not provide an insight as to the level of technological quality of the products. To pass a judgment on this aspect of their production would demand in-place observation and verification or a very specific documentation.

From our perspective, based in part on discussion with respective enterprises, which we asked for comments on their willingness to participate or on reason for refusal to participate in questionnaire-gathering, we came to a number of factors and attitudes, which call for remedies in a policy-oriented action (see Chapter VIII on recommendations).

The low response rate to the questionnaires may derive in our opinion from the following:

- Confidentiality requirements.

  It turned out that in some cases fulfilling the questionnaire triggered internal procedures, sometimes even the management board acceptance. It was especially the case of large state owned companies. Such restrictive approach to confidentiality issues was certainly not justified in this case and may be, in our opinion, attributed to the old-fashioned and still lingering habits inherited from the communism period.

- Lack of knowledge about EDA activities and objectives, including those pertaining to the creation of EDTIB.

  The European Union policies are relatively new issue for the EU12 countries and the respective management boards members of the questioned companies. The opening of the EU defence market, promulgated at the political level within the ESDP and EC directives is often taken with suspicion as an instrument to subdue the defence industry of the economically weaker and less competitive EU12 defence sector to the interests of powerful Western defence industry. The objectives of the EU and EDA in particular, are not well known or understood. In consequence, the propensity to fulfil the questionnaire and send it back in written to PwC was rather low. Repeated questions about the EDA's Technological Taxonomy indicated a low level of insight into the basic efforts taken within the Community in this regard. Depth of comments regarding issues linked to EDTIB speaks also for itself.

- "Reference problem".

  The innovation (and competitiveness) is not the issue, which stand upfront in the planning, programming or marketing strategies of the managers of defence enterprises within EU12. Direct questions on these issues are brushed away rather than raise an interest or cause a practical action.

- Misunderstanding of the origin of the study.

  Despite the clear and unequivocal elaboration of the origins of the study and the methods used in its implementation the attitude to questionnaires, not sanctioned by the official governmental stamp (despite the EDA Steering Board's decision being the source of the effort), was predominantly hesitant. Several respondents asked for explanations of the role played by the PwC (the Consortium leader) in asking questions pertaining to the internal developments at the enterprise level.

IV. Status and trends of the EU12 defence-related supplier base

1. Historical backgrounds

The defence industry of the states, composing the core of the 12 new European Union's members, located in the Central Eastern Europe /CEE/, reached its peak productive potential during the last years of the 1980s. The region as a whole enjoyed comparatively well advanced sectors of military production, such as aircrafts and helicopters, armoured vehicles, artillery, SALW weapons, all categories of ammunition, various electronic, optronic, and telecommunication systems. It possessed good research facilities and very well educated and advanced research and engineering cadres.

After 1988 the defence market demand, both internal and external, rapidly shrank in response to the general political international tendencies, characterized by "détente" in the East-West relations, as well as to the serious deterioration in the Warsaw Pact countries' economies. Similar tendencies could be observed in the whole industrialized world due to the overall decline of political antagonisms. Then Western defence industry responded to this situation by quickened pace of consolidation and mergers, both national and trans-border, as well as by wider diversification of production, including partial conversion of production into the civilian market.

However, the production capacity of the state-own and inflexible defence industry of the CEE states has been kept intact, mainly for political reasons. The disproportion between the unused production capacity and the actual market needs enforced a painful adaptation of the industry in all countries concerned. After 1990 this adaptation has been accelerated by the general systemic transformation of the political and economic system of these states. One aspect of this transformation was an overall demilitarization of the social, political, and economic system. The decline of the defence industry of the CEE states continued until mid-1990s, as evidenced by radically smaller output, substantial reduction of employment, and disappearance of a large number of the defence enterprises. The typical scale of this reduction can be seen from example of the arms industry employment in Poland and Czechoslovakia in years 1990-92, compared to that of mid-1980s: Poland - 180 000 compared to 260 000, and in Czechoslovakia - 75 000 compared to 145 000[2]. In general, the production and employment levels throughout the CEE post-Warsaw Pact countries reached in the mid-1990s about 30% of the cold-war peak years[3].

Among the factors influencing the breakdown of the market demand for the defence products of the CEE states were:

- breakdown of the Warsaw Pact/Soviet Union's common defence market, in which the East European members served mainly as sub-contractors or Soviet-licensed producers of the

[2] *The defence industry in East-central Europe. Restructuring and Conversion*. Yudit Kiss,SIPRI, Oxford Univwersity Press, 1997
[3] *Arms Industry limited*, Ed. Herbert Wulf, SIPRI, Oxford University Press

final products; most of traditional co-operation links and R&D projects between former allies were abrogated or ceased to function;

- reduction of the size of national military forces, creating a surplus of equipment and thus diminishing the demand for new supplies;
- cuts in military expenditure, resulting in a drastic reduction of procurement budgets;
- withdrawal of state subsidies and other forms of financial support (like access to investment and credits, writing off bad credits, providing bank guarantees, tax allowances and exemptions, export and import assistance, privileged gain of raw materials and equipment), due to the general economic crisis of the early 1990s, resulting in a sudden drop of economic viability of the defence enterprises;
- rupture of traditional trading patterns with several Middle East customers;
- transformation of ownership and administrative structures, including those related to research and development institutions, undercutting or re-directing the well-established processes linking R&D efforts with production subjects, and those between the R&D and traditional military clients.

The depth of collapse of the defence industry of the region varied from state to state, depending on its importance for the national economy and on the political decisions, concerning its preservation, conversion, or/and restructuring. While the Czech defence industry (separated from the Slovak one in 1993) underwent the least dramatic changes and breakdowns, the Polish, Romanian, and Bulgarian industries went through a painful "hibernation" period until about mid-1990s, with the Hungarian defence industry suffering the most painful collapse. Several defence production enterprises were eliminated in the process (for example, during the period 1991 to 1997, the number of defence production enterprises in Czech Republic diminished from 58 to 49, in Slovakia from 45 to 38, and in Hungary from about 30 to some 10 companies)[4].

All of the countries have undertaken to capitalized on the prospective "peace dividend" by converting as much as possible the defence industry into civilian production. However, conversion of industrial capacity is highly-capital-intensive, with only a fraction of specialised machinery and lines of production can be utilized for civilian production. All the states of the CEE region were at this period in a deep recession and economic turmoil, making the conversion even more intractable. Also, while a conversion was an attractive political objective in the states concerned, the administrative and managerial levels at the enterprise levels were hardly prepared or able to execute such a complex process. While it was attempted on a large scale in all states concerned and brought a partial success, the end results are rather meagre. There are only a few defence industry enterprises where share of civilian production and sells constitute large percentage of profits or became the main area of activity (like, for example, in the Slovenian "Fotona" enterprise, leading producer of the medical laser equipment), with the civilian production treated as a fall-back or "supplementary" element of capacity, helping in case of crisis on defence market.

Another way of transformation of the defence industries was their quasi-privatization or "commercialization", that is, turning the state-owned companies into joint-stock companies, owned completely or partially by the state treasury. In this process shares of the commercialized companies could be transferred to creditors and banks (dept for shares swap) or sold on the market.

Without belittling the value and importance of the general national political and legal framework for fostering the international co-operation on defence-related production, the actual inter-action in this regard is decided at the level of enterprises. In the efforts to resuscitate the collapsing

[4] *Przemysł obronny państw Europy Środkowej i Wschodniej (Defence Industry of the CEE States), Studia i materiały*, Paweł Wieczorek, PISM, Warszawa 1998, p. 5; EC COST Action A10, Hungary/Belgium, 2000

arms industry the CEE states undertaken in the 1990s to establish new relations with the foreign countries in technologically and financially potent Western European, US, and Israeli partners in a way of joint ventures. Most of them, if not all, concentrated on cooperation in production, only some were linked to the joint R&D projects. The objective of conversion thorough such joint-ventures were to emphasise the export potential of the enterprises.

In line with the changes in the political, legal and economic system of the CEE states, and their growing strategic leaning towards the integration with the Western democratic group of states, the international links in defence production grew steadily. In particular, as far as the former-Warsaw Pact are concerned the prospect of NATO integration served as a strong impulse to, first, increase the interoperability of the weapons systems and equipment possessed by their armed forces, second, to modernize the arsenals, and third, to open up new sources of military technology. All three aspects made it mandatory that the respective governments and industrial entities turned to the international market, including the Western European one. On the other hand, the political and economic transformation of the EU12 countries made them a potentially attractive new market for the Western arms producers thus creating a reversed-direction pressure to enter into cooperative relations with EU12 (joint ventures, offset obligations, outsourcing less technologically demanding but labour-intensive production, acquiring the production facilities).

The improvement of national economies of EU12, beginning in Poland in 1993 and then spreading to the whole region, permitted a “stabilization” and even re-vitalization of the defence sector. Invariably, and especially in Poland and Slovakia, arms export gained in strength and the infusion of co-production projects enabled the industries to preserve most of their capacities, so much un-utilized in the previous years. Simultaneously, privatization process continued apace in Bulgaria, Czech Republic, Slovenia, and Hungary. However, in Romania and particularly in Poland, the defence industry’s privatization process has stopped at the level of “commercialization”, leaving this sector largely in hands of the state administration and the old managerial cadres.

With the exception of Hungary and, to some degree the Czech Republic, defence industry of CEE region preserved their traditional technological capacities, developed in previous decades. The difference is the quantitative level of production. Most of the new capacities are linked to those areas where the CEE defence enterprises established a licence-based production.

As the mapping exercise, undertaken in the study, indicates their R&D activities, indigenously developed production and the licence-based production capacities cover practically all areas of technology, listed in EDA Technology Taxonomy.

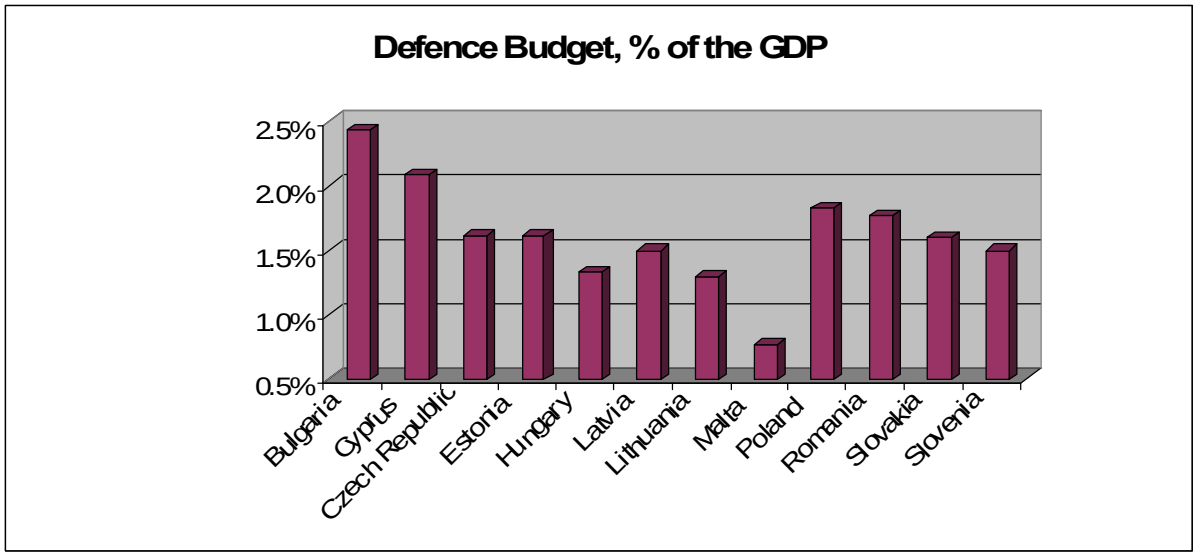
2. Present status and trends

The situation of defence industries of EU12 depends predominantly on the internal market as the national armies are the main, if not the only, customer. Only some of states in the group, Slovakia and the Czech Republic in the past, and Poland at present, take export of defence product as an important part of economic policy, partially also because it seems to be the only way to preserve the existing defence production potential, considered important aspect of security policy. By observing the trends in the volumes of national defence budgets, strengths of national armed forces, defence R&D outlays, investments in weapons and systems procurement, one may draw conclusions as to the place of defence-related production potential of a given country. As a rule, all these indicators are over the last 20 years on decline in EU12.

The capability development policies of the defence establishments in the EU12 countries and the investments they make in defence research and development and equipment—both new and upgraded—differ considerably. Hence, even though some of the EU12 countries may not have an elaborate defence industrial policy, their defence and related industries function in different environment under the influence of the particular level of defence investments and the relation between areas of defence capabilities specialisation and the traditional defence industrial strengths.

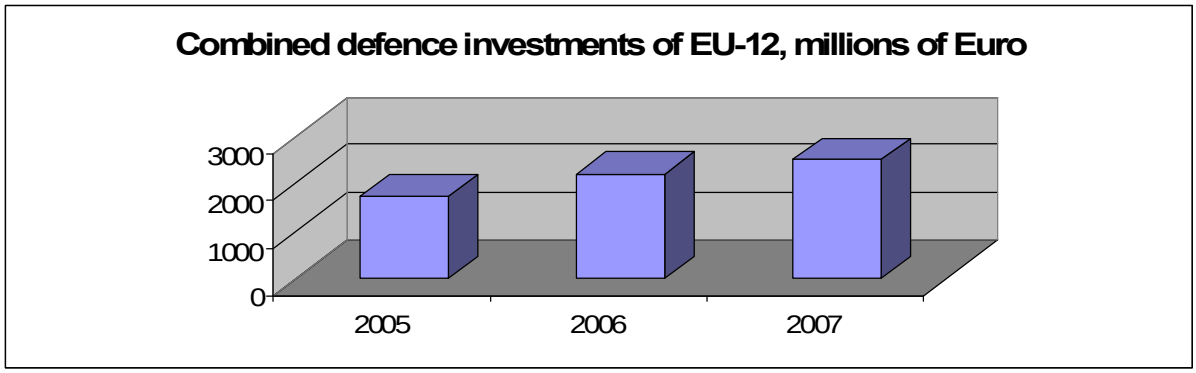
First, their defence budgets differ considerably, both in terms of overall size and as a percentage of the Gross Domestic Product (GDP) of the country. The following table presents the average percentage of the defence budget of each EU12 country from its GDP for the period 2004-2008[5].

Figure 1: Defence budgets as percentage of the GDP, 2004-2008 average



While the combined defence investments of the EU12 countries do not exceed a quarter of the investments of France or the UK alone, a significant growth is witnessed in the period after the accession to the European Union[6]. On an annual basis defence investments (EU12 total) increased by 26 percent from 2005 to 2006, and by another 14 percent from 2006 to 2007.

Figure 2: Combined defence investments of EU12 countries

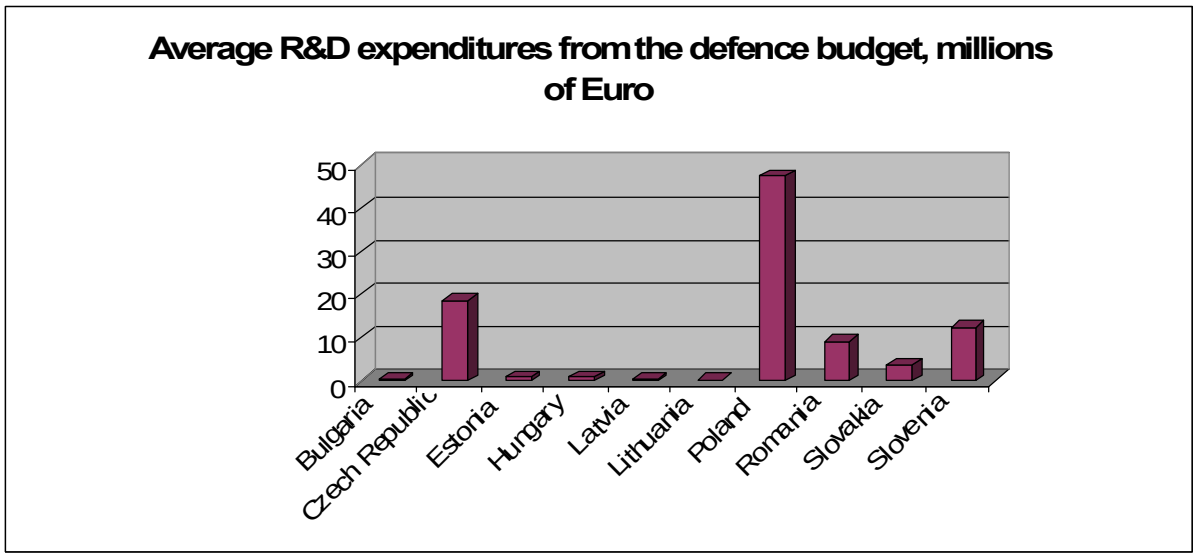


[5] Here and further down, for Cyprus and Malta we use data for the period 2005-2007 – *National Defence Expenditure in 2005* (EDA, 24 Jan 2007), <www.eda.europa.eu/genericitem.aspx?area=Facts&id=179>, with details in "*National Breakdowns of European Defence Expenditure*," <www.eda.europa.eu/WebUtils/downloadfile.aspx?fileid=224>; and *Defence Data of EDA participating Member States in 2007* (EDA, 11 Dec 2008). For the remaining ten countries, which are also members of NATO, the data series is supplemented with information from *Financial and Economic Data Relating to NATO Defence. Defence expenditures of NATO countries (1985-2008)*, Communiqué PR/CP (2009)009, 19 February 2009, www.nato.int/docu/pr/2009/p09-009.pdf.

[6] The total amounts on the figure includes the defence investments of Bulgaria and Romania, Thus, this increase is not a result of the two countries joining the EU in 2007.

The investments in R&D from the defence budget were also analysed. The figures below present annual R&D expenditures in millions of Euro and as a percentage of the defence budget (averaged over available data in the period 2004-2007). Cyprus and Malta do not report on defence R&D expenditures.

Figure 3: Average R&D expenditures from the defence budget



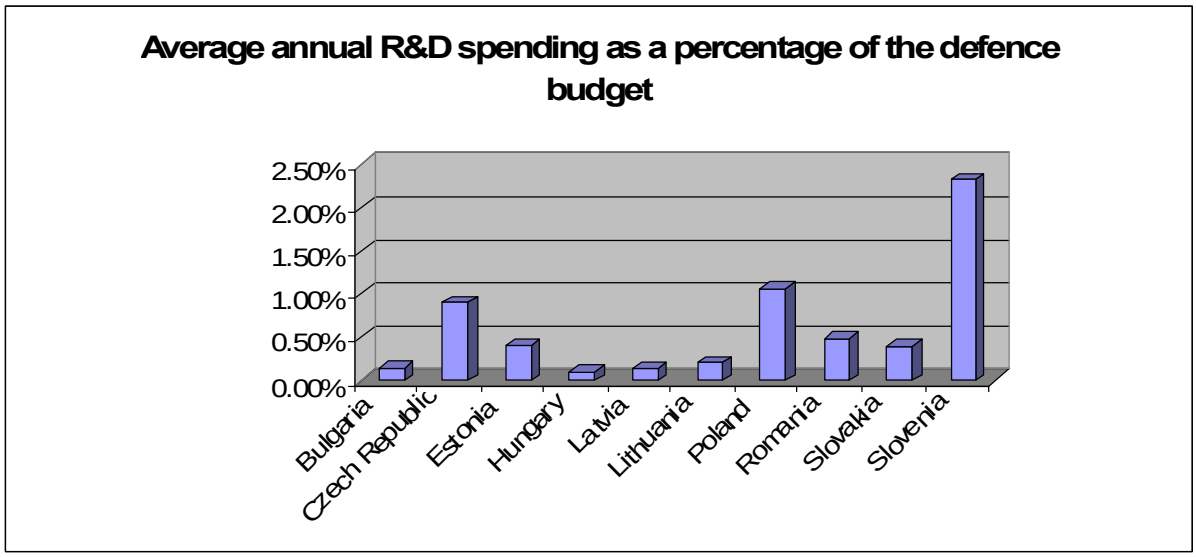
The combined annual R&D spending from the defence budget is under 100 million Euro in 2005 and 2006 and slightly exceeds that figure in 2007. The R&D expenditures of Poland account for approximately half of that amount, and those of the Czech Republic – for another 20 percent of the EU12 total.

The available data [7] relates defence expenditures almost exclusively to the "Central Support, Administration and Command" function, which does not allow to assess whether the R&D of these two countries is focused and in which areas. Data on the defence expenditures of Poland for 2005 and 2006 fiscal years indicates some priority in R&D in the interest of the Land Forces and the Air Force (along with the 'support' function).

Compared to other EU12 countries, Romania, Estonia, and in particular Slovenia also spend a notable proportion of their defence budget on R&D which, if focused, is a possible indication of some niche competencies of interest to EDTIB.

[7] *Transparency in armaments, United Nations Instrument for Reporting Military Expenditures*: Annual Consolidated Reports of the Secretary-General (2004, 2005, 2006, 2007 and 2008).

Figure 4: Average annual R&D spending as a percentage of the defence budget



EDA data does not show participation of the EU12 countries in collaborative procurement of defence equipment. A minor participation of Lithuania in 2007 is the only exception so far. It is important to note though, that several EU12 countries—the Czech Republic, Estonia, Hungary, Poland, Romania, and Slovenia—already participate in collaborative projects for research and technology development. It may be expected, that with time this will facilitate the involvement of the EU12 countries in collaborative procurement.

The investments in equipment and R&D differ even more widely, both as a percentage from the defence budget and in terms of expenditures. The following table presents the average investments in equipment and R&D for the period 2004-2008 as percentage of the GDP of the country.

Figure 5: Investment (equipment and R&D) as percentage of the defence budget

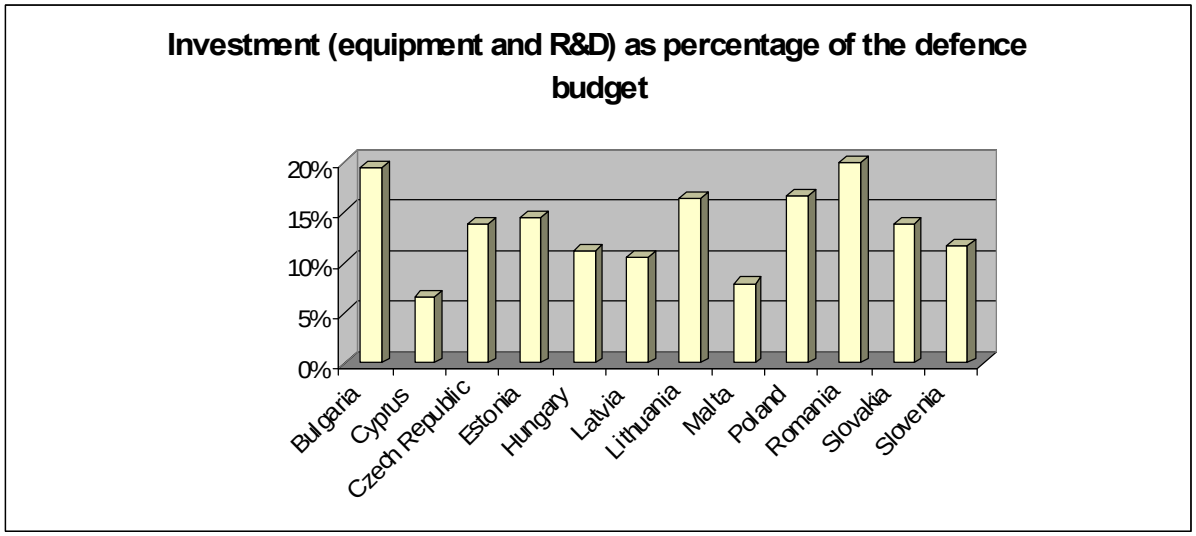


Figure 6: Investment (Equipment Procurement and R&D) in Millions of Euro, 2004-2008 average.

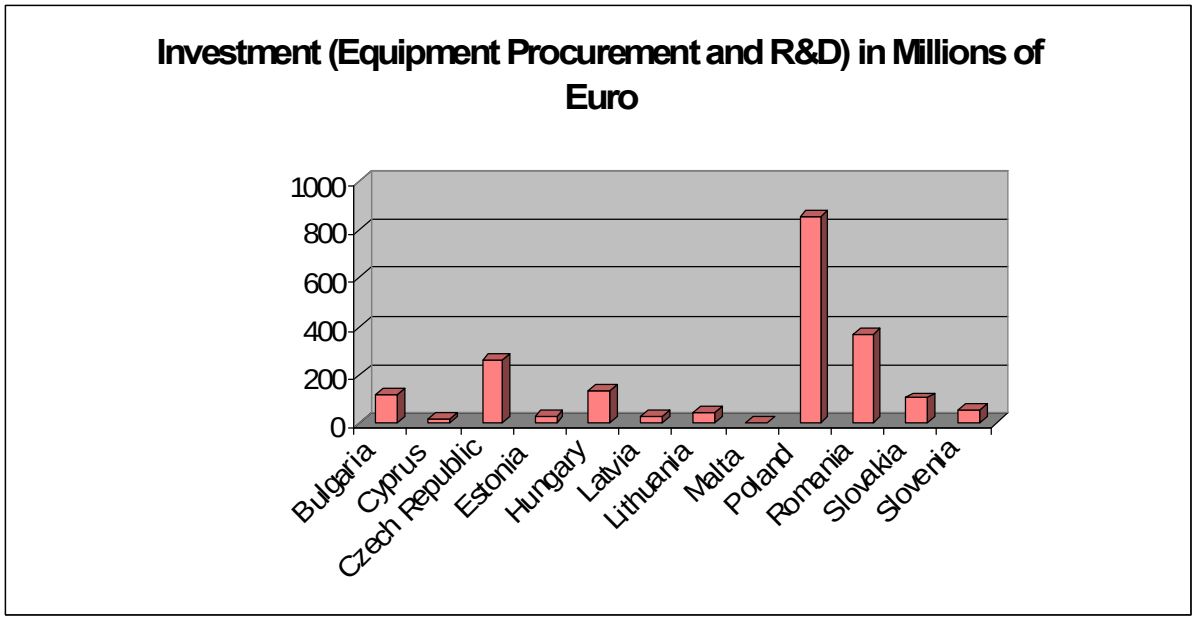
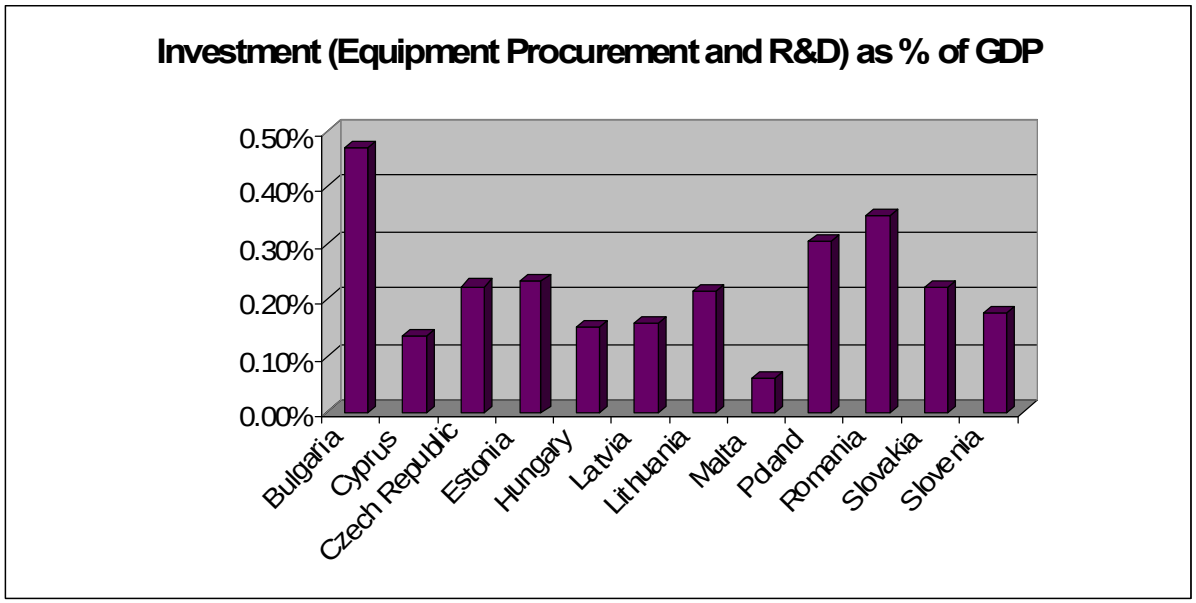


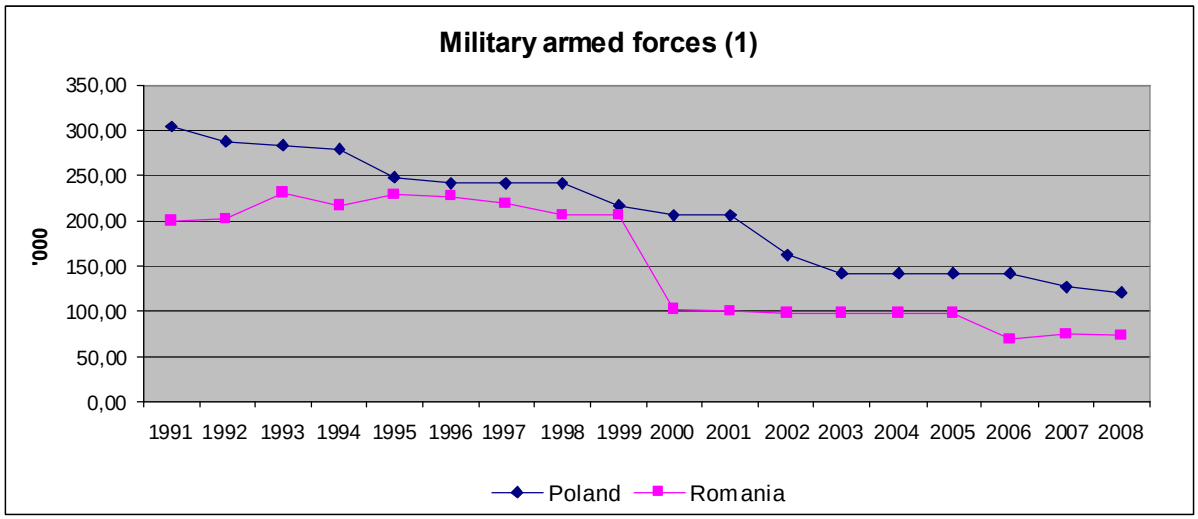
Figure 7: Defence Equipment Procurement and R&D) as a percentage of GDP, 2004-2008 average.



Armed forces

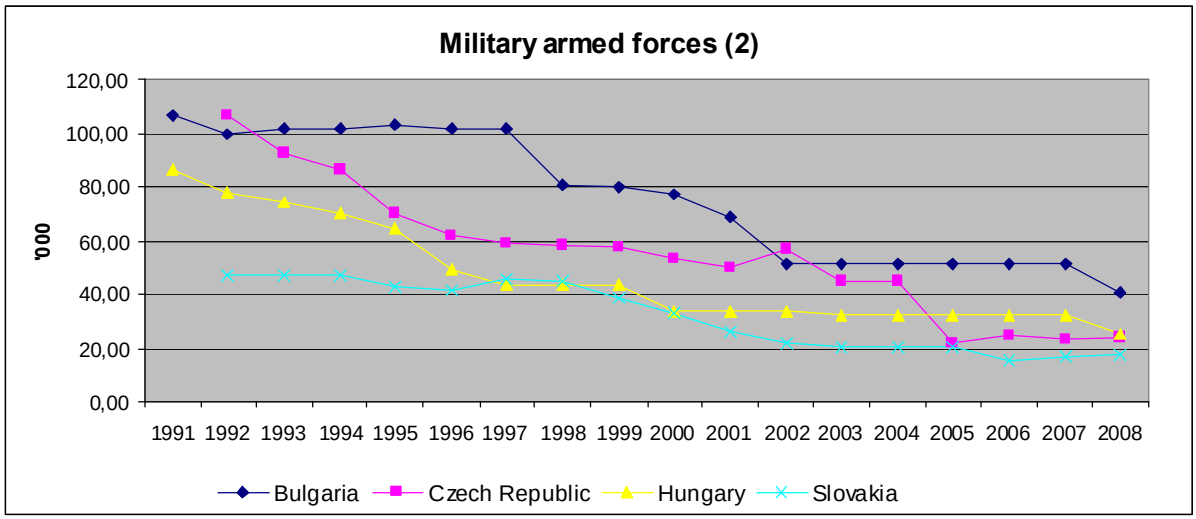
The charts below present the sizes of armed forces (excluding paramilitary) of the EU12 countries. The data presented below are divided into three groups of countries depending on the size of its armed forces.

Figure 8: Armed forces – Poland and Romania



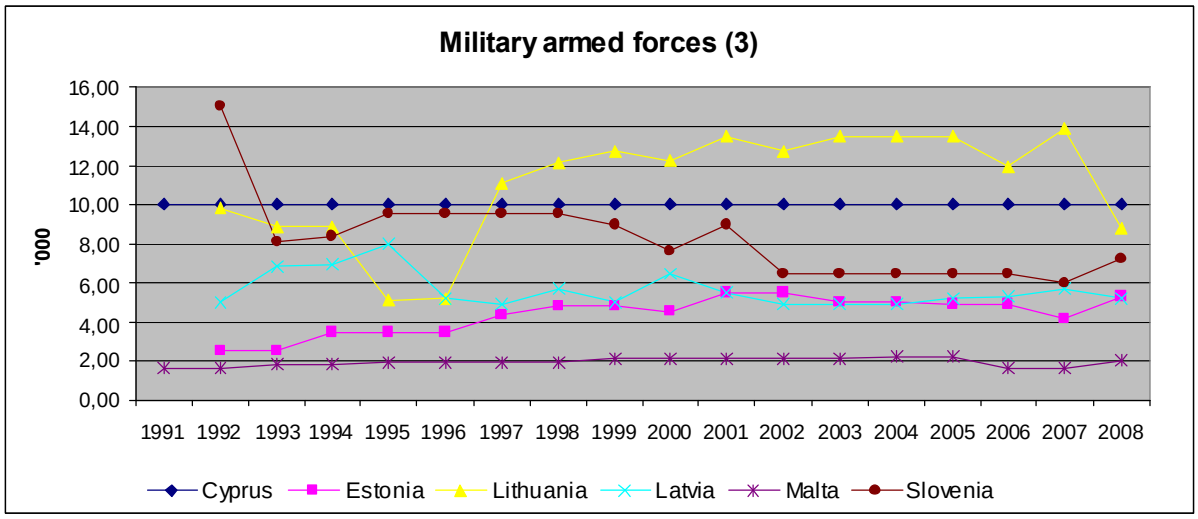
Source: SIPRI

Figure 9: Armed forces – Bulgaria, Czech republic, Hungary, Slovakia



Source: SIPRI

Figure 10: Armed forces – Cyprus, Estonia, Lithuania, Latvia, Malta, Slovenia

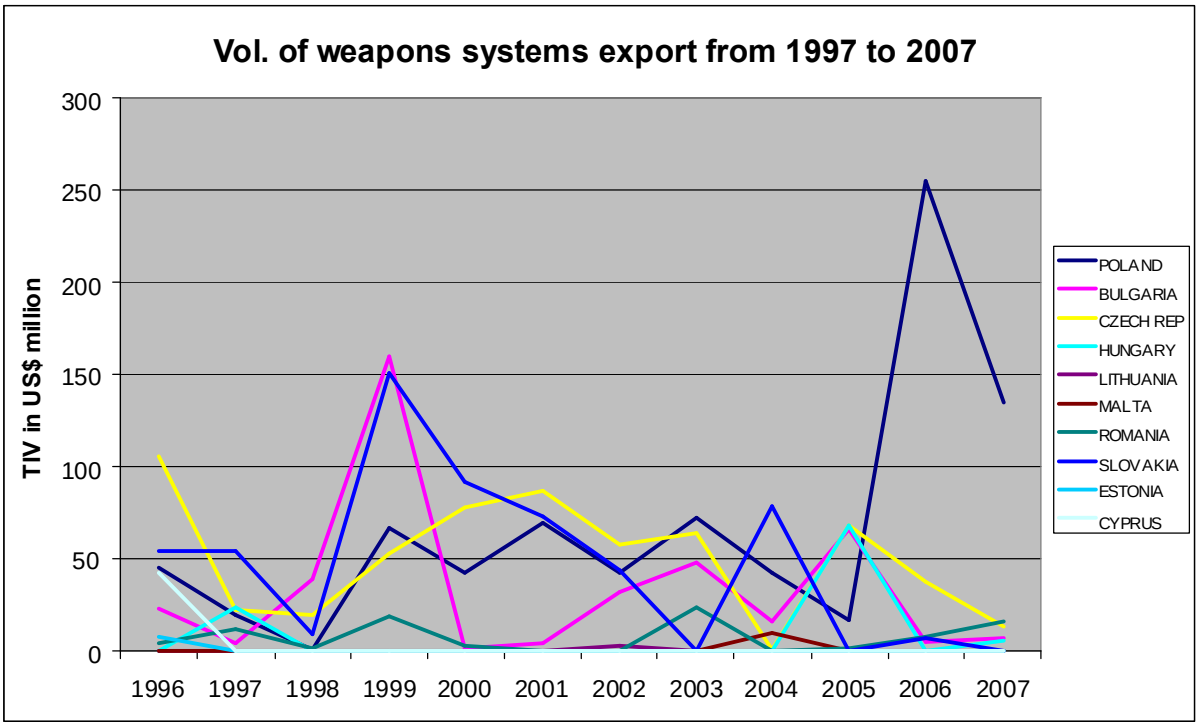


Source: SIPRI

The chart below presents data on the volume of weapons systems export from EU12. The data are presented in the form of SIPRI Trend Indicator Values.

SIPRI data on arms transfers refer to actual deliveries of major conventional weapons. Data on arms transfers are presented in the form of SIPRI Trend Indicator Values (TIVs). TIVs are expressed in US$ m. at constant (1990) prices. However, although figures are expressed in US$, TIVs do not represent the financial value of goods transferred. Instead, TIVs are an indication of the volume of arms transferred. Hence, TIVs can be used to measure trends in international arms transfers, such as changes in the total flow of weapons and the geographic pattern of arms exports or imports. The data can also be used to measure a particular country's share of the overall import or export market or the rate of increase or decline in its imports or exports. However, since TIVs do not represent the financial value of the goods transferred, they are not comparable to official economic data such as gross domestic product or export/import figures. It is also worth to notice that some values of export of armament in a number of CEE states in the late 1990s represent selling of an excessive materials and equipment, not a contemporary national production.

Figure 11: Volume of weapons systems export (1997-2007)



V. Mapping of competences in the defence-related supplier base of EU12

1. Introductory information

1.1 Sources

As a basis for the mapping of competences in the EU12 defence-related supplier base, we used:

- Responses to structured questionnaires that were prepared by the study team and addressed to the EU12 defence industry companies and non-defence industry companies with potential links to the defence sector;
- Direct interviews conducted with representatives of the EU12 defence industry companies;
- In-depth analysis of available publications and other source documents;
- Desktop research.

This set of source documents was supplemented with our in-house knowledge of the EU12 defence-related supplier base.

1.2 Method

In order to map the competences of the EU12 defence-related supplier base we compared the results of the abovementioned research against EDA Technology Taxonomy. EDA Technology Taxonomy defines three basic levels of defence-related technological activity:

2. Underpinning Technologies;
3. Systems-related Technologies;
4. Systems/Products.

For each of these basic levels EDA Technology Taxonomy provides two levels of detailed descriptions, to which further in the report we refer to as:

- 'four-digit' taxonomy fields, e.g. "B06.12 – Magnetic Sensors," and
- 'two-digit' taxonomy fields, used for aggregate examination of activities and competences, e.g. the field of "B06 – Sensor Systems" that groups fifteen four-digit taxonomy fields currently in use.

We matched each of the competency identified with respective EDA 'four-digit' taxonomy field. In next step, for each of the competency identified we distinguished between 3 categories: research, self-engineered production and licence-based production.

2. Results of EU12 competences mapping

The charts below present information on defence-related competences aggregated to 'two-digit' taxonomy field for each country, divided into research and production (self-engineered and licence-based) competences. Vertical scale on each chart represents number of identified entities engaged in the respective field of activity in each country.

In Annex D we present detailed results of competences mapping on the 'four-digit' EDA taxonomy fields level. The data is presented for all EU12 countries. For the purposes of clarity we divided the results between A, B and C-level taxonomy fields. In order to map the type of competences identified in these EDA taxonomy areas we also present separate tables for 3 different categories of competence: research, self-engineered production and licence-based production.

Figure 1: Bulgaria - defence-related competences aggregated to 'two-digit' taxonomy field.

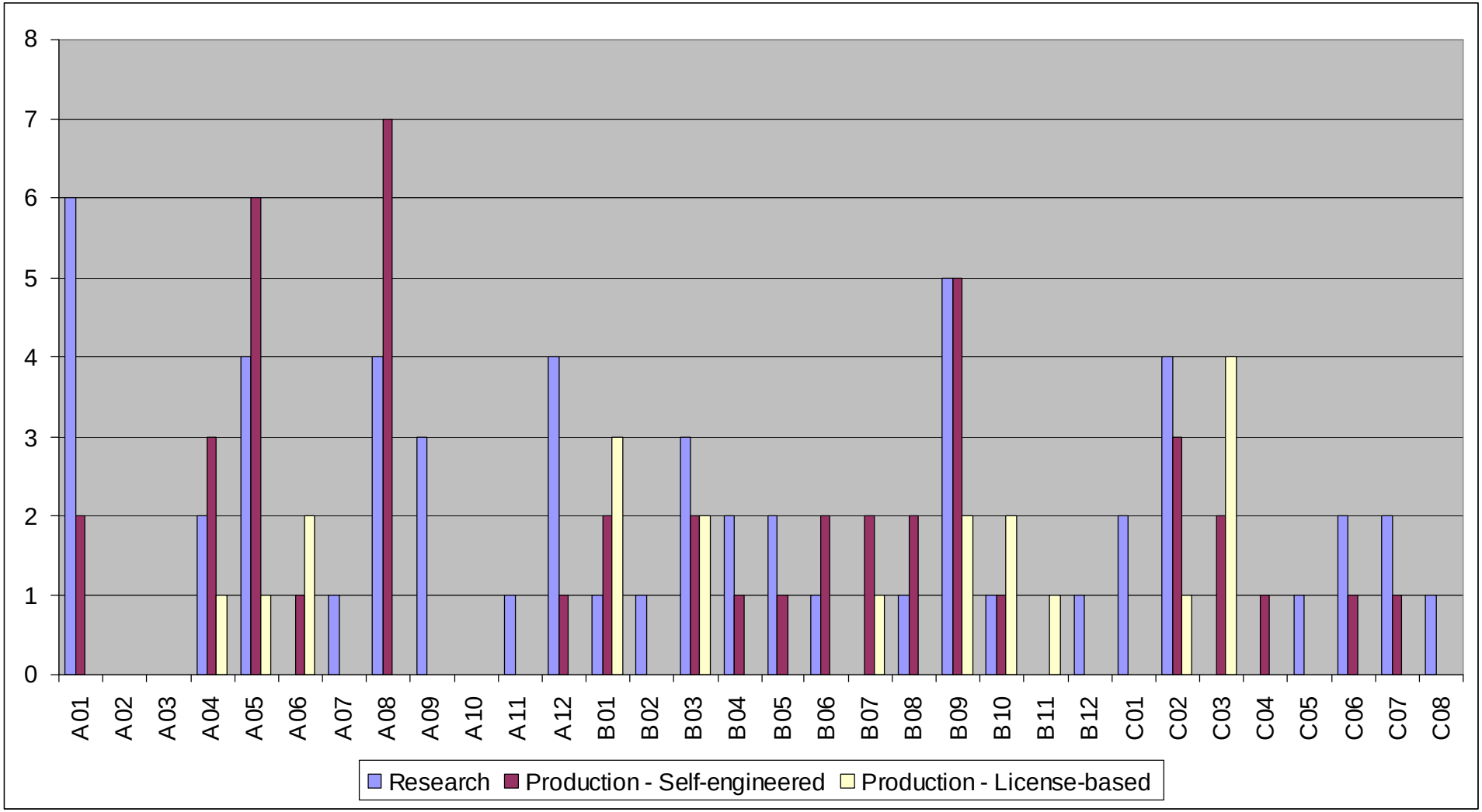


Figure 2: Czech Republic - defence-related competences aggregated to 'two-digit' taxonomy field.

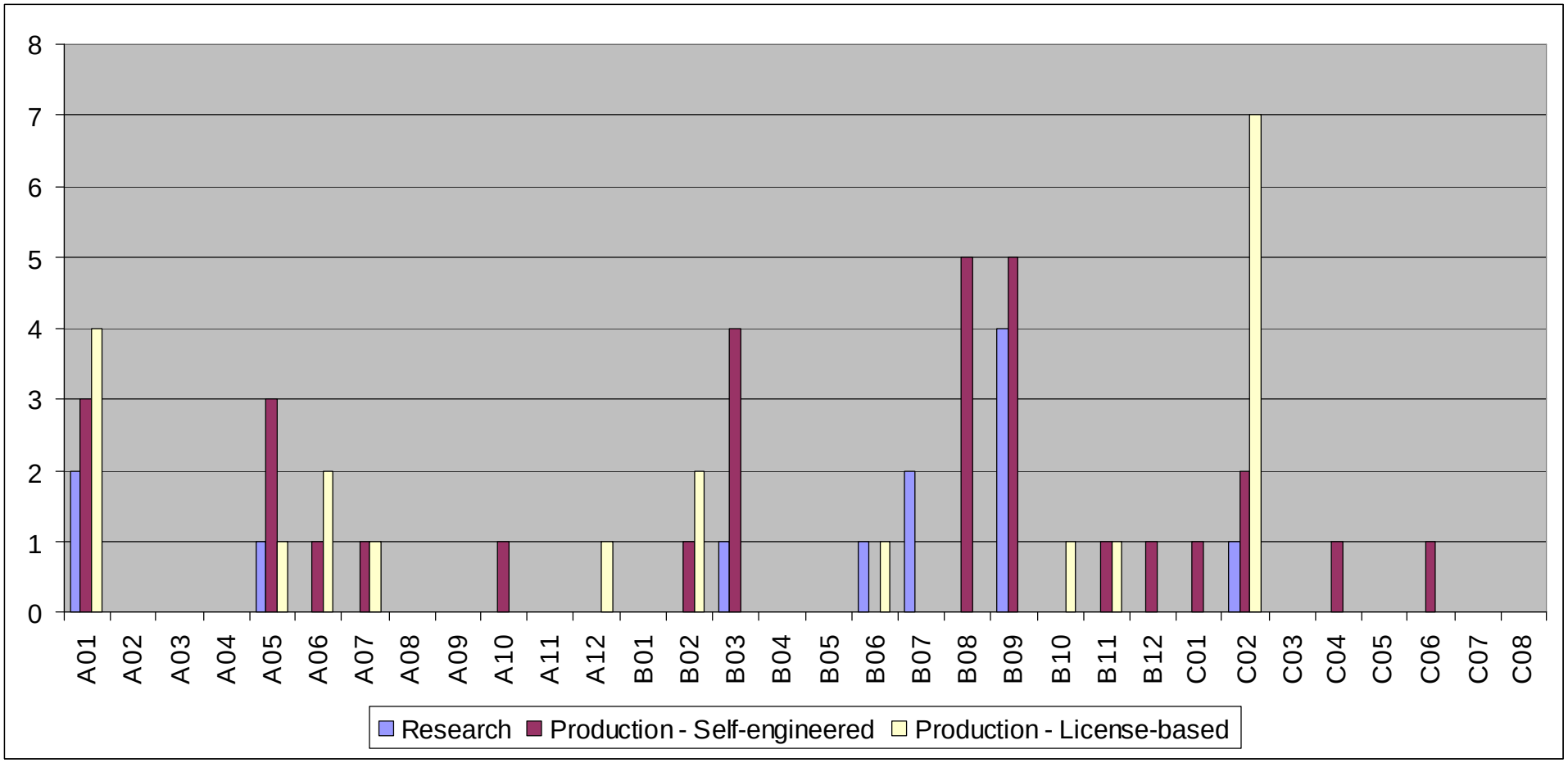


Figure 3: Estonia - defence-related competences aggregated to 'two-digit' taxonomy field.

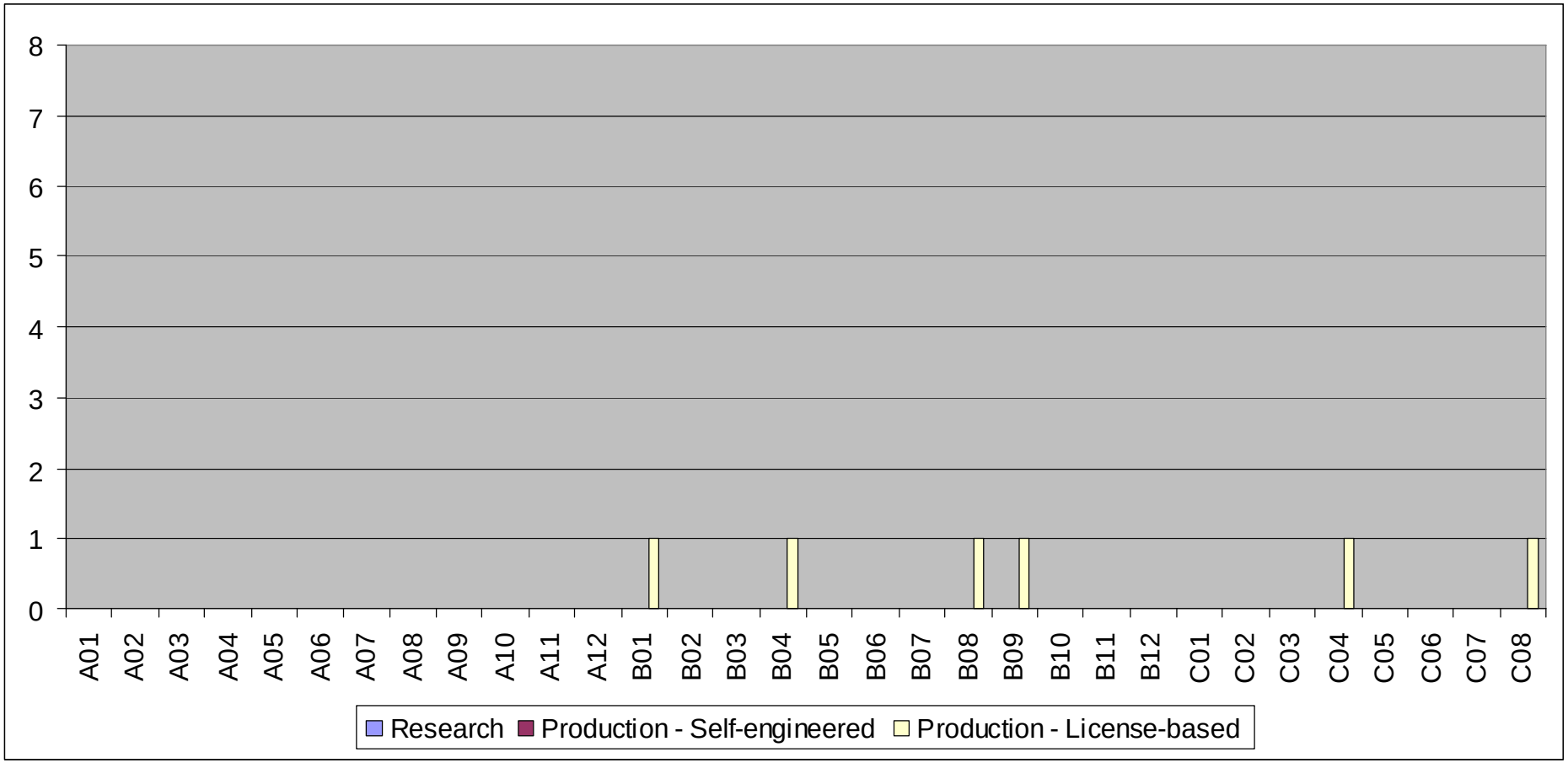


Figure 4: Hungary - defence-related competences aggregated to 'two-digit' taxonomy field.

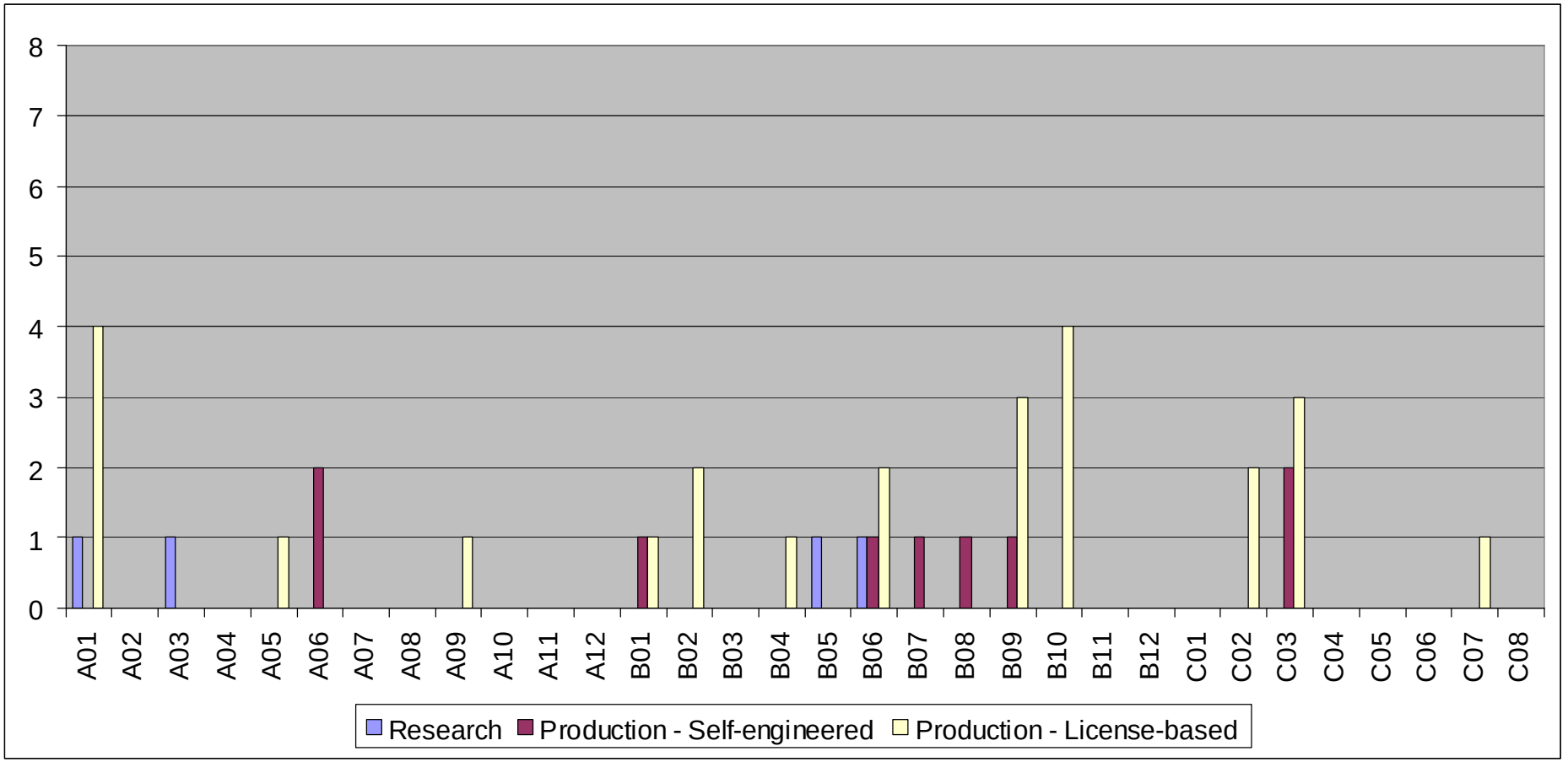


Figure 5: Lithuania - defence-related competences aggregated to 'two-digit' taxonomy field.

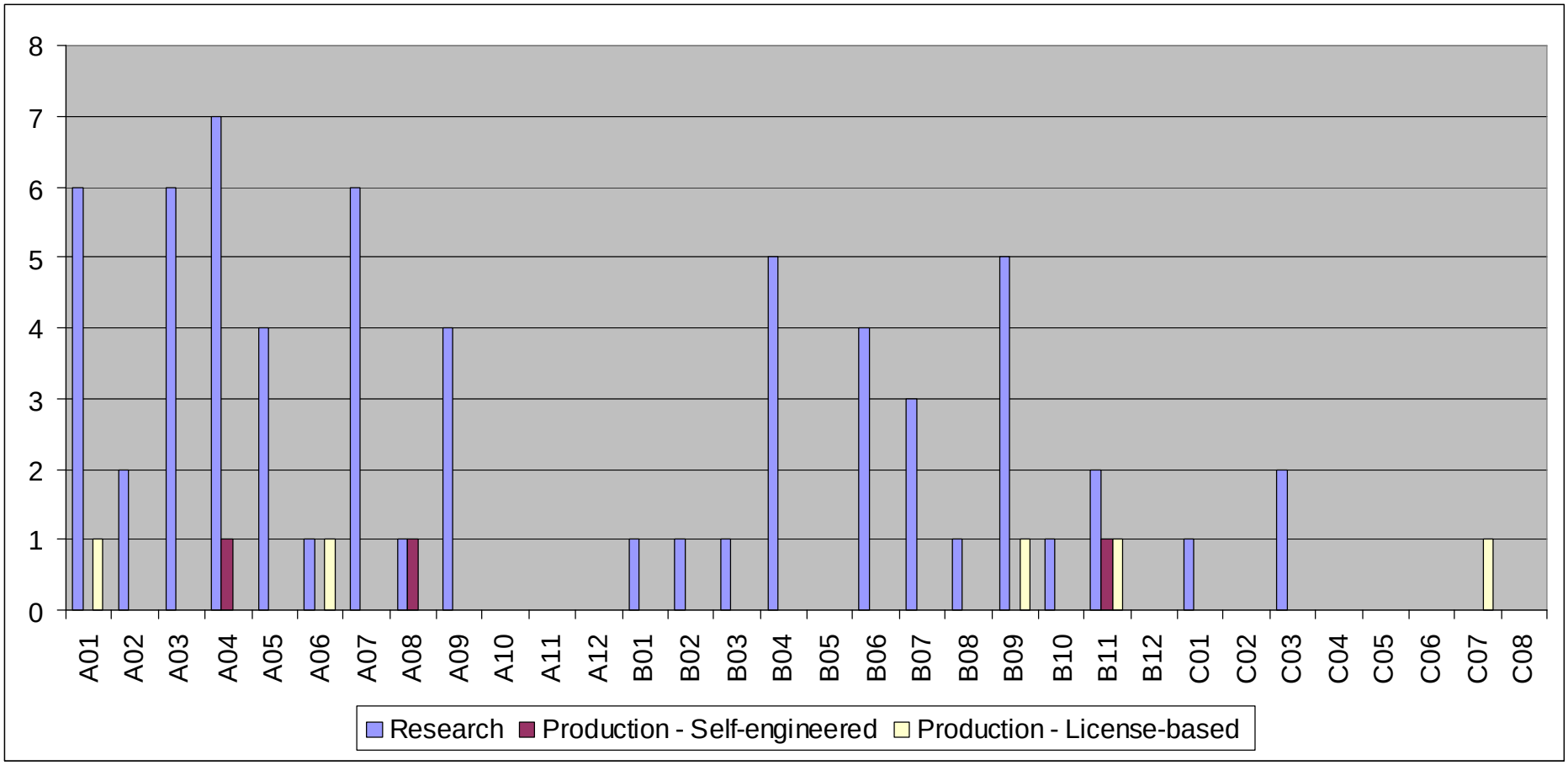


Figure 6: Poland - defence-related competences aggregated to 'two-digit' taxonomy field.

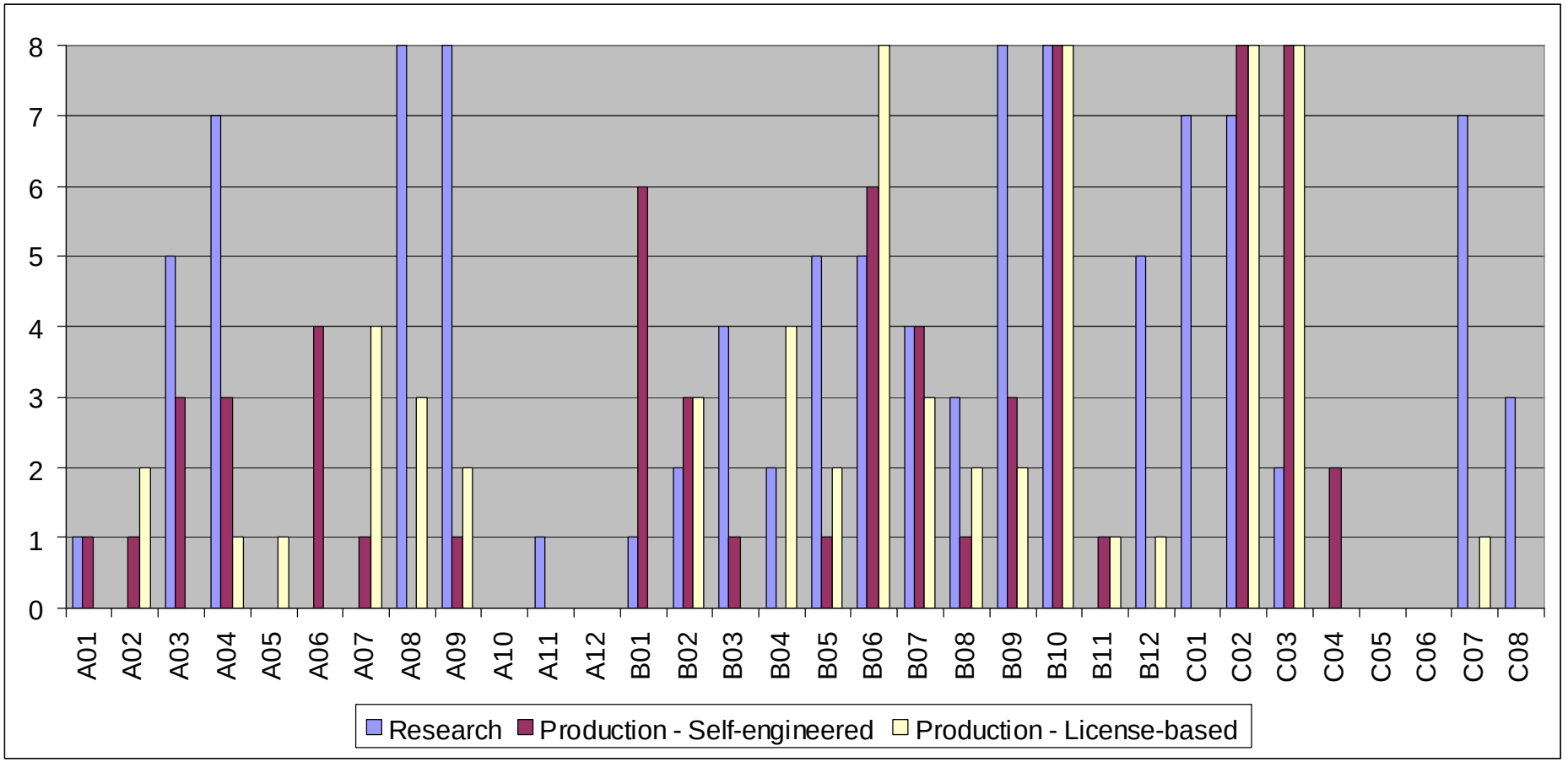


Figure 7: Romania - defence-related competences aggregated to 'two-digit' taxonomy field.

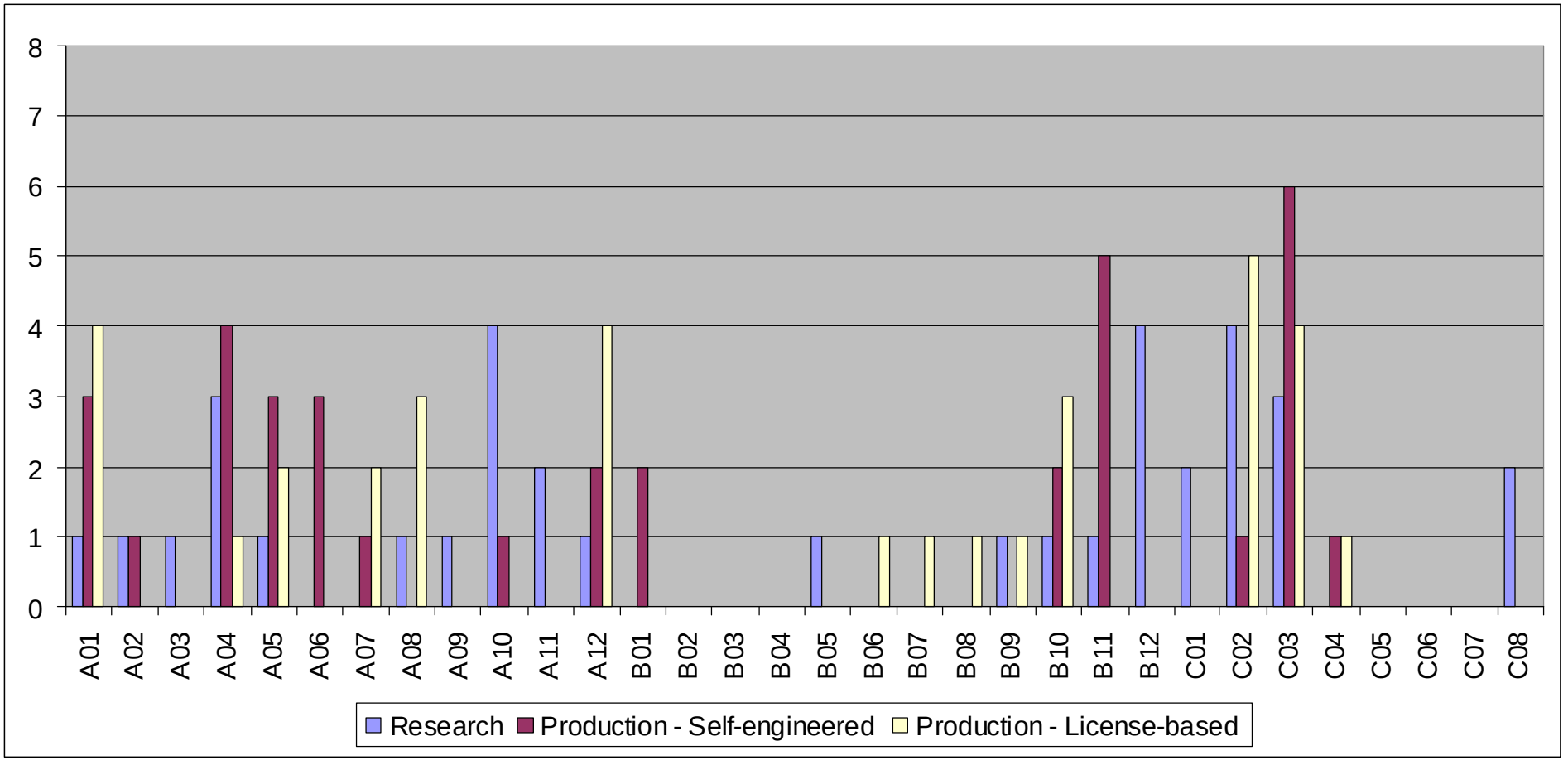


Figure 8: Slovakia - defence-related competences aggregated to 'two-digit' taxonomy field.

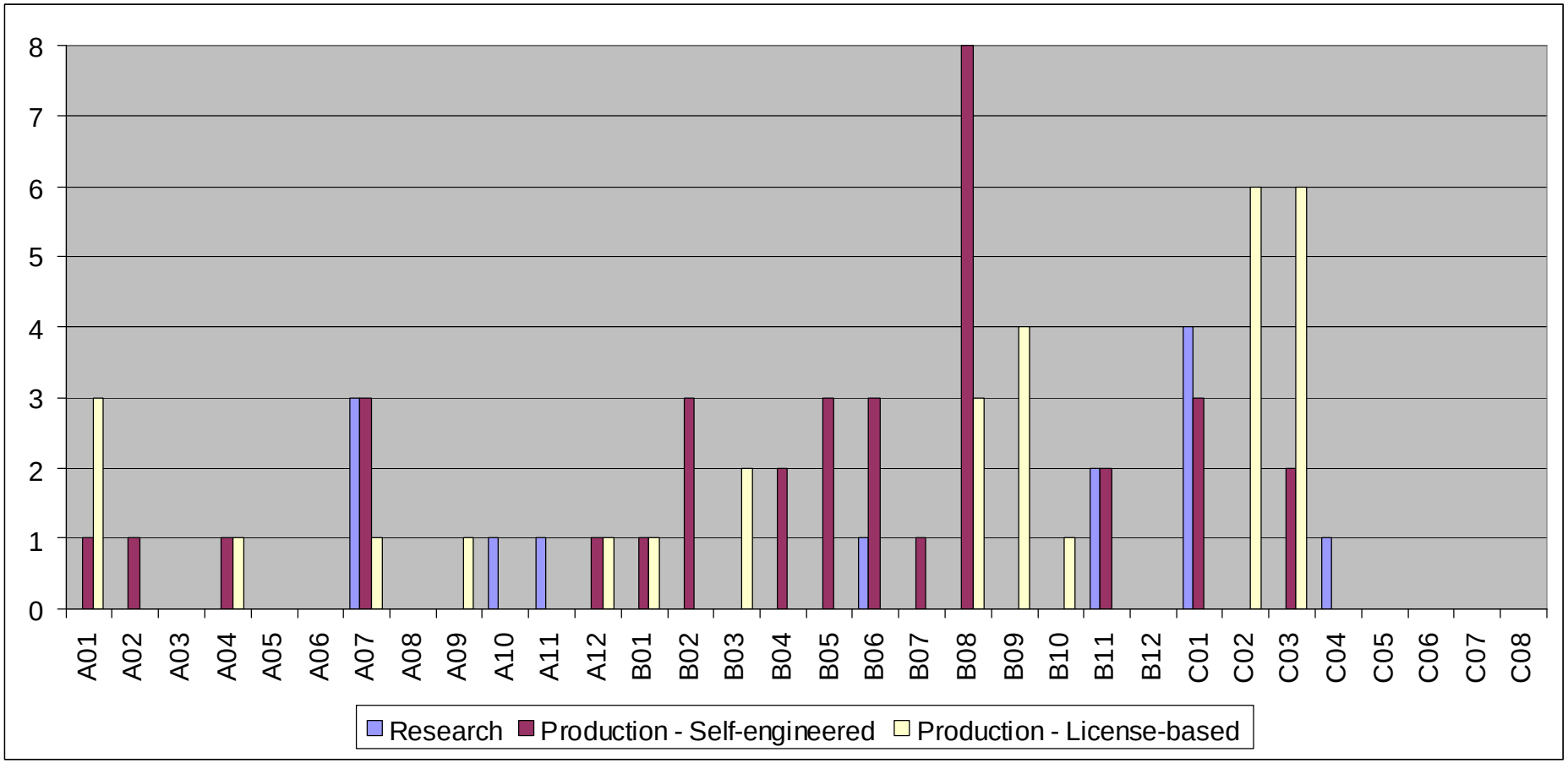
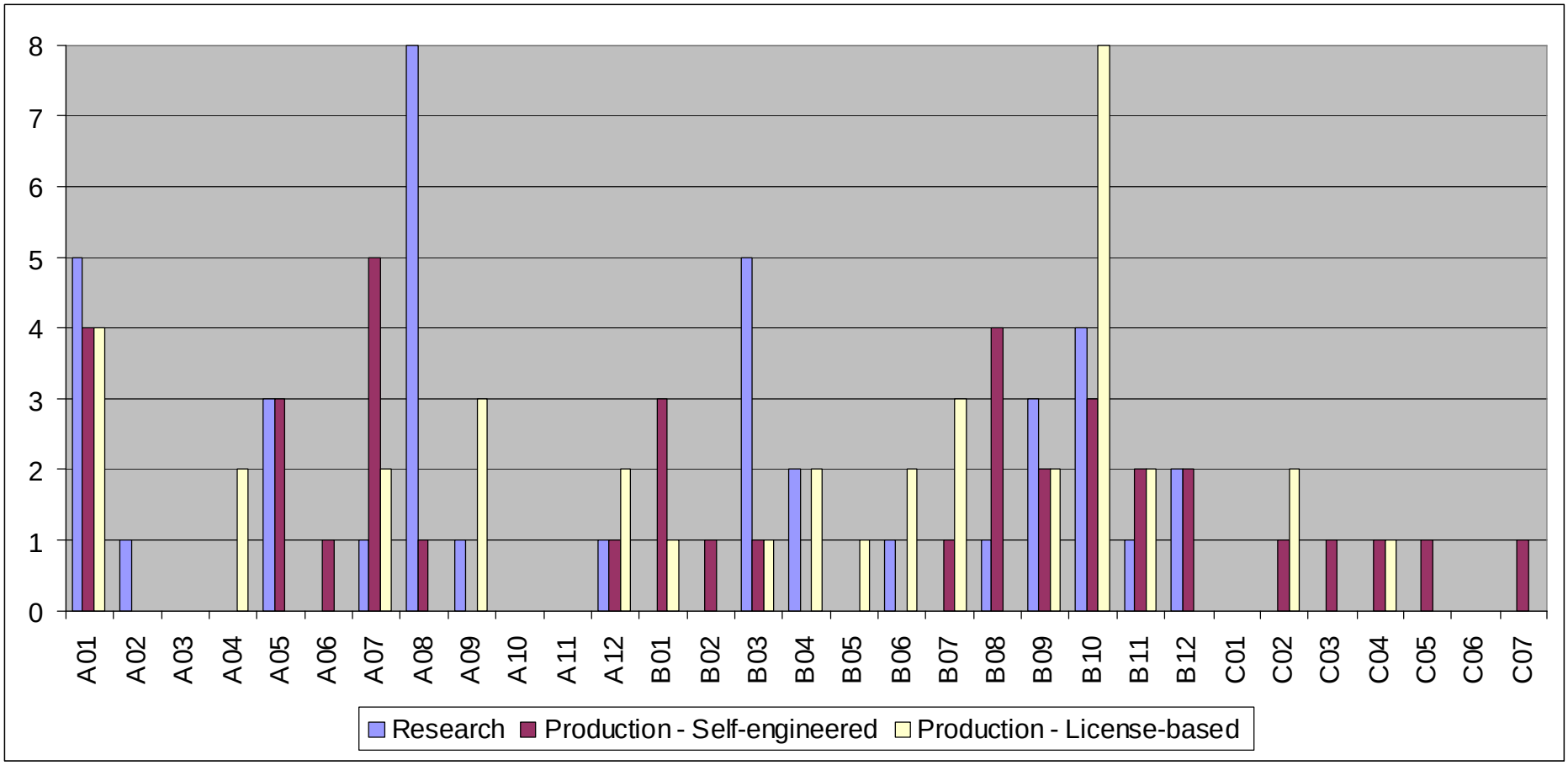


Figure 9: Slovenia - defence-related competences aggregated to 'two-digit' taxonomy field.



3. Conclusions

The results of our mapping are a fairly good illustration of the real competencies of EU12 in the defence-related supplier-base. However, they cannot be taken as an absolutely complete picture, due to the uncertainty as to the comprehensiveness of our data. Moreover, the charts 1-9 indicative the "presence" of a given competence but do provide an insight as far as the volumes or qualities are concerned. We have possessed such information only partially, where the questionnaires were responded in detail, which was not always the case. Most of the data has been exerted from the open literature.

As the material shows three of EU12, namely Cyprus, Malta, and Latvia had no identified competences in defence. In case of Estonia we have found only six license-based competences. The main competence of Hungary lies in the license-based production (12 competencies in licence-based production, while only four competencies in the area of R&D and seven in self-engineered production). Lithuania seems strong in the defence-related R& D (with 20 areas of competence, while only in five in licence-base production and three in self-engineered products). On the other end, a strong aspect of the Czech competence is its self-engineered production, indicating well-developed indigenous research potentials (seven areas of R&D activities together with 15 competencies in self-engineered production, and only 10 licence-based production). An interesting case is presented by Slovenian defence-related technological capacity, indicating relatively large defence-related industrial base. This capacity covers most of technology taxonomy, with 15 competencies in R&D, 20 in self-engineered production and 16 in licence-based production. As expected, the three larger arms producers, Bulgaria, Romania and, in particular, Poland enjoys competencies in by far more numerous fields in all categories. In case of Bulgaria its technology base entails nearly entire spectrum of defence-related competencies in "two-digit" taxonomy fields (24 competencies in R&D, 20 in self-engineered production, and 11 in licence-based production). Romania, in turn, has visibly less comprehensive competencies (not present in some B-level sub-systems, materials, and sensors), with competencies in 19 areas of R&D, 14 areas of self-engineered production and 14 in licence-based production. Finally, Poland's technological base is the widest within EU12, covering close to all technological fields, with 22 of them in R&D areas, 20 in self-engineered production and 19 in licence-based production.

The "mapping" exercise, undertaken in the study, while helping to assess the "geographical" distribution of technological competencies it does not, at this level of data availability, permit sound conclusions on the competitiveness of the EU12 defence-related supplier-base potential. On the other hand, judging after data provided here on the self-engineered or licensed production as well as on the strength of the national R&D devoted to defence production, some judgment can be made on potential innovativeness in the states concerned. Five countries – Poland, Romania, Czech Republic, Bulgaria, and Slovakia – present most promising picture in this regard.

VI. Competitiveness and innovativeness of the EU12 defence-related supplier base

This chapter will deal with innovation, competitiveness and their driving forces and barriers in the EU12 countries. The first observation to be made is that there is a striking scarcity of public data on the subject. Gathering new data proves to be at least as difficult. Therefore we have to be careful in making assessments. Having said this, the chapter will focus on the main EU12 countries; Bulgaria, Czech Republic, Hungary, Poland, Romania and Slovakia. These are the largest EU12 countries in terms of GDP and population. Because of the characteristics of the defence market, these six EU12 countries have the largest potential for integration into EDTIB. They have the largest (potential) home market and potential defence and/or dual-use industrial base. The available statistics on the remaining six smallest EU12 countries show that the defence industry in these countries is very small.

1. Innovativeness – background

Although the defence industry represents only a small fraction of the economic potential of EU12, one cannot consider its innovative potential in isolation from the rest of national economy. The scientific, technological, managerial and other characteristics of a given country create the framework and basis for the innovation performance in all specific sectors of its economy. The appearance of niche capabilities in specific cases, showing outstanding innovation, is an exception if and when the overall level of innovation performance is low.

The general position of EU12 in the area of innovation is provided by the European Commission publications[8]. These publications measure a number of indicators. Specifically the European Innovation Scoreboard (EIS) measures 25 innovation indicators, classified into five "dimensions": 1.) innovation drivers, 2.) structural conditions for innovation, 3.) knowledge creation, investments in R&D activities 4.) innovation and entrepreneurship and application of innovation 5.) value added in terms of labour and business. To categorise countries in terms of innovation, the EIS uses a so called innovation ladder. This ladder formed by Innovation Leaders, Innovation Followers, Moderate Innovators and Catching up countries. According to this methodology all EU12 fall into the last two categories. Cyprus, Czech Republic, Estonia, and Slovenia fall into the third group of moderate innovators, and the rest of EU12 belongs to the catching up countries. The classification, according to the EIS report, is relatively stable over the last five years. Over a longer period countries showing the lower performance, like Czech Republic, Estonia and Lithuania, are showing a potential to close the gap with the Innovation Followers and Innovation Leaders. However, "based on trends over recent years, it would take most Modest Innovators and Catching-up countries 20 or more years to close gap with the EU" (EIS, 2007). Only the three aforementioned countries have a chance to catch up with the EU average within a decade or so.

[8] *European Innovation Scoreboard 2007. Comparative Analysis of Innovation Performance* (Pro Inno Europe paper No. 6, February 2008), *Science, technology and innovation in Europe*, 2008

"Science, technology and innovation in Europe", which is a result of the latest Community Innovation Survey, provides a view on a large number of indicators pertaining to the European states' potential in science and technology. It collects data on government budgetary appropriations on R&D, R&D expenditure, including business enterprise sectors, R&D personnel, human resources in science and technology, innovation trends including "knowledge transfer", patents, as well as high-tech and knowledge-based services, including high-tech trade and venture capital investments. Again, according to these analyses, EU12 are, in general, occupying the lowest positions amongst the Community, trailing far behind countries like the United Kingdom, Germany, France, Sweden or Finland. In the most aggregated indicator of the innovation potential, namely the government sponsored R&D outlays, five countries – Germany, France, the United Kingdom, Sweden, and Spain – represent about 80% of the total R&D expenditure of the EU27. The volume of business-borne R&D funds makes this difference even more striking.

Another and somewhat more positive general insight into the general innovative capability of the EU12 may be gained from the World Bank's analysis (source: The World Bank, Public financial support for commercial innovation, Washington, 2006). This analysis utilizes a Knowledge Economy Indicator (KEI) which is constructed by inclusion of data on economic incentives and institutional environment (tariff and non-tariff barriers, quality of normative regulations), education and human resources (literacy, medium and higher education indicators), innovation system (number of scientists per million of inhabitants, number of patents, number of publications per million of inhabitants) and, finally, the information infrastructure (number of telephones, number of computers, number of internet users). According to this data the scores for the EU15 member states are not much different from those of EU12, though the second group is visibly trailing behind by a small margin. While the best scores like Sweden's and Finland's are around KEI 9,17 and 9.02, respectively, the worst scores for this group of states, namely Portugal's and Greece's are around 7,30 and 6,97. In case of EU12, the best score, Estonia's and Slovenia's, are at the KEI level of 8,26 and 7,88, respectively, and the worst two, namely those of Bulgaria and Romania, are at the KEI level of 6,19 and 5,27. What these indicators may mean is that EU12, while being less knowledge-based economies, are well positioned to catch up with the leading ones.

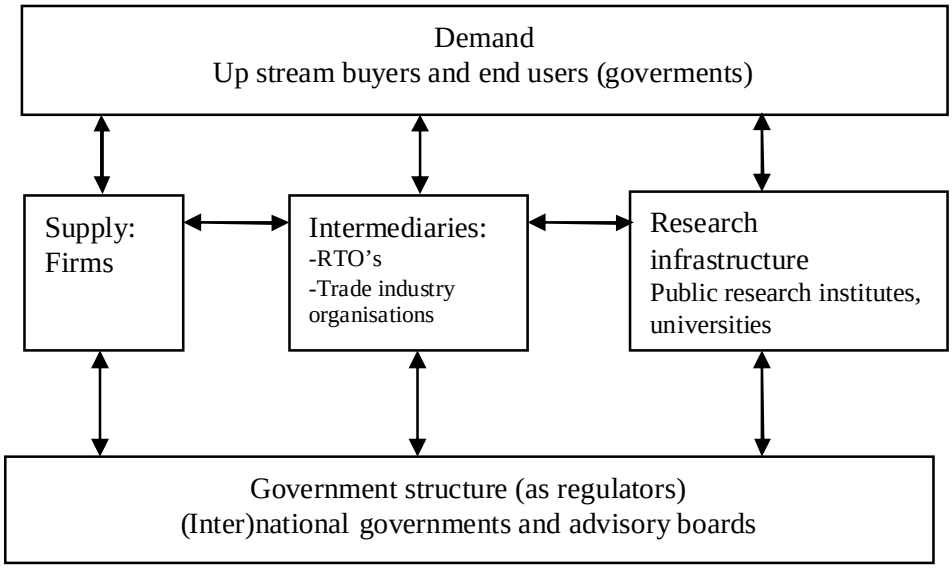
2. Competitiveness and innovativeness

Competitiveness and innovativeness are closely linked topics. Competitiveness is a comparative concept of the ability and performance of a firm, sub-sector or country to sell and supply goods and/or services in a given market. However environments change just as demands do. Therefore in order to stay competitive, one has to be innovative as well. According to the OECD (2008), innovation refers to the development of new products, new services, new processes and new markets. Often new systems and new business models are also included. Then, the concepts are linked in that innovativeness is the ability to guarantee future competitiveness, through the introduction of innovations.

One of the major factors influencing competitiveness and innovativeness (C&I) is the environment in which it takes place. Because of the systemic nature of the developments in the defence sector, this chapter will use the National Innovation System approach[9] to describe factors and actors influencing C&I. The generic description of an innovation system is presented in figure 1.

[9] *Motors of sustainable innovation; Towards a theory on the dynamics of technological innovation systems*, Suurs, R A A, 2009, Utrecht University

Figure 1: National Innovation System



Source: Suurs, 2009

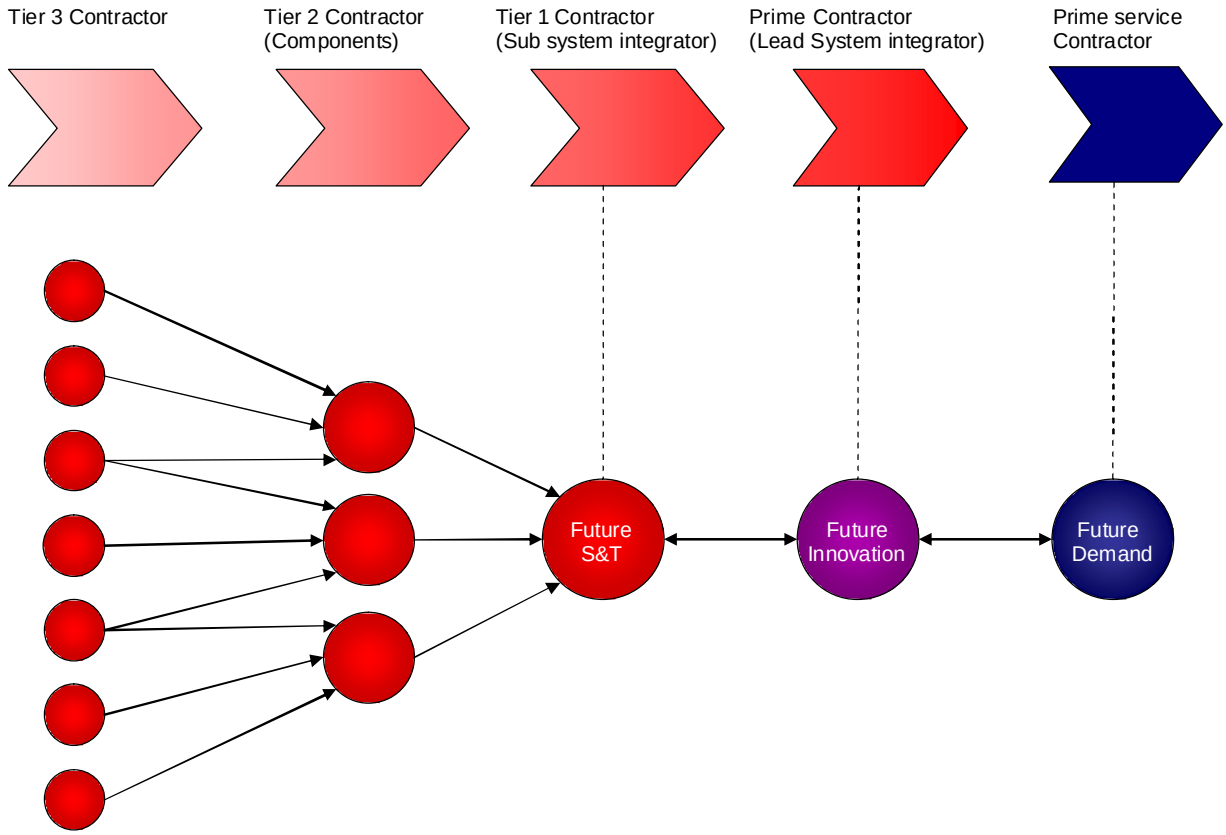
This generic structure illustrates the type of stakeholder categories involved in innovation and the interrelationships between the stakeholders. The arrows indicate the flow of innovation. Successful innovation and competition is dependent on the quality of those *relationships*.

For instance, often fundamental research takes place in academic institutions. If this research is not well connected to the demand side, the research takes place in vain.

In Western Europe, increasingly company research institutions and academic institutions are located on the same spot and form a center of excellence in which knowledge flows from academia to industry and vice versa. EADS and the University of York successfully operate such a campus. Proximity turns out to be essential.

With regard to the *roles* in an innovation system, the defence sector is rather a special innovation system. One of the most important characteristics of this supply chain is that the end customer (government) also determines to a large extent the terms of engagement in its role as a regulator. And in some cases the *end user* and the *regulator* are also the *owner* of the supplier (this is the case when governments own parts of the DTIB). This makes it a complex innovation system. In this context the defence supply chain is often depicted as we have done in the upper part of figure 2.

Figure 2: Supply chain actors and roles in the innovation system



Source: Authors

To be sure the customer is not necessarily a WE government. As will be discussed in section 6.3., customers of the defence supply chain are distributed all over the world. For the current purpose it is good to bear in mind that also suppliers can be situated all over the world (although when for instance Primes are discussed, usually it is referred to WE Primes).

In the following section the various tiers and roles are further elaborated. The strategies / modalities that can be played by EU12 actors in this value chain are subject of Chapter VII on Modalities.

Prime contractors

Prime contractors often are Lead Systems Integrators (LSI's), platform producers and producers of weapon systems). In the EU these are mainly large companies (primarily national champions), specialized in defence production. Lead system integrators assemble defence systems from several defence domains (for example, an aircraft carrier). Others are specialised in only one area (transport aircraft for example).
Typical examples of prime contractors in the EU are BAE Systems (UK), EADS (France and Germany, with the headquarter in the Netherlands), Thales (France), Saab (Sweden) in fighter aircraft, Finmeccanica (Italy) in helicopters and armoured vehicles, Nexter (former Giat,of France) and Krauss-Maffei Wegmann (Germany) in major battle tanks, Thyssen Krupp (Germany), Fincantieri (Italy) and DCNS (France) in naval vessels.
When these companies deliver directly to EU12 governments, they are also their prime contractors.

However, there are cases where EU12 governments are supplied with Integrated Platforms (ships, planes, tanks and missiles) by EU12 prime contractors such as Bumar-Labedy or Radwar in Poland and AERO Vodochody of the Czech Republic. In such cases it is even possible that WE companies serve as suppliers to EU12 prime contractors, for example in some smaller C3ISTAR projects, e.g. the Bulgarian company Samel 90 Plc, serving as system integrator in one project for the Bulgarian armed forces, has subcontracted Thales for communications equipment and components.

However, in terms of size (turn over, number of FTE), scope, investments in R&D and new market development, these EU12 "local" primes are smaller than their WE counterparts and their ability to sustain the ambition to function as prime in the new political and market environment has yet to be proved. In Chapter 7, where we investigate modalities and strategies for the EU12 defence companies, a prime contractor of this type is called "The Aspiring Prime."

Tier 1 contractors

Tier 1 contractors usually are specialised systems producers, for example in electronics, and producers of complete sub-systems or major components). These contractors are often specialized firms which are subcontracted by the prime contractors. Often, these are also risk sharing partners. Examples of such companies in Western Europe are Rolls Royce (UK), Groupe Safran (France), MTU (Germany) in engines, and Indra (Spain) in electronics.

In EU12, examples of tier 1 contractors / specialised systems producers are Radwar (part of the Bumar group, Poland) while AERO Vodochody in certain cases also operates as a tier 1 supplier.

Tier 2 contractors

Tier 2 contractors usually produce components and supply services such as electrical & electronic equipment, mechanical engineering, metal working, casts & moulds, etc., along with a variety of services. Usually small and medium enterprises (SME) or subsidiaries of the major defence producers (prime contractors and sub-contractors), these companies often produce dual-use goods or services. They are not always listed as defence producers since they operate at the margin of the defence sector.

Examples of such companies in EU12 are Optix and BIG AD of Bulgaria, Syscom and Elettra Communications of Romania, and many others.

Tier 3 contractors

These are commodity suppliers and general service suppliers, as well as capacity contractors. This level also includes all providers of general economic infrastructure services (transport network and services, communications, externalized training, etc.). At this level of the supply chain one finds a large number of small and medium enterprises (SME) as well as subsidiaries of major defence producers (prime contractors and sub-contractors) which supply dual-use products to prime contractors or subcontractors. In the statistics of the EU defence industry or in company lists of the defence sector these companies are usually not listed since they operate mainly at the margin of the defence sector an often pursue, in addition, non-defence product lines.

SMEs involved in defence, produce small arms and ammunitions, low caliber artillery, military vehicles, small ships, military electronics, subsystems for weapons and components.

Many defence producers, mainly the large ones, but also some smaller producers, are involved at several levels of the supply chain[10].

The "prime" and the "tier 1 contractor" can be identified as defence companies. However, up stream in the value chain, companies become less part of the defence industry and more of the civilian industry. These are typically dual-use firms or non-identifiable generic manufacturing industries. Although they can deliver crucial components to the defence industry, they may not be aware that they are part of it. For instance, the roller bearing industry is crucial to all integrated platforms. Equally challenging from a research and policy development perspective is the fact that very often data is not collected on them.

The prime service contractor of lead service integrator (LSI) is a role that seems to be emerging in the supply chain. Rather than selling a system, the supply chain delivers functionality, a service. An example is the British MoD buying the service of in flight refueling rather than buying tankers. Since this is a new role it could offer opportunities to new comers, perhaps also new comers from CEE. Lema trading of Bulgaria might serve as a potential "micro-level" example in EU12, although it currently lacks the financial strength/size to truly operate in this role (see Chapter VII).

To be sure, these value chains not only describe the situation where a western European prime is the final link. Supply chains can also relate to smaller equipment and/or less high tech equipment. A number of the EU12 countries have their own supply chains (for instance the Bulgarian supply chain for Small Arms and Light Weapons).

However, this study places the supply chain of western European primes in a central position. In that respect the position of the EU12 companies in these supply chains is often at tier 2 – tier 3 level.

More important for this study is the role the supply chain actors have in the further development of this chain. The prime contractor is the firm that delivers to the end user and translates the demand of the end user into products and services. Therefore the Prime also knows about future demand. Knowing future demand, they will develop innovations together with their suppliers. When the required innovation is known, then the supply chain can also work on the required technologies.

This distinction between future demand, innovation and science and technology is the basis of our line of reasoning for this chapter. Competitiveness and innovativeness are determined by the degree to which the EU12 supply matches EU15 demand, at present but especially in the future. For arguments sake, in this case demand is equal to the demand of the primes. The better the match, the better the competitiveness and innovativeness.

In order to say something about competitiveness and innovativeness in a structured and comparable way, we will first asses the capabilities of firms in the seven EU12 countries. We will do this by categorising their activities in terms of the EDA technology taxonomy. These companies will come from two pools; the questionnaire respondents and firms from the reports we found during our desk research. The current situation of the DTIBs of the 7 EU12 countries will be enriched with some additional data on industry size and markets.

Secondly, we will try to assess future demand of EU15. This will done by finding out on which innovation themes these nations (in fact the primes and first tier firms) are working[11].

In the third step we will asses the technologies/capabilities that are required for these innovations and categorize them in terms of the EDA taxonomy.

Finally, we will compare future demand with current capabilities. The higher the match, the more competitive and innovative EU12 is.

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[10] *Anticipation of change in the European Defence industry,* Bergstrom O, Bruggeman F, Ganczewski J, 2008, EDA

[11] An innovation theme is a theme along which the sector innovates during the coming 20 years. Non-lethal weapons are an example of an innovation theme. They consist of a category of innovations.

3. Innovativeness and competitiveness in the EU12 countries

In order to get a feel for the current situation of the DTIBS of the EU12 countries we have looked at the size of the DTIBs of the EU12 countries, at the development of their markets/sales and at their capabilities.

3.1 Current size of CEE DTIBS

As compared to the size of Western European defence industry base, the size of the Eastern European defence and industry bases is relatively small in terms of employees working in the defence-related industry (see table 1).

Table 1: Key employment figures 7 largest EU12 DTIBS

Year	*< 1989*	*2004*	*2005*	*2006*	*2007*	*2008*
BUL	110000	22000	22000	22000	22000	22000
CZ	NA	22000	24000	25000	25000	25000
HUN	NA					2000
POL	180000					63000
ROM	N.A.	16000	14000	13500	13500	13500
SLOVE	N.A.	9000	9000	9000	9000	9000
SLOVAK	N.A.	23000	20000	20000	20000	20000

Source: BMI, 2009

With regard to the size of the current Defence Industrial Base in terms of the number of companies (development and production capacity of the DTIB's) some remarks can be made:

Bulgaria:
The number of defence (related) companies decreased from over a 100 in 1989 to ca. 25 at the moment (no indication of size). Seven of them are state owned (BMI 2009), while some of these are in the process of privatization.

Czech Republic:
At least more than 100 companies (BMI, 2009)

Hungary:
Hungary has one of the smallest defence industries of the Central and Eastern European countries. Currently 60 companies are involved in arms production, about 40 of which actually produce defence items while the rest are primarily import/export trading companies (BMI, 2009). No information on the size of the companies.

Poland:
Currently, there are approximately 39 companies that form the core production capacity in the Polish defence sector. Restructuring of the sector sees the creation of two holding companies as part of a consolidation drive (BMI. 2009).

Romania:
Currently there are 38 arms manufacturers (27 state owned and 11 privately owned) plus 20 defence related equipment producers and service providers (private). Of these companies, 15 are grouped within RomArm, which, for now, is a state-owned holding company. Privately owned stock companies form 11 others under the formal co-ordination of the Ministry of Industry and Resources (BMI, 2009)

Slovakia:
The Slovakian defence industry is made up of around 40 companies (BMI, 2009).

Slovenia:
50 civilian companies registered for defence production (military sector has been incorporated into civilian). The proportion dedicated specifically for military production varies from 10% to 25% of their total output. (BMI, 2009)

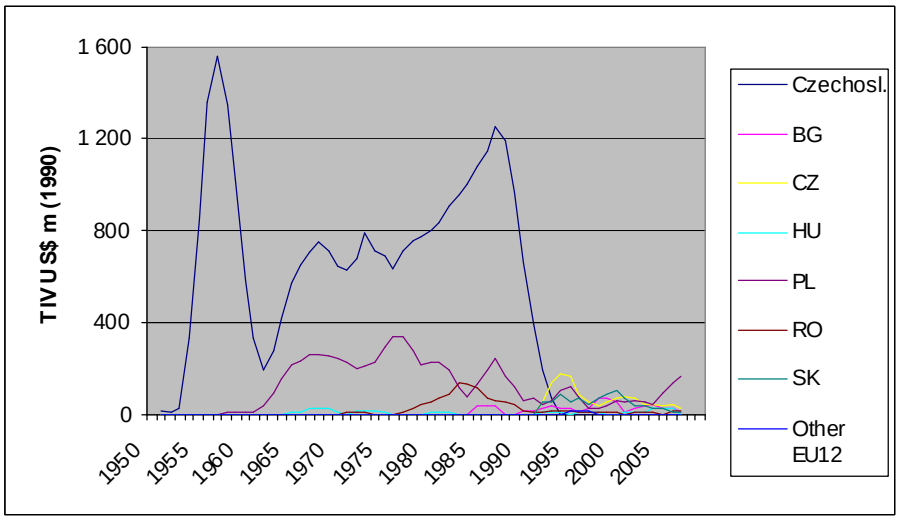
Table 1 and the number of organisations described above, also shows some of the consequences of the reformation process for the countries where the data was available. The regional DTIBS nearly collapsed over the last fifteen years in terms of number of companies and employees.

3.2 Markets and sales

In what follows EU12 exports and to some extent imports are analysed based on SIPRI data for major equipment transfers. The data used imply important limitations. The trade of small arms and light weapons (SALW) – with e.g. Bulgaria a successful exporter – is hardly captured, and the same is true of at least smaller subsystems (major subsystems like weapons, sensors, and engines are covered). SIPRI data are based on open sources with financial data estimated in a way intended to be consistent over time but not necessarily giving a correct picture of the actual contracts (Trade Indicator Value, TIV). With their limitations, the SIPRI data are the best available.

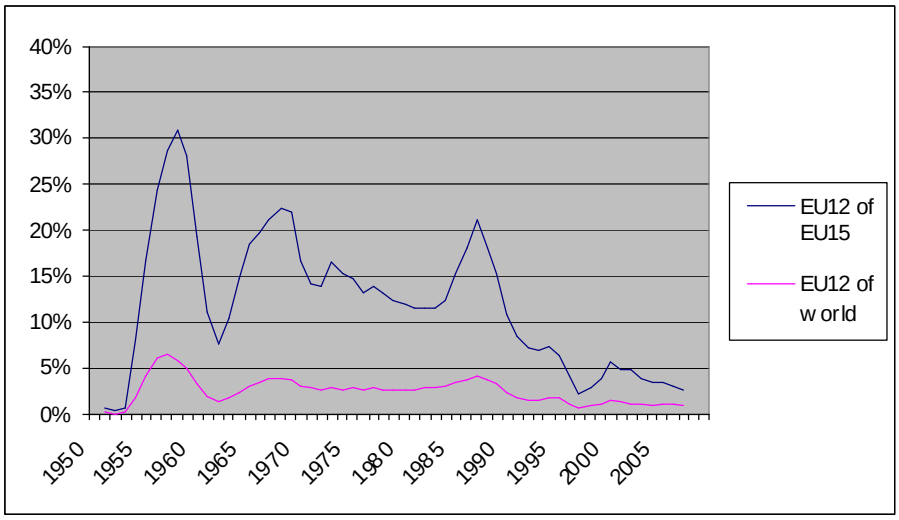
It is a very striking feature how the significance of what is now EU12 has dwindled since the cold war when in particular Czechoslovakia was a very significant arms exporter (Figures 3 and 4).

Figure 3: Major defence equipment export from EU12, 3-year moving averages with fixed prices.



Source: SIPRI

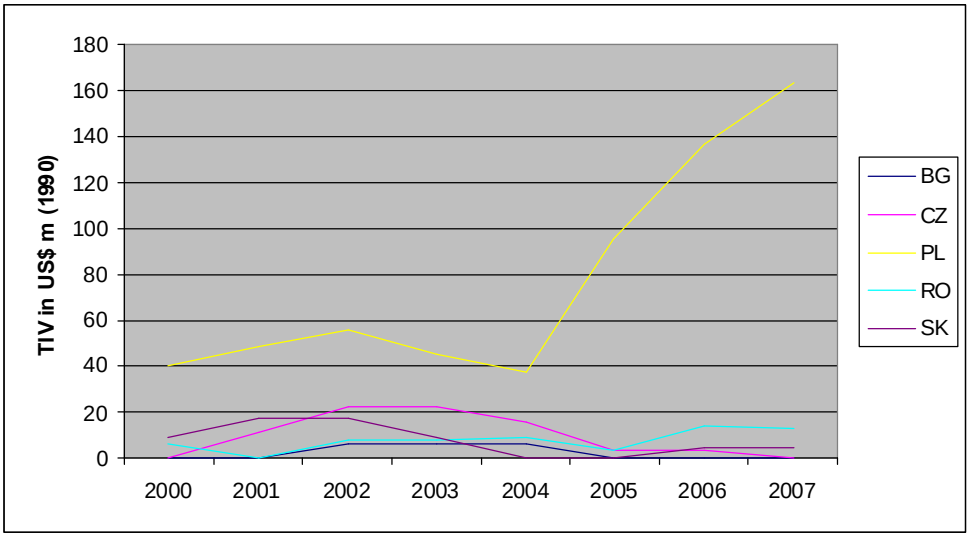
Figure 4: EU12 percentage of EU15 and world exports of major defence equipment.



Source: SIPRI

Another feature seemingly caused by the post-cold war period is that where previously Czechoslovakia and Poland were entirely dominant, the picture now seems more fragmented. Apart from the obvious fact that there are now two successor states of Czechoslovakia this is, however, largely spurious. SIPRI covers also sales of surplus equipment, and this has been a significant part of the EU12 post-cold war arms exports. Therefore, to give a picture of greater relevance for assessing competitiveness, in Figure 5 we provide estimated data restricted to exports of "fresh" equipment only[12].

Figure 5: "Fresh" (non-surplus) defence equipment export for EU12, 3-year moving averages with fixed prices.



Source: estimated from SIPRI data

[12] Surplus equipment accounted for as much as 69 percent of EU12's SIPRI TIV value for 1999-2003. For 2004-2008 the figure went down to 42 percent as a natural consequence of excess cold war equipment either already being sold or becoming obsolete.

The “fresh” exports data very strongly indicate the pre-eminent position of Poland among EU12. Romania has maintained a low but relatively stable position whereas the Czech Republic and Slovakia seem almost annihilated as major equipment exporters.

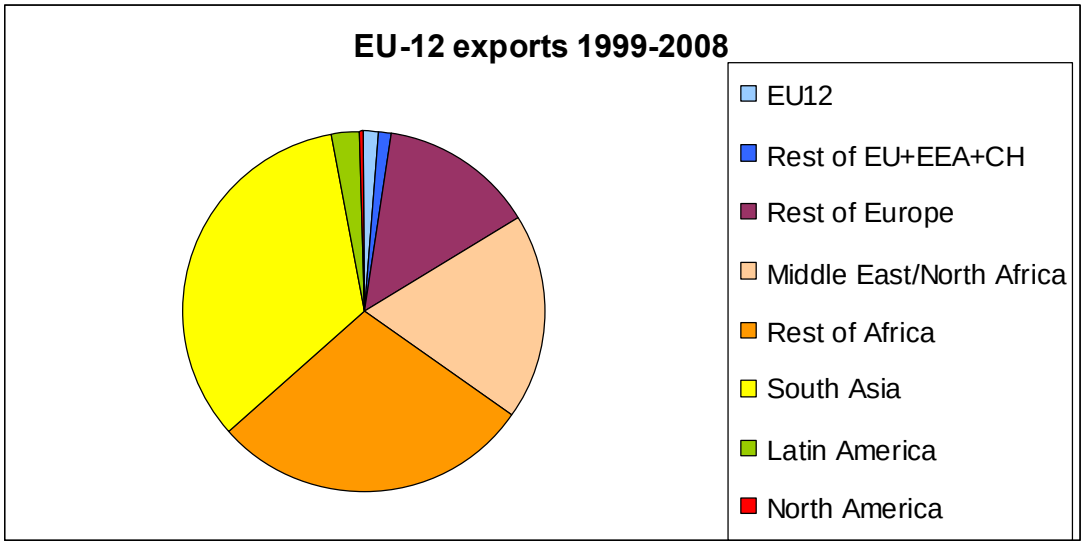
Whereas Poland has a broad scope of systems although entirely dominated by land (air represented by light transport and ships by landing crafts), the Czech Republic is specialised in air (trainers), and Slovakia in land systems. Despite the limited size of its exports also Romania has sold both air (helicopters), land and sea systems.

Poland’s increasing export is striking – comparing 2004-2008 to 1999-2003 the rise was as high as 147 percent. During the same period EU15 exports grew at 54 percent, global at 17 percent. The other four “fresh” major systems exporters all saw reduced exports, although in Romania’s case only by 2 percent. *In toto* EU12 increased their exports of “fresh” major systems by 50 percent, but again the growth was entirely a Polish phenomenon.

Comparing 1999-2003 vs. 2004-08 total world trade in major defence equipment has shifted somewhat away from air systems. In view of this the decreasing market share of land system specialist Slovakia may seem problematic. In contrast Czech competitiveness in their air niche – albeit small – is somewhat reconfirmed by a 2008 contract with Bolivia. On the other hand, BMI depicts Slovakia as still having a relatively strong defence industry although specialising in non-major deliveries like ammunition and spare parts and upgrade packages[13]. Another EU12 country with significant export not of major equipment but SALW and electronics is Bulgaria.

Another important indicator of competitiveness is the destination of exports. Figure 6 gives this information for EU12[14], while Figure 7 presents the global imports as a comparison.

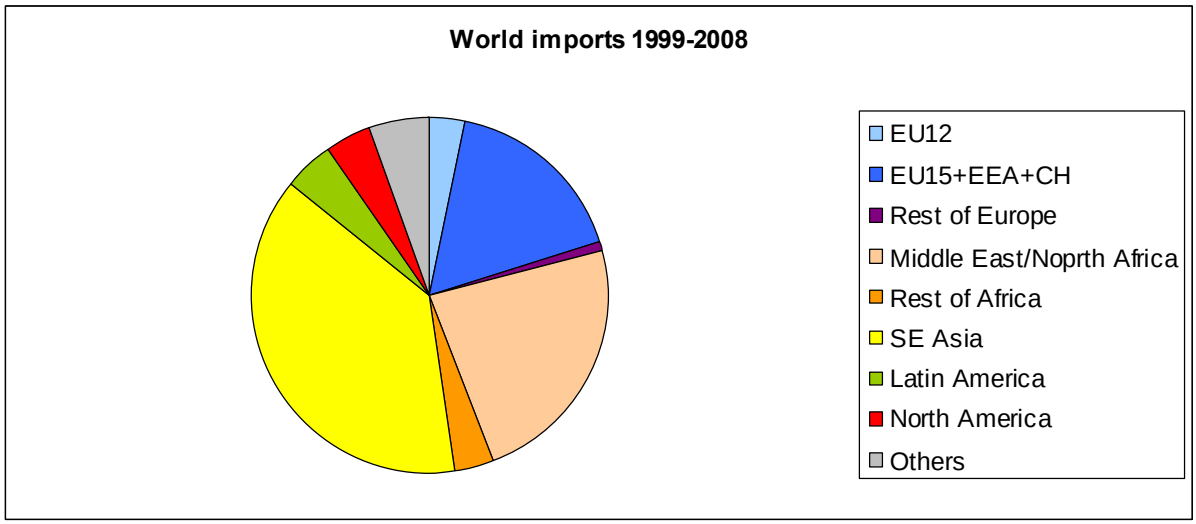
Figure 6: Major defence equipment export from EU12 by region.



Source: SIPRI

[13] By this token also surplus sales may have some relevance for competitiveness. However, e.g. Czech surplus equipment upgraded in Slovakia counts as Czech exports in the SIPRI data.
[14] Both surplus and ”fresh” equipment. There is nothing in the data to suggest any significant difference with regard to destination between these categories.

Figure 7: Major defence equipment import by region



Source: SIPRI

The most striking feature – also in relation to world imports – is the small size of Western Europe and North America as customers – as well as the limited size of EU12 itself as a customer. The markets where EU12 has a particularly strong position are "Rest of Europe" (RoEurope) and "Rest of Africa" (RoAfrica which is Eastern Europe and Africa south of Sahara)[15].

Although not a certain proof, together with other information this strongly suggests that EU12 do hardly play any major part in EU15 supply chains. This might be an indicator of inadequate quality or relatively low technological level of the equipment that EU12 develops, but it may also be a consequence of some other factors, such as the lack of a proper mutual knowledge of the defence supply-chains or the possibility that the technological needs of WE companies are higher than those of non WE markets. Another conclusion might be that quality and technological level of EU12 equipment fits with the requirements of the customers they have. The markets in South Asia, Middle East and, in particular, Africa in general show a demand for technologically less advanced arms, where the focus is more on reliability and robustness over time and in different climates. Furthermore, technological sophisticated equipment requires staff that is able to use and maintain that equipment. In a number of countries, the staff issue is a serious problem (also for WE exporters). The responses from the interviews with employees of the Western European primes indicate that indeed there is little knowledge about the capabilities of EU12 and few resources are allocated to do continuous market analysis of potential suppliers. However, due to the limited knowledge and information that western European primes have about the EU12 suppliers, it is hard to draw conclusions about the quality and fit of western European primes and potential the EU12 suppliers.

Summing up, available data suggest that there is little connection with the EU15 DTIB's as well as low intra-EU12 trade. Poland dominates the field and is a fast-growing exporter. But even for Poland a number of caveats should be kept in mind:

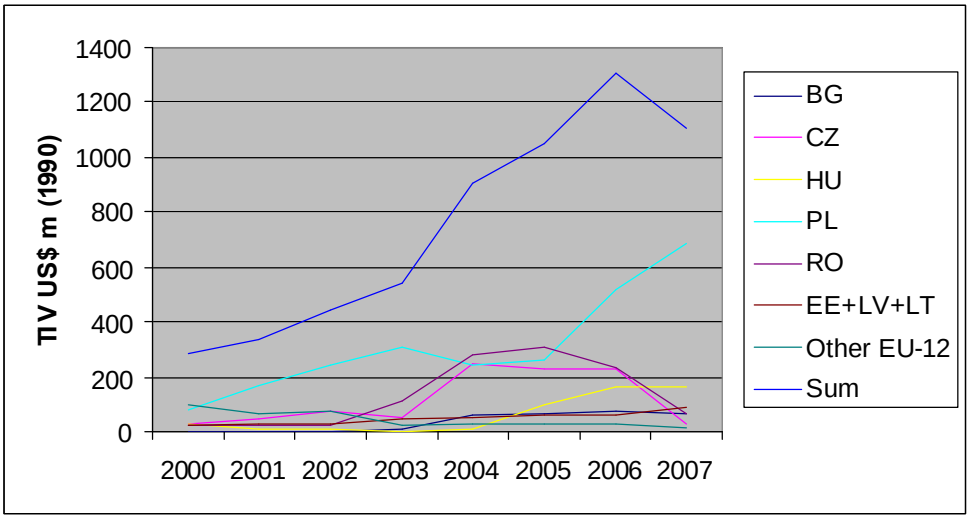
- Polish imports were more than four times as high as exports 2004-08 (480 vs. 110 TIV units).
- LOI-6, the Netherlands, Belgium, and Switzerland all had more defence exports than Poland 2004-08.
- Polish exports do not go to the most advanced industrialised countries.

[15] For EU12 the Rest of Europe and Rest of Africa markets are 13 and 8 times their share of the global market, the biggest import markets MENA and Southern and Eastern Asia have just under their global share (0.8 and 0.9 times), Latin America and EU12 itself lie at 0.4, EU15 etc and North America lie below 0.1, whereas no export to Others (Australia, New Zealand, international organisations, and unknown recipients) was recorded from EU12.

3.3 Import as a basis for cooperation

As can be seen from Figure 8, increased defence equipment imports are a very striking feature of EU12 during the past 10 years. For the whole group the increase is just under 200 percent from 1999-2003 to 2004-08. As a comparison the EU12 defence expenditure grew by 18 percent in fixed prices between 1998-2003 and 2004-2007[16]. Most countries had higher import growth than 150 percent when comparing 1990-2003 with 2004-08, but with Cyprus, Slovenia, and Slovakia displaying decrease according to the SIPRI data. Of course major deals create "humps" as can be seen for the Czech Republic and Hungary (fighter aircraft) and Romania (frigates). The combined effect of the Czech and Romanian "humps" actually causes a downturn in the overall EU12 figure from 2006 to 2007.

Figure 8: Major defence equipment import to EU12, 3-year moving averages with fixed prices.

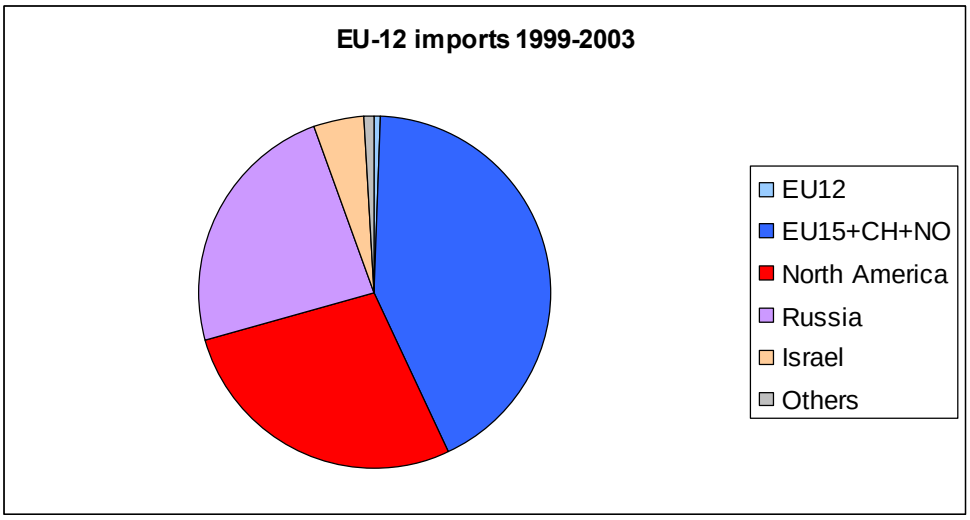


Source: SIPRI

It is also of great relevance from where the imports come. Figures 8 and 9 answer this for the periods 1999-2003 and 2004-08 respectively.

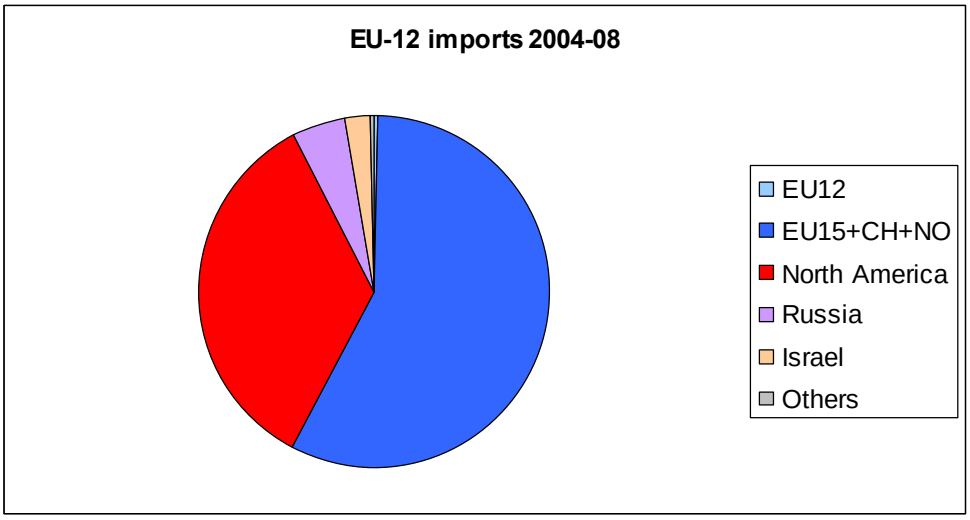
[16] SIPRI data. Different periods of comparison due to unavailability of expenditure data for 2008.

Figure 9: Major defence equipment import to EU12.



Source: SIPRI

Figure 10: Major defence equipment import to EU12.



Source: SIPRI

Western Europe is clearly the biggest provider, in the later period representing as much as 57 percent. Also North America increased its share of an increasing market to 35 percent. Russia's going from a quarter to five percent meant a decline also in TIV terms, whereas Israel scored an absolute increase but a decline in relative terms.

Could the increasing the EU12 imports be expected to create increased integration for EU12 in the European defence equipment market and DTIB? For the period 2004-08 EU12 actually account for as much as ca 27 percent of EU major defence equipment imports This is a significant figure, but it is worth mentioning that it is only slightly higher than that for the single biggest importer in EU, viz. Greece (24 percent 2004-08 – and as much as 28 percent 1999-2003).

The SIPRI data give indications of cooperation in particular in the form of "licensed production". This is more or less the same as extensive direct military offset, i.e. offsets going into the specific system

being acquired. Arguably in line with our findings above on export competitiveness, Poland is found to have by far the largest number and largest financial turnover for such deals:

- APC's from Finland with turrets from Italy
- Frigates from Germany
- Transport aircraft from Spain and Russia
- Turrets for self-propelled artillery from UK
- Coastal defence systems from Norway
- Anti-tank missiles from Israel
- F-16 fighters from US.

This lists of programmes also suggests that Poland is striving for a for a relatively "complete" domestic DTIB. Taking an EDTIB perspective, the natural situation would be to have specialisation patterns such that even the biggest countries were to import certain types of equipment. Such a strategy would be indicated by indirect military offsets rather than the direct ones seen in these cases, i.e. firms in the offset receiving country sell military systems and sub-systems with no technological link to the imported system. It should be mentioned here that the Polish F-16 case of "licensed production" does not include the traditional final assembly. This can be seen as an important step towards an international pattern of mutual specialisation more in line with the EDTIB vision.

The other cases of "licensed production" according to SIPRI are quite modest in size:

- Romania producing on license French SA-330 Puma helicopters (also a main Romanian defence equipment export), Israeli IFV turrets, and UK turbojet engines
- Slovenia producing on license Finnish and Austrian APCs.

Also the EDA Defence Data can shed some light on cooperation as was discussed in Chapter IV. Generally these data indicate very low levels of collaboration for the EU12 countries even though R&T collaboration is increasing.

In sum the data on import and cooperation give further support to the pre-eminence of Poland among EU12.

3.4 Current capabilities

In the previous section we discussed the size of the defence-related industry base of the seven EU12 countries. At least as important are the capabilities of that base. However, no direct data is available. As discussed in the introduction, we have looked at the activities of two groups of companies from the seven EU12 countries:

- lower tier suppliers (more at the level of components and sub- sub-systems), from the questionnaire, and
- a group at a higher tier level, from the desk research.

From that desk research[17] we identified the most important defence companies in the 7 most relevant EU12 countries: Poland, Czech Republic, Romania, Bulgaria, Slovakia, Hungary and Slovenia.

[17] *Defence and Security Reports*, Business Monitor International Ltd, 2008

Using that data, these firms have been profiled according to the EDA Technology Taxonomy. The profiles are presented in table 2. In the top row we added the number of employees, whenever available, in order to give an indication of the “weight” of the entry.

When looking at the description of these firms and looking at table 2 on the next page which shows the EDA Technologies that these firms are working on, it becomes clear that these companies manufacture end products, mainly weapons, military vehicles and small airplanes. In the previous section, it was clear from the export statistics that EU12 only sell very limitedly defence end-products to EU15. The best opportunities for these companies are in supplying Western European primes.

Table 2: Capabilities

	Bulgaria		Czech Republic	Hungary		Poland				Romania					Slovakia			Slovenia			
EDA Taxonomy	Arsenal	Arcus	Aero Vodochody	Danubian Aircraft Co.	FÉG-Army Arms Manufacturing Ltd	PHZ Bumar	HSW	WSK PZL Mielec	WSK PZL Rzeszow	IAR S.A Brasov	Aerostar	MFA Mizil	Romaero	EADS/Eurocopter Romania	Konstrukta Defence	ZVS Holding	ZTS Špeciál	Sistemska Tehnika	Fotona Defence	Tovarna Vozil Maribor (TVM)	Skupina KIK Kamnik
Number of FTE	4000	2920	1650	400	N.A.	N.A.	1169	1500	4500	1200	1138	N.A.	1370	91	N.A.	385	337	300	N.A.	200	N.A.
A01 Structural & Smart Materials & Structural Mechanics				X	X			X	X			X					X	X			
A02 Signature Related Materials																					
A03 Electronic Materials Technology																			X		
A04 Photonic/Optical Materials & Device Technology																			X		
A05 Electronic, Electrical & Electromechanical Device Technology											X										
A06 Energetic Materials and Plasma Technology																					
A07 Chemical, Biological & Medical Materials																					
A08 Computing Technologies & Mathematical Techniques																					
A09 Information and Signal Processing Technology																					
A10 Human Sciences																					
A11 Operating Environment Technology																					
A12 Mechanical, Thermal & Fluid-Related Technologies & Devices																					
B01 Lethality & Platform Protection																					
B02 Propulsion and Powerplants									X												
B03 Design Technologies for Platforms and Weapons					X																

	Bulgaria		Czech Republic	Hungary		Poland				Romania					Slovakia			Slovenia			
EDA Taxonomy	Arsenal	Arcus	Aero Vodochody	Danubian Aircraft Co.	FÉG-Army Arms Manufacturing Ltd	PHZ Bumar	HSW	WSK PZL Mielec	WSK PZL Rzeszow	IAR S.A Brasov	Aerostar	MFA Mizil	Romaero	EADS/Eurocopter Romania	Konstrukta Defence	ZVS Holding	ZTS Špeciál	Sistemska Tehnika	Fotona Defence	Tovarna Vozil Maribor (TVM)	Skupina KIK Kamnik
B04 Electronic Warfare and Directed Energy Technologies																					
B05 Signature Control and Signature Reduction																					
B06 Sensor Systems																					
B07 Guidance and Control systems for Weapons and Platforms																			X		
B08 Simulators, Trainers and Synthetic Environments																					
B09 Integrated Systems Technology											X	X	X	X				X			
B10 Communications and CIS-related Technologies																					
B11 Personnel Protection Systems																					
B12 Manufacturing Processes/Design Tools/									X												
C01 Defence Analysis																					X
C02 Integrated Platforms			X			X	X	X		X		X	X					X		X	
C03 Weapons	X	X			X	X	X								X	X					X
C04 Installations and Facilities																					
C05 Equipped Personnel															X						
C06 Miscellaneous Defence Functions and Policy Support																					
C07 Battlespace Information																					
C08 Business Process																					

The second group of companies we assessed were the respondents from the questionnaire. They reported which technologies from the EDA Technology Taxonomy were in their area of activity. Table 3 on the next page gives an overview of the results. Again, where available we added the number of employees.

From this table it becomes clear that the companies that filled in the questionnaire have different characteristics than the companies from the BMI reports. None of the companies mentioned in the BMI report responded to the questionnaire. This opens the opportunity to analyze companies within EU12 that are in a different part of the value chain (see figure 2). The companies that responded to the questionnaire rarely are dedicated defence companies, but more often they are not dedicated, and they supply only some technology, components or subsystems to other firms in the defence sector. While in the previous section the conclusion was that the companies in the defence industry in EU12 have different end markets and are focusing on a lower-end markets and offer little options for cooperation with prime companies in western Europe, the companies that responded to the questionnaire could be potential (or are actual) suppliers for western European firms in the defence sector. Unfortunately we cannot assess the quality of the products of these (potential) suppliers. The assessment that can be made is by identifying current cooperation between the EU12 suppliers and EU15 customers (primes or other suppliers further on the value chain) from the questionnaire and by the assessment made by the EU15 primes about their perception of the EU12 current and potential suppliers that was derived from the interviews.

I.

Table 3: Capabilities

EDA Taxonomy	Bulgaria												Lithuania				Poland	Romania			Slovenia
	Telesys COD	Aviotechnica	OpticoElectron group JSC	Samel-90 PLC	Simsoftware Ltd	Bulgarian Industrial Group AD	Industrial Holding Bulgaria	Mussala	Optix	Terem Khan Krum EOOD	Terem Ovech	Bulgarian Ship Hydrodynamics Centre	EKSPLA	Elsis	Detonas	Lithuanian Textile Institute	Enamor	Elettra Communications	Sycom 18 SRL	S.C. IOR	Trival Antene
Number of FTE	8	30	21	400	10	86	3100		345	86	74	79	107	190	126	1354	64	70	132	435	10
A01 Structural & Smart Materials & Structural Mechanics				X																	
A02 Signature Related Materials																					
A03 Electronic Materials Technology																					
A04 Photonic/Optical Materials & Device Technology				X									X								
A05 Electronic, Electrical & Electromechanical Device Technology							X	X												X	
A06 Energetic Materials and Plasma Technology																					
A07 Chemical, Biological & Medical Materials																					
A08 Computing Technologies & Mathematical Techniques					X							X		X							
A09 Information and Signal Processing Technology																					
A10 Human Sciences																					
A11 Operating Environment Technology												X									
A12 Mechanical, Thermal & Fluid-Related Technologies & Devices						X			X			X									
B01 Lethality & Platform Protection										X											
B02 Propulsion and Powerplants																					

EDA Taxonomy	Bulgaria												Lithuania				Poland	Romania			Slovenia
	Telesys OOD	Aviotechnica	OpticoElectron group JSC	Samel-90 PLC	Simsoftware Ltd	Bulgarian Industrial Group AD	Industrial Holding Bulgaria	Mussala	Optix	Terem Khran Kum EOOD	Terem Ovech	Bulgarian Ship Hydrodynamics Centre	EKSPLA	Elsis	Detonas	Lithuanian Textile Institute	Enamor	Elettra Communications	Sysoom 18 SRL	S.C. IOR	Trival Antene
B03 Design Technologies for Platforms and Weapons			X																		
B04 Electronic Warfare and Directed Energy Technologies						X			X												
B05 Signature Control and Signature Reduction																					
B06 Sensor Systems	X																		X	X	
B07 Guidance and Control systems for Weapons and Platforms																					
B08 Simulators, Trainers and Synthetic Environments												X									
B09 Integrated Systems Technology														X			X	X			
B10 Communications and CIS-related Technologies	X																	X			X
B11 Personnel Protection Systems															X	X					
B12 Manufacturing Processes/Design Tools/																					
C01 Defence Analysis																					
C02 Integrated Platforms		X				X			X												
C03 Weapons																					
C04 Installations and Facilities																					
C05 Equipped Personnel																					
C06 Miscellaneous Defence Functions and Policy Support																					

EDA Taxonomy	Bulgaria												Lithuania				Poland	Romania			Slovenia
	Telesys OOD	Aviotechnica	OpticoElectron group JSC	Samel-90 PLC	Simsoftware Ltd	Bulgarian Industrial Group AD	Industrial Holding Bulgaria	Mussala	Optix	Terem Khran Kʻum EOOD	Teem Ovech	Bulgarian Ship Hydrodynamics Centre	EKSPLA	Elsis	Detonas	Lithuanian Textile Institute	Enamor	Elettra Communications	Sysoom 18 SRL	S.C. IOR	Trivial Antene
C07 Battlespace Information				X										X							
C08 Business Process																					

4. Future demand

In order to asses whether the EU12 DTIBS are competitive we need to know the degree to which their capabilities match future demand. In order to assess future demand we looked at the "innovation themes" the Western primes are working on (i.e. Defence Innovation Strategy, 2006). These are:

- Soldier modernization
- Armoured fighting vehicles
- High performance airplanes
- High performance, special purpose ships
- Unmanned platforms and robotics
- Precision weapons
- Beyond visual range weapons
- Nuclear, Biological and Chemical defence
- Non lethal weapons
- Directed Energy Weapons
- E-learning and simulations
- Military information expert systems
- Information operations
- Intelligent Logistics
- Life-cycle management
- Ammunition Management
- Shared situational awareness

Then we compared these innovation themes to the EDA Technology themes asking a question: which EDA technologies are necessary for the development of those innovation themes.

This assessment is presented in table 4.

Table 4: Future demand WE

	Soldier modernisation	Armoured fighting vehicles	High-performance aircraft	High-performance special-purpose ships	Unmanned platforms & robotics	Precision weapons	Beyond Visual Range weapons	NBC defence	Non-lethal weapons	Directed energy weapons	E-learning and simulations	Military information expert systems	Information opeations	Intelligent logistics	Life cycle management	Munition management	Shared situational awareness
A01 Structural & Smart Materials & Structural Mechanics	X	X	X	X	X	X	X										
A02 Signature Related Materials	X	X	X	X	X												
A03 Electronic Materials Technology										X							
A04 Photonic/Optical Materials & Device Technology	X	X	X	X	X	X	X			X							
A05 Electronic, Electrical & Electromechanical Device Technology	X	X	X	X	X	X	X			X							
A06 Energetic Materials and Plasma Technology						X	X										X
A07 Chemical, Biological & Medical Materials	X	X		X				X									
A08 Computing Technologies & Mathematical Techniques					X								X				
A09 Information and Signal Processing Technology	X	X	X	X	X	X	X										X
A10 Human Sciences	X										X	X	X				X
A11 Operating Environment Technology						X	X			X							
A12 Mechanical, Thermal & Fluid-Related Technologies & Devices		X	X	X	X	X	X		X	X							
B01 Lethality & Platform Protection	X	X	X	X	X	X	X		X	X							
B02 Propulsion and Powerplants		X	X	X	X	X	X										
B03 Design Technologies for Platforms and Weapons	X	X	X	X	X	X	X		X	X							
B04 Electronic Warfare and Directed Energy Technologies										X			X				
B05 Signature Control and Signature Reduction	X	X	X	X	X												
B06 Sensor Systems	X	X	X	X	X	X	X										

	Soldier modernisation	Armoured fighting vehicles	High-performance aircraft	High-performance special-purpose ships	Unmanned platforms & robotics	Precision weapons	Beyond Visual Range weapons	NBC defence	Non-lethal weapons	Directed energy weapons	E-learning and simulations	Military information expert systems	Information operations	Intelligent logistics	Life cycle management	Munition management	Shared situational awareness
B07 Guidance and Control systems for Weapons and Platforms		X	X	X	X	X	X			X							
B08 Simulators, Trainers and Synthetic Environments											X	X					
B09 Integrated Systems Technology	X	X	X	X	X	X	X	X	X	X				X	X		
B10 Communications and CIS-related Technologies	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
B11 Personnel Protection Systems	X	X	X	X				X									
B12 Manufacturing Processes/Design Tools/	X	X	X	X	X	X	X	X	X	X					X		
C01 Defence Analysis																	
C02 Integrated Platforms	X	X	X	X	X						X	X		X	X	X	
C03 Weapons	X	X	X	X	X	X	X		X	X							
C04 Installations and Facilities																	
C05 Equipped Personnel	X										X						
C06 Miscellaneous Defence Functions and Policy Support														X	X	X	
C07 Battlespace Information	X	X	X	X								X	X				X
C08 Business Process														X	X	X	

In table 5 below we narrowed it down to the primes.

Table 5

	Soldier modernisation	Armoured fighting vehicles	High-performance aircraft	High-performance special-purpose ships	Unmanned platforms & robotics	Precision weapons	Beyond Visual Range weapons	NBC defence	Non-lethal weapons	Directed energy weapons	E-learning and simulations	Military information expert systems	Information operations	Intelligent logistics	Life cycle management	Ammunition management	Shared situational awareness
BAE Systems	X	XX	XX	XX	XX	X	X	X			X	X	X	X	X	XX	X
Thales	X		(X)	(X)	X	X	X	X		X	X	X	X	X			X
EADS			X		X							X	X	X			X
Finmeccanica	X	X	X		X	X	X					X	X	X			X

The primes are especially focussed on defence-related space and aerospace technologies (but also in civilian use) as well as related equipment like radars, electronics systems, avionics, communication and surveillance technologies as well as services. BAE Systems offers a wide product palette, including aerospace systems, land vehicles, ships, missile systems as well as electronics and services.

Thales focuses on electronics systems, radars, sensors and information technologies that can be used in a wide range of products.

EADS major activities lie in aircraft (incl. helicopters and unmanned drones) and space technology and related electronics.

Finmeccanica manufactures aerospace products and ground vehicles as well as related defence electronics and systems. Selex Communications, a Finmeccanica company develops technologies for the Italian “Future Soldier” project and therefore is also involved in innovative personnel equipment. Information about emerging developments like non-lethal weapons and directed energy weapons is not sufficiently available for all primes on public access basis.

The primes put very much effort in R&D activities and offer products as well as services and consultation. Their products are state-of-the-art and very likely represent the highest standards within their product classes. If a company is capable of producing state-of-the-art technologies, it is certainly also capable of producing lower-grade products if economically feasible, whereas it is more difficult to keep up with the demand of high standards if there exists a lack in required capabilities.

In order to be able to supply to the prime contractors also in the next decade, it is crucial for the potential suppliers to possess a capacity that enables the production of these product groups.

When the capabilities indicated in table 2 (firms from our desk research) are matched with table 4 (the future demand), one can make the following observations

- The best opportunities for these companies are in supplying western European primes (reference to BMI report of one of these countries).

- One opportunity for cooperation between companies in EU15 and companies in these 7 countries is in the field of A01 Structural & Smart Materials & Structural Mechanics. According to the BMI reports, many (7 out of 21) companies are active in this field, which according to table 4 enables the following innovation themes:
  - Soldier modernization
  - Armoured fighting vehicles
  - High-performance aircraft
  - High-performance special-purpose ships
  - Unmanned platforms & robotics
  - Precision weapons
  - Beyond Visual Range weapons
- Since each of the four primes (BAE, Thales, EADS and Finmeccanica) is active in at least one of these innovations (see table 5), this opens the possibility for these defence companies to supply to Western European Primes critical knowledge and components in the field of Structural & Smart Materials & Structural Mechanics.

When table 3 (firms from our questionnaire) is matched with table 4 (future demand), one can make the following observations:

- When taking into account the size of the firms, table 3 suggests that electronics and personnel protection systems are the largest specializations among the firms that responded to the questionnaire.
- The following innovation themes make use of these technologies:
  - Soldier modernization
  - Armoured fighting vehicles
  - High-performance aircraft
  - High-performance special-purpose ships
  - Unmanned platforms & robotics
  - Precision weapons
  - Beyond Visual Range weapons
  - Directed energy weapons
  - NBC defence

Besides these technologies it seems that the responding firms have a very diverse background and specialization, which could indicate that this is also the case for companies in EU12 in general.

In this assessment it is not possible to ascertain the quality of the technology that the EU12 companies produce, which is a decisive criterion to the primes for selecting suppliers (source: interviews). Also it is not possible to assess the maturity of the technology in the Technology Life Cycle: are the technologies that the EU12 suppliers are developing in the same stage of the Technology Life Cycle as the technologies that are demanded by western primes, or are these technologies in another stage of the Technology Life Cycle and do not match the demand from EU15. This cannot be concluded from the tables and requires further research.

5. Actors and factors driving and hindering innovation and competition in EU12

In the previous sections we made an assessment of the gap between the current situation of the DTIBS of the seven largest EU12 countries and future demand. As can be seen from that analysis, innovation is not a strong and unquestioned feature of the defence suppliers in these countries. Quite to the opposite, it seems these countries need to emphasize this aspect of their production and technology base if they want to be competitive on the European and world defence markets. In this section we look at factors and actors driving and hindering innovation

5.1 Actors driving innovation

Defence technology and the defence industry heavily rely on innovation and staying ahead in research and development to produce technologies and solutions that give an important and vital advantage over ones competitors. To achieve this objective, a number of cooperating key players is crucial. Academia and research organisations, which also include the R&D departments of firms and RTO's like FOI and TNO, play an initial role since they create the scientific foundations for innovation and technological advancement that can be realised by firms and the industry by turning knowledge into products. Intermediary organisations (e.g. TNO, FOI, industry organisations) serve as concept developers and advisors and mediate between (academic) R&D and the industry by helping in knowledge transfer. Governments serve as regulators and in case of defence also as major customers. Together these stakeholders form the innovation system of a country or a region. The quality and density of the relationships between these stakeholders determine to a large extent the performance of the innovation system. Therefore we will look somewhat further into this.

The role of Academic and Research Institutions

From the National Innovation Systems approach as described in the introduction, it is known that the role of Academia and research organisations is crucial in the innovation of a region and/or a sector. Here the foundations of science and knowledge are laid that can be taken up by the industry. Especially if the industrial players in the system do not invest enough R&D of their own, it is crucial that relevant knowledge and technology is developed elsewhere in the system and that the knowledge is sufficiently well transferred to the places where it is needed.
To get a better picture of the situation, a PWC Questionnaire was sent out to universities and research institutions in EU12. The purpose was to give insight in the extent to which the research of the academic institutions in the EU12 countries matches the areas the companies are innovating in. This could indicate the possible source of new knowledge and access to skilled and qualified personnel. Table 6 summarises the responses from academic institutions to the question about their research involvement in regard to a set of relevant technologies. From this data it can be concluded that with the exception of technologies for Installations and Facilities (C04), Equipped (C05) and Miscellaneous Defence Functions (C06) as well as Policy Support[18], at least on research institute has been identified being involved in the selected topics.

According to the questionnaire, the EU12 companies mostly focus on electronics and personnel protection systems. By taking the number of researchers as an indicator, the subjects mainly covered by academic research institutes are photonic/optical materials & device technology (A04), chemical, biological and medical materials (A04) and mechanical, thermal and fluid related technologies and devices (A12). According to the BMI reports and the questionnaires answered by the companies, only a limited number of companies directly apply these technologies. However the academic research areas are quite broad, so that they can actually contribute to the focus areas of the EU12 companies (electronics and personnel protection) and be of use for defence-related purposes in general.

[18] Although this might also be covered by non-technological research areas like social sciences

In this respect, it might not be a general mismatch between research focus and industry needs that poses problems, but rather a possible insufficient knowledge transfer or a maladjusted focus.

Table 6

EDA Taxonomy	Bulgaria										Lithuania								Poland				Romania	
	Bulgarian Academy of Sciences	Centre for National Security and Defense Research	Institute of Metal Science	Institute of Parallel Processing	Center Laboratory of Mechatronics and Instrumentation	Space Research Institutes	Technical University of Varna	Central Laboratory "Nato - Defense technologies"	University of National and World Economy	Faculty of Technical Sciences, University of Chumen	Institute of Defence Technologies of Kaunas Universityof Technology	System Analysis Department at Kaunas Universityof Technology	Ultrasound Institute of Kaunas University of Technology	Institute of Biochemistry	Institute of Materials Science and Applied Research	Kaunas University of Technology	Lithuanian Textile Institute	Semiconductor Physics Insitute	OBR CTM SA	Faculty of Electronics and Information Technology	Military Communication Institutes	Institute of Aviation	Military Technical Academy	SCSTRAERO SA
Number of FTE	3000	8	155	10-lip	61	50	400	24	10	31	12	5	16	100	100	2920	108	250	215	300	223	498	450	28
A01 Structural & Smart Materials & Structural Mechanics			X					X					X		X	X						X		X
A02 Signature Related Materials																X								X
A03 Electronic Materials Technology															X	X		X		X				
A04 Photonic/Optical Materials & Device Technology	X										X				X			X		X				
A05 Electronic, Electrical & Electromechanical Device Technology					X											X		X						
A06 Energetic Materials and Plasma Technology																		X						
A07 Chemical, Biological & Medical Materials	X													X	X	X								
A08 Computing Technologies & Mathematical Techniques			X							X									X	X	X			

EDA Taxonomy	Bulgaria										Lithuania							Poland				Romania	
	Bulgarian Academy of Sciences	Centre for National Security and Defense Research	Institute of Metal Science	Institute of Parallel Processing	Center Laboratory of Mechatronics and Instrumentation	Space Research Institutes	Technical University of Varna	Central Laboratory "Nato - Defense technologies"	University of National and World Economy	Faculty of Technical Sciences, University of Chumen	Institute of Defence Technologies of Kaunas University of Technology	System Analysis Department at Kaunas University of Technology	Ultrasound Institute of Kaunas University of Technology	Institute of Biochemistry	Institute of Materials Science and Applied Research	Kaunas University of Technology	Lithuanian Textile Institute	Semiconductor Physics Institute	OBR CTM SA	Faculty of Electronics and Information Technology	Military Communication Institutes	Institute of Aviation	Military Technical Academy	SC ST RAERO SA
A09 Information and Signal Processing Technology										X						X			X	X	X			
A10 Human Sciences									X		X													X
A11 Operating Environment Technology							X																	
A12 Mechanical, Thermal & Fluid-Related Technologies & Devices	X				X																			X
B01 Lethality & Platform Protection			X					X										X						
B02 Propulsion and Powerplants																						X		
B03 Design Technologies for Platforms and Weapons																						X		X
B04 Electronic Warfare and Directed Energy Technologies																		X			X			
B05 Signature Control and Signature Reduction																			X					

EDA Taxonomy	Bulgaria										Lithuania								Poland				Romania	
	Bulgarian Academy of Sciences	Centre for National Security and Defense Research	Institute of Metal Science	Institute of Parallel Processing	Center Laboratory of Mechatronics and Instrumentation	Space Research Institutes	Technical University of Varna	Central Laboratory "Nato - Defense technologies"	University of National and World Economy	Faculty of Technical Sciences, University of Chumen	Institute of Defence Technologies of Kaunas University of Technology	System Analysis Department at Kaunas University of Technology	Ultrasound Institute of Kaunas University of Technology	Institute of Biochemistry	Institute of Materials Science and Applied Research	Kaunas University of Technology	Lithuanian Textile Institute	Semiconductor Physics Institute	OBR CTM SA	Faculty of Electronics and Information Technology	Military Communication Institutes	Institute of Aviation	Military Technical Academy	SC ST RAERO SA
B06 Sensor Systems			X		X		X							X				X	X					
B07 Guidance and Control systems for Weapons and Platforms																			X					X
B08 Simulators, Trainers and Synthetic Environments		X			X														X					X
B09 Integrated Systems Technology					X	X	X				X					X		X	X		X	X		
B10 Communications and CIS-related Technologies						X													X		X			
B11 Personnel Protection Systems												X					X							
B12 Manufacturing Processes/Design Tools/								X											X					
C01 Defence Analysis		X							X										X					
C02 Integrated Platforms						X													X					
C03 Weapons											X								X					

EDA Taxonomy	Bulgaria										Lithuania								Poland				Romania	
	Bulgarian Academy of Sciences	Centre for National Security and Defense Research	Institute of Metal Science	Institute of Parallel Processing	Center Laboratory of Mechatronics and Instrumentation	Space Research Institutes	Technical University of Varna	Central Laboratory "Nato - Defense technologies"	University of National and World Economy	Faculty of Technical Sciences, University of Chumen	Institute of Defence Technologies of Kaunas University of Technology	System Analysis Department at Kaunas University of Technology	Ultrasound Institute of Kaunas University of Technology	Institute of Biochemistry	Institute of Materials Science and Applied Research	Kaunas University of Technology	Lithuanian Textile Institute	Semiconductor Physics Institute	OBR CTM SA	Faculty of Electronics and Information Technology	Military Communication Institutes	Institute of Aviation	Military Technical Academy	SC STRAERO SA
C04 Installations and Facilities																								
C05 Equipped Personnel																								
C06 Miscellaneous Defence Functions and Policy Support																								
C07 Battlespace Information																			X		X			
C08 Business Process									X															

With regard to the academic and research institutions some other observations have been made on the basis of the surveys and desk research, from which some issues, however, are of rather general nature and not necessarily only limited to the EU12 countries.

The survey responses from the governments as well as country reports (from Proinno-europa.eu) mention the lack of appropriate human resources for R&D and a too small number of S&T graduates and employees that are capable of conducting the necessary research as a major problem for the EU12 countries. This observation is also backed by the European Commission report "Progress towards the Lisbon Objectives in Education and Training" (EC 2008) where in regard to Math, Science and Technology (MST) graduates all CEE states with the exception of Poland and Lithuania were still below the EU (Lisbon) benchmark during 2000 and 2006. All countries were however catching up and the picture for MST graduates looks quite positive in comparison to other indicators like reading performance or Life Long Learning[19]. According to the results of the project for DG EMPLOYMENT, conducted by TNO in 2008-2009, the lack of sufficiently skilled workers has been mentioned throughout different industrial sectors and within many EU15 and EU12 counties.

The country reports (from Proinno-europa.eu) also note a lack of multidisciplinary skills in many EU12 countries which is regarded as a barrier to creativity and innovation, especially with respect to the shift towards disciplinary convergences in different science and technology areas.

Since the knowledge that is being generated within academia and research has to be disseminated to the industry, sufficient knowledge transfer and cooperation between these two systems is necessary. Insufficient cooperation between academia and research institutes has been the most frequently reported barrier to innovation in the EU12 countries. This problem could be explained by the structure of academia and science that has been inherited from the Soviet era which mainly focussed on fundamental research.

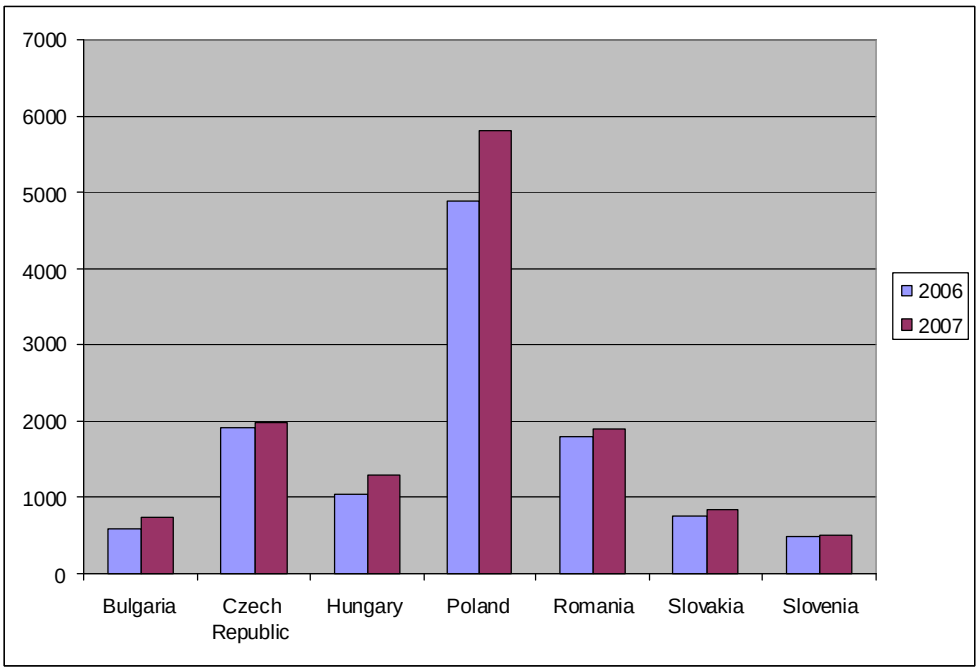
Role of national governments as a launching customer

Governments play a dual role in defence R&D and technology. They function as investor in academic R&D and are the major clients for defence-related products. Government expenditures on defence equipment are a main indicator for the prospects of defence industries.

The importance of this role depends on the size of the government expenditure in defence equipment. Figure 11 gives an indication of markets sizes of the 7 largest EU12 countries.

[19] *Defence and Security Reports*, Business Monitor International Ltd, 2008

Figure 11: Defence expenditure / market size in the 7 largest EU12 states



Source: EDA

In these major EU12 countries, the size of the government expenditure is relatively low and insufficient to sustain a viable and competitive defence industry because the size of the home market is too small. In the defence industry, the home market is of special relevance, since the respective home governments are the primary clients. A small home market size therefore indicates that quite probably the general market and with it the whole industry is small, which also hinders off-sets in the sense that these markets are not interesting enough to invest in (source: Interview BAe Systems, Thales).

Role of (inter)national governments as regulators / policy makers / industry owners

Recently the EU adopted the defence package with the goal of "setting up a 'genuine European defence market' for military equipment". This package also includes a directive on defence procurement to foster the competitiveness of the defence industry sector and to enhance openness and intra-European competition in the national defence market.

Also the use of article 296 that can be applied to limit open procurement of defence products for reasons of protecting security interests should be limited to cases with founded reasons.

EDA also plays a role in increasing innovativeness and competitiveness, e.g. by increasing market transparency via the EBB. Furthermore it issued a number of guidelines to improve competitiveness and innovativeness.

National governments also get the opportunity for improving their cooperation and to pool their resources, for example through the Visegrád Group (V4), and alliance of the CEE states; Czech Republic, Hungary, Poland and Slovakia with the objective to progressing their European integration.

According to the government and industry surveys, further major hindering factors for cooperation and innovation are to be found in strict regulations and bureaucratic structures as well as in a lack of clear national strategies and policies. In the EU12 countries there is often no clear national defence strategy, and the national policies are regarded as unclear in regard to e.g. strategy, planning and privatization. From the interviews it has been learned that on the other side some of

the strategies are also considered to be unrealistic and far too ambitious given the current situation.

Role of intermediaries

Another remark that has often been mentioned in the surveys is that EU12 are hardly recognised in the international arena and that clients do not want to invest much time in searching for new suppliers as long as their current practices and relations are working sufficiently well and are solidly established. Therefore there exists the necessity of intermediary organisations that improve the communication between CEE states and EU15 or support the EDA in this task.

5.2 Factors driving and hindering innovation and competition

NATO-interoperability

NATO interoperability becomes an important issue for EU12 because their equipment and forces have to become sufficiently interoperable with NATO requirements as soon as possible. This represents a driver for innovation, which, however, also requires investments and adjustments and poses many challenges. Poland, for instance, expects that 40% of their forces will be compatible with NATO requirements in 2010.

Off-sets

Off sets are compensations offered by a seller to a buyer. It is applied for so called off the shelf procurement, i.e. for already developed systems[20]. On the one hand offsets allow receiving countries to get access to new markets and knowledge. On the other hand, the are instruments distorting the development of a level playing field (as there are other distorting instruments as well). Off sets are a complex issue. In a perfect market and on a level playing field there would be no off sets However, today's defence market is not perfect. Therefore, as a first step, EDA wants to develop and implement measures to both mitigate any adverse effects of offset in the collective endeavour towards developing a fair and competitive EDEM and to use offsets mainly to help shape the aspired EDTIB of the future (EDA, 2009). Therefore on July 1st 2009, EDA's Code of Conduct on Off Sets was launched with 26 member states (except Romania) and Norway. The Offset CoC introduces three measures; 1. Increasing transparency (all subscribing Member States publish information on their national offset policies and practices, including national regulations and guidelines, offset requirements criteria and modalities on EDA's off set portal), 2. the Code provides for the evolving use of offsets to help develop industrial capabilities fully consistent with the objectives of the EDTIB Strategy (the code describes how off sets can be used to increase capabilities, competitiveness and competencies) and 3. the Code introduces a 100% cap on offsets.

With regard to EU12, the code will probably have impact on those countries that use off set policies. In Poland and Lithuania off sets are part of binding law in the form of acts of parliament, Latvia has a non binding law on the matter, Czech Republic decides on off sets on a case by case matter on the basis of ministerial directives. In the Czech Republic adherence to the offsets arrangements is a requirement of participation. In Hungary, Poland, Slovakia and Slovenia offsets are an award criterion taken into account as one aspect of the tender evaluation process. In Lithuania the winning bidder can be eliminated for the benefit of the runner-up if he or she does not accept the required offset arrangements.

[20] *Study on the effects of offsets on the Development of a European Defence Industry and Market*, Final Report, E. Anders Eriksson with contributions by Mattias Axelson, Keith Hartley, Mike Mason, Ann-Sofie Stenérus and Martin Trybus, FOI, SCS, 2007

The importance of offsets as one of many award criteria varies in those Member States where it is a criterion, ranging from 12.5 per cent in Portugal, to 15 per cent in Belgium, or 20 per cent in the Czech Republic. Arbitration clauses for offsets arrangements exist in Greece, Finland, the Czech Republic, Poland, Belgium, Sweden, Portugal, and Lithuania[21].

Through off-sets, EU12 can get access to higher level knowledge and markets. But off-sets are only profitable for EU12 countries if there is a sufficient symmetry. The interviews revealed, however, that WE companies find it hard to work with off-sets, partly because of the small size of the local market (5)[22]. And finally, research shows that it is difficult to build new competence centres without a pre-existing structure[23].

Privatization

Privatization of local companies and foreign investments (FDI) helps in integrating more advanced technology to EU12 (e.g. Thales Bulgaria), thus making them more innovative and competitive. However, the Level Playing Field study noted that many the EU12 defence institutes are still government owned, merely due to a lack of private parties willing to invest or take them over.

Anti competitive behaviour, e.g. dumping.

Defence companies sometimes sell products at different prices if bidding nationally or trying to sell in other CEE states, which will hinder competition.

Environmental issues

Stricter environmental regulations at EU level aim at the "… increase of investments in all kinds of means to curtail pollution and emissions of noxious fumes to the atmosphere, sewage and other types of dangerous refuse as well as to lower the energy consumption[24]. This might be relevant for highly pollutant companies like manufacturers of gunpowder, explosives and propellants. The growing concern over environmental issues may also call for new and innovative military products like lower emission vehicles and aircrafts or improvements in ammunition and ammunition management.

R&D intensity and innovation funding

Major issues of concern for the EU12 countries are the relatively low business R&D, the lack of financing for innovation as well as the need for better exploitation of R&D (2, 4). When limited R&D is conducted in business, this is a large barrier for innovation by firms.

In general, only 14 % of the R&T budget in Europe is spent on collaborative projects, which often results in duplications, less advanced technologies and hinders improvements in efficiency of companies. Collaboration and networking is an important source for acquiring new ideas and for the exchange of knowledge and experience. The limited amount of R&T conducted in collaborative projects limits this access to new knowledge and will more likely result in the duplication of research efforts.

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[21] *Ibid.*
[22] This and following data in brackets refer to results of interviews conducted with the WE primes.
[23] *Study on the effects of offsets on the Development of a European Defence Industry and Market*, Final Report, E. Anders Eriksson with contributions by Mattias Axelson, Keith Hartley, Mike Mason, Ann-Sofie Stenérus and Martin Trybus, FOI, SCS, 2007
[24] *Level playing field for European Defence industries: the role of ownership and public aid practices*, Ingeniera de systemas para la Defensa de Espana & Fraunhofer Institut, 2009

In order to improve this situation, EDA launched the R&T Joint Investment Program (JIP) scheme in 2006. The first JIP was on Force Protection. Recently this JIP had its fourth call. In 2008 a second JIP was announced on Emerging Technologies[25]. In the future there could be even more JIP's, running parallel. This party depends on the Member States. A JIP is a voluntary program where so called contributing members states (cMS) cooperate on R&D in the first Technology Readiness Levels of innovation (up to TRL 4 / 5). These are the pre-competitive phases of innovation. In the JIP Force Protection 20 cMS[26] collaborate and together funded approx. € 55 million. In the JIP on emerging technologies less cMS (11[27]) collaborate and funding is at approx. €17 million.

One of the most important characteristics of the JIP program, and a contrast to other (previous) programs, is the fact that cMS contribute to a common budget for R&D funding without knowing in advance where those funds will be allocated (and if they will get back what they invest. This uncertainty is one of the reasons the UK is currently not involved).

Besides having a joint fund which also gives smaller countries the opportunity to participate in relatively larger R&D programs, the JIP scheme also fosters European co-operation because every proposal has to be submitted by a consortium of at least two different participating member states while a wide integration of SMEs, research institutes and universities in the proposal is favored. In this way innovation networks are stimulated and developed. As can be observed from the proposals and experiences in the field, certain specialization seems to be taking place on certain topics. On these topics there will be leaders and followers because success breeds success, thus possibly standing at the basis of networks of excellence.

Around 300 European defence companies, research institutes and universities have been invited to submit proposals in the first JIP[28]. Proposals are selected based on the requirements (at least one other cMS, participation of SME's, academia, RTO's, etc.) but also on the basis of the size of the contribution the particular cMS made to the JIP (a cMS funding more than another cMS will also have more proposals granted).

With regard to EU12, the following observations can be made. The 20 cMS forming the JIP on Force Protection, include 6 of the EU12 countries with Poland funding 18% of JIP FP budget. This means that they are only second to France and equal to Germany in terms of contribution. It also means Poland is very active in this scheme, because of the allocation mechanism. Currently, EDA let it be known that collaboration with a cMS from CEE would increase the chances of success of a proposal. This makes the JIP scheme even more interesting for CEE cMS. However, from publicly available information the degree of actual participation of EU12 countries in granted proposals cannot be assessed not the development therein.

Still, as far as we know now, the JIP's seem to be an effective way of stimulating innovation, also with regard to the integration of innovation in EDTIB. The reasons for the JIP on emerging technologies being smaller than the JIP FP are yet unknown.

The growing blur between defence and security could generally improve the level of co-operation between different EU countries, because security is a broader topic, more civilian oriented and less critical (in relation to security of supply, security of information issues) than pure defence technology. Within FP7, Security (research theme 10) has a budget of €1350 million (2007-2013). This theme is very broadly defined and includes many civilian applications like protection against crime and terrorism, general surveillance, safety and security technologies, security of infrastructure, environmental protection, rescue and humanitarian tasks as well as security research into for instance disruptive technologies. In this context EU12 and EU15 firms could meet and get to know each other (and each others capabilities). However the participation rate of the EU12 countries in FP7 projects is still below that of EU15, although there are differences

[25] "Emerging technologies which might have a disruptive effect on the battlefield"
[26] Austria, Belgium, Cyprus, Czech Republic, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, the Netherlands, Norway, Poland, Portugal , Slovakia, Slovenia, Spain and Sweden
[27] Cyprus, France, Germany, Greece, Hungary, Italy, Norway, Poland, Slovakia, Slovenia and Spain. From EU12 it is Hungary, Poland, Slovakia and Slovenia. This time Estonia is not contributing.
[28] http://www.eda.europa.eu/newsitem.aspx?id=218

within the EU12 country group, e.g. due to different R&D landscapes, country size and financial situation. This could also serve as an indicator for the general R&D competitiveness of EU12 countries.

In general, the possibilities of joint European research on defence-related technologies and innovations are growing, but also here EU12 countries are still lagging behind in regard to participation. This also has partly to do with structural conditions (e.g. internal R&D infrastructure) of EU12 that influence their competitiveness in (defence related) R&D activities. Therefore it is important to strengthen their capabilities to provide them with equal opportunities to compete in joint R&D projects. If this is achieved, their commercial and industrial competitiveness is also likely to grow. Otherwise, competition will simply be shifted to the R&D arena.

Entry barriers

There are general, maybe system-inherent, barriers for newcomers and foreign companies to enter the well established defence market. This seems to apply especially for the relation between established EU15 (or even LOI6) countries and the EU12 newcomers which are often hardly recognised by EU15. Many EU15 prime companies already have a list of preferred and established suppliers, making it hard for the EU12 companies to enter. This situation is also emphasised by the general tendency of governments with regard to defence-related products to "buy national". Furthermore "security of supply" considerations also favour national suppliers over foreign suppliers[29].

This is especially unfavourable for the EU12 countries, because their national defence budgets are relatively low and foreign countries are only very marginally interested in buying their products. Adding to this, the international defence equipment market is reported to be stagnating, thus limiting the resources for companies that can be reinvested into R&D and innovation[30].

Also some CEE states are still not part of the Euro-Zone, which leads to further disadvantages. International cooperation has also been stalled after the disruption of the Warsaw Pact[31]. This also led to maladjustment of products and developments and a lack of standardisation which now hinders the integration of new products and limits the success of established goods and the development of innovations. The EU12 companies are often not classified as "qualified suppliers" (juste retour), thus giving them limited access to the international or trans-European market[32]. In this sense, a kind of vicious circle has been set up: due to lacking financial support and lacking interest by the EU15 countries, EU12 have difficulties with innovating and adjusting to standards, thus making their products rather uninteresting to EU015 countries, which leads to financial difficulties.

Measures have to be taken to break this vicious circle. These will be discussed in chapter VIII.

[29] *Level playing field for European Defence industries: the role of ownership and public aid practices*, Ingeniera de systemas para la Defensa de Espana & Fraunhofer Institut, 2009
[30] *Ibid.*
[31] *Ibid.*
[32] *Ibid.*

VII. Modalities of cooperation and practice

1. Identifying modalities

Chapter V of the report revealed wide spectrum of competencies in the EU12 defence supplier base. These competencies are provided by traditional defence companies, R&D organisations, or companies with prevailing civilian orientation. They function in differing environments and at different levels of the supply chain (see Figure 2 in Chapter VI). What is common among all these entities is that in the new political and market environment they have found a functioning model that provides for a sustainable business with a notable defence segment.

To understand what makes the defence business in the EU12 countries sustainable, the study team analysed national defence environments, companies' approaches to specialisation, ownership issues, relationships with foreign companies, investments in and role of R&D, company offer, educational level of the employees, the range of customers and the position in the supply chain. The team constructed seven 'dimensions,' along which it described particular company approaches and experience. The assessment along the first dimension is country specific and is based on the information provided in Chapter IV of the report. The practice and/or policy of individual companies along the remaining six dimensions were assessed on the basis of responses to the study questionnaires and analysis of additional publically available information.

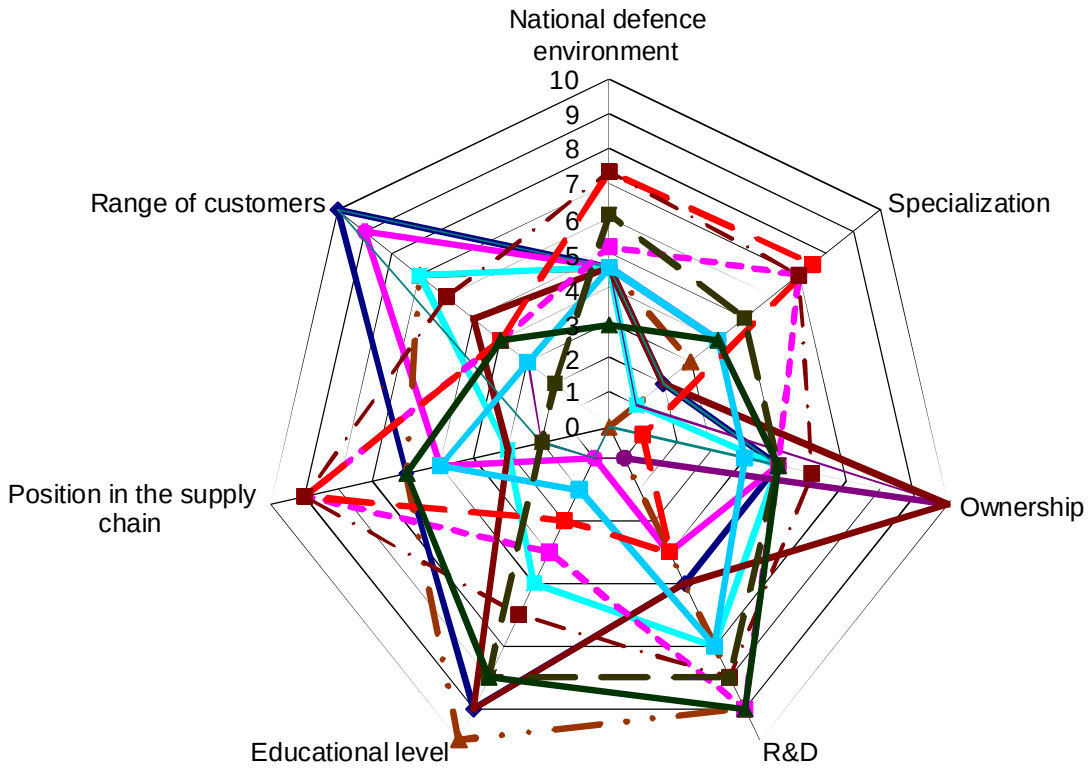
The seven dimensions are:

1. National defence environment (defence budget and its distribution, defence capability orientation and its correlation with areas of expertise of the defence industry)
2. Degree of specialization (assessed on the basis of responses to Questions 6 and 9 [33])
3. Ownership Structure (Questions 3 and 29)
4. Research & Development (Questions 5, 8 and 14)
5. Educational level of company personnel (Questions 20, 21 and 22)
6. Position in the supply chain (Question 40)
7. Range of customers (Question 54).

Each case study was assessed along the seven dimensions. The figure below presents visually a number of selected cases in a radar chart format. The chart shows that even a subset of EU12 defence suppliers' cases practically spans the whole space under analysis. Hence, a functional mode of operation for a defence supplier may be a result of rather different combinations of factors, reflecting diverse strategies—whether explicitly formulated or not—of the EU12 defence related companies.

[33] Here and further down we refer to the responses to Study Questionnaire # 1.

Figure 1: Subset of the EU12 defence related companies (case studies)



A more detailed analysis of defence related companies that have survived the transition from planned economy, when all the main economic assets were fully owned by the state, to market economy and post-Cold war restructuring of the EU12 defence sectors, the study identified six main types of companies' strategies and/or practice. Further down these are referred to as "modalities":

- "The Niche Competitor";
- "The Aspiring Prime";
- "The Intermediary";
- "The Flexible High-Tech Company";
- "The Logistics Service Provider";
- "The Low Cost Company".

Each of the following six sections of the current chapter starts with description of the respective modality. It is important to note that these descriptions are of 'pure' models and that some companies attempt, often successfully, to function in more than one of these modalities. For each of the modalities, we include cases of interest to the study which serve as examples of the identified modalities.

Only a few of the companies described below can be considered 'best cases', that is, as enterprises contributing to the strengthening of EDTIB. Most of them exemplify a functioning model, albeit with limitations on effectiveness and efficiency. All cases contribute to our

understanding of the developments within the defence technological and industrial base of the EU12 countries, and assist the identification of viable alternatives and the formulation of recommendations for the strengthening of EDTIB through involvement of the EU12 defence and defence-related companies.

2. "The Niche Competitor"

The "niche competitor" in the EU12 countries is often a SME, but may be also a large defence company[34]. It provides systems and products in a small number of related 'four-digit' taxonomy fields and, on occasion, may serve as lead system integrator.

The niche competitor may be state owned or fully private but, as a rule, there is no foreign ownership of company shares.

Investments in R&D provide for implementation of the company's 'first to market' strategy and preservation of the competitive edge in a particular niche.

The company requires technical expertise, but to keep costs low it may employ only limited numbers of university graduates and few PhDs, if any. In such case, the company would outsource the requisite R&D. Another alternative is to have in-house R&D capacity, and employ a higher number of university graduates in the respective technology fields and maybe experts with PhD degrees.

As a rule, there are numerous potential customers for the company's products and services. In some cases the company may provide 'commodity products,' such as hand-held guns.

A favourable national defence environment, in particular the specialisation of the national armed forces in defence capabilities utilising the company's technologies and products, as well as state investments in related R&D, greatly facilitates the preservation of the competitive edge in the respective niche. The practice of the EU12 countries shows, however, that a favourable national defence environment as just described is not a prerequisite as long as the level of investment in R&D and innovation is high[35].

Arcus Co., Bulgaria

Arcus is a well established, internationally recognized centre of competence in military engineering, specializing in the development, production and supply of small arms, grenade launchers and mortars, grenades for grenade launchers, medium calibre ammunition, mortar bombs, and fuses for artillery and tank ammunition, mortar and air bombs.

It is fully private company, without known foreign participation in its ownership structure. With some 2800 employees, the company focuses on a few related niche products, acting as a prime or Tier 1 contractor. In the former case it is able to close to cycle of design, production and delivery of final products to the end user.

A relatively small percentage of the company's employees have university degrees in technology related fields. However, some 120 engineers work on R&D projects, and the company further outsources some of its research and development. That allows it to be innovative on the global market in its niche of specialisation and to meet the demands of numerous potential customers.

The domestic market has a minor role in the company's strategy, often limited to testing, certification, and delivery of small series.

Arsenal JSC, Bulgaria

With a history of over 130 years, Arsenal is widely known for its specialised capacity to design and manufacture small arms and artillery armaments, ammunition, fuses, powders, charges, and pyrotechnic products.

[34] In EU12 'large' are usually considered companies with few thousand employees.
[35] In one of the case studies the niche competitor is actually a research institute, subsidized by the government.

The majority of shares in the company are in the hands of local private entities, while 34 percent are owned by the state.

With over 4400 employees, the company acts as a prime in its niche of specialisation, closing the cycle of design, production, and delivery of its products to end users. It also supplies components to other manufacturers, primarily powders, charges, and pyrotechnic products.

A small percentage of the employees have university degrees in technology related fields. Nevertheless, a considerable number of engineers conduct research and development, and that allows the company to maintain its competitive edge in the niche of specialisation and to meet specific demands of variety of customers.

Only a small portion of the company's defence products are intended for the domestic market.

Przemysłowy Instytut Telekomunikacji S.A. (PIT S.A.), Poland

PIT S.A. (Telecommunications Research Institute S.A.) is a wholly state-owned company, which concentrates on research and development in the area of radar technology, command & control systems, and electronic recognition systems. It has over 840 employees, with a few hundred having Master of Science, engineering, and doctoral degrees.

The competitive niche of PIT S.A. includes its advanced 3D long-range radars, procured by the Polish armed forces as the most important customer for Institute's solutions. That includes radars dedicated for the NATO "backbone" network, as well as mobile medium range 3D radars. Systems, developed by the Institute, are in use in the Land Forces, the Navy and recently also in the Air Force. PIT S.A. has become a recognized partner of the Polish Navy as a supplier of solutions for sea protection, including sea patrol aircraft being equipped with a sea surface surveillance radar and additional systems. Modern information, command and control system has been developed by the Institute to support the tactical command of the Land Forces. The system has been introduced into service also in the multinational military structures. A separate and important line of products includes the passive reconnaissance equipment.

Institute of Metal Science, Bulgarian Academy of Sciences (IMS-BAS)[36]

IMS-BAS functions as a research institute of the Bulgarian Academy of Sciences. It is a public organisation, established according to the Law on the Bulgarian Academy of Sciences. As such, it is subsidized by the state, and there is no private or foreign participation in its ownership structure. It employs some 430 personnel, 155 of whom are researchers.

IMS-BAS provides technologies and products in a few related taxonomy fields. It functions both as a prime in a narrow niche and as supplier of technologies and sub-systems (Tier 1 or Tier 2 contractor).

With more than 150 researchers on staff, many of whom hold advanced degrees, IMS-BAS maintains a considerable research capacity that allows it to maintain the competitive advantage in its niche of defence business, as well as to develop technologies and integrate products at sub-systems level. IMS-BAS is a *de-facto* technological Centre of Excellence with international recognition.

IMS-BAS closely cooperates with the national defence establishment and its research institutes, which provides for a good grasp of current and anticipated capability requirements in the field of its niche products, as well as towards sub-systems and components.

There is a limited number of potential customers for the IMS-BAS' products and technologies.

TRIVAL PC ANTENE, Slovenia

TRIVAL PC ANTENE is a privately owned partnership company, one of the four Profit Centres of the company TRIVAL. TRIVAL PC ANTENE has 11 employees.

[36] IMS-BAS can be examined as a "Niche Competitor," as well as a "Flexible High-Tech Company".

The major part of the company's products is sold on the domestic market. The Slovenian Ministry of Defence, Ministry of Internal Affairs and Slovenian Railways are its main customers. The company also exports its products to Croatia, Bosnia and Herzegovina, Italy, Germany, England, Sweden, Finland, Syria, Egypt, India, United Arab Emirates, the United States and others. The company's export was growing on importance in recent years and currently it exceeds 50 percent of total sales.

Its product list contains more than 200 types of antennas, including military antennas and antennas for marine applications, civil professional communications and even for radio amateurs. Its offer covers also custom designed antennas and accessories. The materials used in production are mainly composites. The company cooperates in this area with TRIVAL KOMPOZITI.

In TRIVAL ANTENE, R&D is seen as a source of the company's growth. Well equipped laboratory enables it to perform all the climatic and mechanical tests of base material or final products. The company's employees are working on development of new products and improvement of standard ones. The company benefits from tax deductions on its R&D activities.

3. "The Aspiring Prime"

Such EU12 companies act as primes, providing systems and products in a small number of related taxonomy fields. The :aspiring prime" is considered a 'national champion' and enjoys privileged relations with the national defence establishment.

Often this establishment is the only customer of the company's defence products. Attempts have been made to provide the same products to armed forces of other countries. In some cases these attempt are successful, however in general the products are sold outside EU to developing countries.

It is usually state-owned, but examples of private companies are also available.

As a rule, the company provides products and/or services that are innovative on the national market (but not necessarily on the global market). Limited investments in R&D serve to incorporate the required new technologies and allow system integration capabilities.

A small percentage of the company's employees have university degrees in related technology fields, and they are often concentrated in its R&D unit.

The Aspiring Prime functions in a favourable national defence environment, with sufficient funding for procurement of the company's products. Such procurements are justified by standing capability needs.

AERO Vodochody, Czech Republic

AERO Vodochody a.s. is the largest aerospace manufacturer in the Czech Republic. It focuses on development, production, sales and support of aircraft and aero structures, both civil and military.

The company was privatized in January 2007 and is currently a join-stock company. Currently, 100 percent of the shares of the company are owned by the private equity group Penta. A restructuring process was conducted along with the privatization procedure.

The company has two major business lines. In the first one it acts as a prime, focusing on development, production, sales and support of advanced military training and light combat aircraft. Currently the company's key customer for this business line is the Czech Air Force, but its traditional product—jet trainers—has been exported to dozens of countries around the world.

The second one – aero structures programme – concentrates on deliveries of aviation technology at upper levels of the supply chain and continually extends its portfolio of customers to include world leading aviation manufacturers. Currently, it cooperates with Sikorsky Aircraft Corporation (S-76C helicopter), Alenia Aeronautica (C-27J Spartan center wing box), Latecoere (Embraer 170/190 subassemblies), Saab (JAS-39 Gripen pylons), Spirit Aerosystems (B767 fixed leading

edge kits), EADS (A320/340 subassemblies). In this business line AERO Vodochody functions as "high-tech company," mostly at Tier 1 of the supply chain (see the second section in Chapter VI).

The company employs over 1300 employees and in the last 2 years it has been investing extensively in R&D positions.

Since its privatization AERO Vodochody has been also active as an acquirer in the CEE market – in 2007 it has acquired the Czech producer of composites Rotortech and is currently bidding to buy a majority share in PZL Świdnik, a Polish helicopter producer.

Bumar- Łabędy, Poland

Bumar-Łabędy is the biggest armoured vehicles and armour equipment manufacturer in Poland. Besides, the company is also a player in heavy machine industry. The company, established in 1951, till now remains state owned and belongs to a defence industry holding – Bumar Group.

The most recognized product of the company is the PT–91 tank. Bumar – Łabędy is a final integrator of this product and aims to sell it overseas. The tank was recently purchased by the government of Malaysia. Other company products are being exported to Belgium, Netherlands, India, Germany, Norway, Pakistan, Czech Republic, Russia, Slovakia and USA, among others.

As of April 2009, the company employs approx. 3700 persons. Like majority of defence sector companies in Poland, the company is currently experiencing substantial problems due to significant decrease of government orders and is implementing a restructuring programme.

PZL Swidnik, Poland

PZL Świdnik is a helicopter manufacturer with both public and private participation in its ownership structure. The majority of shares are owned by the Industry Development Agency (ca. 88%), while the only foreign investor AgustaWestland N.V. holds ca. 6 % of shares. Currently the main shareholder is preparing to sell shares of PZL Świdnik, and thus to complete the privatization process.

The leading product is its multipurpose helicopter PZL-Sokół, which obtained type certificates from the Polish, American, Russian, German and Spanish aviation authorities. The other helicopter models manufactured in the factory are: Mi-2, Kania, W-3A Sokół, SW-4. The factory's offer comprises also aviation elements, such as: fuselages and its components, center wing boxes, door mechanisms, control surfaces, fire protection linings. Among the main customers of PZL Swidnik are Aerospatiale, Eurocopter, Agusta, Latecoere, Dassault, Ratier-Figeac, Snecma, Boeing.

R&D activities are conducted by the Engineering and New Programmes Centre. However, the Centre is a separate for-profit organisation, with independent planning and administration. The Engineering and New Programmes Centre is responsible for full research and development cycle essential for the factory's production, i.e. research, design, tests, manufacturing engineering and engineering support.

RADWAR S.A., Poland

The Scientific-Industrial Centre of Professional Electronics RADWAR S.A. is one of the major producers in the Polish defence industry and employs more than 800 employees. The company is incorporated in the state owned BUMAR Capital Group – incorporating majority of Polish defence industry.

Among the major defence products of RADWAR are radar systems, command & control systems, anti-aircraft artillery and missile systems, Identification "Friend-or-Foe" (IFF) systems, information security systems. In the delivery of complete, finished products to the Polish armed forces and abroad, RADWAR acts as prime, integrating technologies from several taxonomy domains.

Besides, RADWAR's offer includes design and production of devices and assemblies on external job orders. Following cooperation agreements, contracts or job orders, the company is able to produce various goods or parts and provides manufacturing services. Such cooperation may be performed on a single-order basis or long-time collaboration in the joint production or distribution of new products.

For years RADWAR has been collaborating with many scientific-research centres - both domestic and foreign. The company takes active part in multinational projects, including large NATO programmes and offset arrangements.

RADWAR's management declares to be spending about 20% of its turnover on R&D activities.

Its key customers are the Polish armed forces, Police and Border Guard. Radwar's equipment is also used in armed forces of other countries in Europe, Asia (Far East) and Africa.

4. "The Intermediary"

Typically, this is a private medium, small or even micro company that, as an exception, may have foreign participation in its ownership structure.

The "intermediary" is oriented entirely to the national defence organisation, and in some cases also to the security establishment. It has an excellent grasp of defence requirements, the specific organisational arrangements and operational processes of the customer and is able to translate these requirements into possible technological solutions. It often contributes key know how and technological expertise, necessary for example in the upgrade of legacy equipment or the utilisation of surplus weapon systems and ammunition.

It is usually highly specialised and employs university graduates, and possibly PhDs, to maintain its operational and technological expertise. Moderate investments in R&D allow the company to anticipate specific customer demands and be innovative on the national market, in the niches of its specialisation.

The positioning of the intermediary in the supply chain is not straightforward. It can serve as a prime that is critically dependent on the delivery of systems and sub-systems by other primes. It may also be sub-contracted by a prime for the delivery of key technological expertise and/or know-how that is crucial for the integration with command and control systems, operational processes, and logistics.

The "intermediary" is heavily dependent on the national defence environment, and can survive only as long as the defence establishment continues to invest in defence capabilities related to its area of expertise and maintains important specifics in its operational processes and the respective requirements.

Telesys Ltd., Bulgaria

Telesys is a small (close to micro), 100 percent private company, with no foreign participation in its ownership structure.

The company's defence products and services are intended for the Bulgarian defence establishment, even almost entirely for the Bulgarian Air Force.

In its defence line of business, Telesys cooperates with system and sub-system integrators and providers of mid-life upgrades. It contributes key technologies in a few technology niches, as well as critical know-how of the operational and business processes of the customer.

To maintain its know-how current innovative position in the national market, Telesys invests moderately in R&D, on a project basis.

All its employees have university degrees, some with PhD degrees, in technology fields related to the Telesys' main lines of business.

The flexibility of the company and its capability to anticipate defence requirements and contribute to the provision of respective solutions, combined with intimate understanding of the customer's modes of operation, are crucial for the positioning of Telesys as a niche company among the user, prime and Tier 1 contractors, as well as for the sustainability of its defence business.

Samel 90 Plc, Bulgaria

Samel 90 is a 100 percent private company, with no foreign participation in its ownership structure. With some 400 personnel, its turnover is typical for SMEs.

In terms of degree of specialisation and its position in the supply chain, Samel 90 has two distinct lines of defence and defence-related business.

In the first one it provides components (in some cases interpreted as 'sub-systems') in a small number of related 'four-digit' taxonomy fields and serves as a Tier 2 contractor. Here the company provides well established products. Its investment in R&D is limited and supports the enhancement of the technological processes. Among its customers are some Western primes. The driver for this line of business of Samel 90 is low cost, while the company maintains a closed technological cycle and reliable deliveries in terms of quality and schedule.

In the second line of its defence business Samel 90 serves as lead system integrator for C3 and ground-based intelligence, surveillance, target acquisition & reconnaissance systems (ISTAR) for the Bulgarian armed forces. The company provides products and services that are innovative on the national market. Limited to moderate investments in R&D serve to maintain Samel's capability for systems engineering and integrated systems design and to incorporate the required new technologies in command and information systems.

In providing integrated systems, Samel 90 utilises its good understanding of capability requirements, organisational processes, support and training needs of the customer and cooperates with lead Western system and sub-system providers of key equipment.

Very small percentage of Samel's employees has university degrees in technology fields, and it does not employ PhDs.

5. "The Flexible High-Tech Company"

This is usually a medium-size or slightly larger company (up to about 500 personnel). As a rule it is private, and attracts foreign capital, but very specific exceptions involving state ownership are also available.

The company provides sub-systems, systems and products in several related technology fields.

It invests considerable resources in R&D, either through employment of personnel with advanced degrees in related technology fields, or through sustained cooperation with R&D organisations. The remaining personnel have good technical skills, achieved through specialized high school (vocational) education in a technology field.

Such defence companies usually act as Tier 1 or Tier 2 contractors, or both, and in some cases provide finished niche products, e.g. night-vision devices.

There are numerous potential customers for the company's products and services.

Since the own defence establishment is not a major customer to the company's products, its functioning depends on the national defence environment only to an extent, e.g. for testing and certifying new company's products and procuring small series or, on occasion, provision of R&D support.

AERO Vodochody of the Czech Republic in its "aerostructures" line of business would be a typical example of EU12 defence supplier functioning in this modality.

WB Electronics, Poland

The company is a highly-innovative manufacturer of electronic devices and information systems aimed at battlefield management, communication and reconnaissance systems (unmanned aircraft), internal communication and automation systems for combat vehicles, sensors of different types. The company is privately owned and highly innovative (ca. 50 percent of its profit is being spent on R&D activities). The company produces exclusively for the defence sector and does not intend to extend its activities to civilian areas.

The company employs approximately 100 persons. With specialisation in C4I systems, its products are being sold worldwide. The main and the most internationally recognized product of the company is its internal communication system FONET.

Syscom 18 SRL, Romania

Syscom 18 SRL, founded in 1991, specializes in complete instrumentation for process control and metering systems. It offers electronic components and transmitters, transducers, panel instrumentation, valves, pumps and data acquisition systems. In some projects, the company functions also as a turn key supplier and system integrator.

The company sells its products both domestically and on foreign markets, including Syria, Bulgaria and Kazakhstan. It employs more than 130 people, 90 of whom are university graduates.

Syscom's growth is driven and fostered by its R&D department, composed of 17 accredited researchers. The R&D activity is periodically evaluated with the use of financial metrics. The company cooperates closely with external parties in R&D and innovation programmes, with the Military Technical Academy and the Polytechnic University of Bucharest as main partners.

Eurosense EOOD, Bulgaria

Eurosense EOOD is a small company – subsidiary of the Eurosense Group for Bulgaria and part of South Eastern Europe. This is a dual-use company, specialised in aerial photography, processing and interpretation of photo and digital satellite images, GIS, database development and mapping. The company's customers are among the few acquirers in the region. It provides component technologies, products and services typical for a Tier 2 contractor.

Almost all its employees have university degrees in technology fields in the company's main lines of business. The parent company provides critical technologies, know-how, and management tools. Eurosense EOOD also conducts studies and contributes to the Group R&D efforts to anticipate customer requirements.

Optix AD, Bulgaria

Optix AD is a 100 percent private company, with no foreign participation in its ownership structure. It employs approximately 350 people. The annual turnover of Optix AD is typical for "small and medium enterprises". It is highly specialised, with a line of optical materials and devices. In this area the company serves as a Tier 2 contractor for a small number of Western primes, but also provides end products (individual equipment) intended for numerous customers.

The company employs some 40 people in its R&D unit. That allows it to provide innovative products, maintain its technological know-how, and enhance its technological processes.

UAB "ELSIS", Lithuania

"ELSIS" is a privately owned group of companies specialized in information technologies and engineering systems. The group comprises of UAB "ELSIS", a joint-stock company, and its subsidiaries: UAB "ELSIS BIURO SISTEMOS", UAB "ELSIS TS", UAB "ELSIS PRO", ZAO "ELSIS SPB", OOO "ELSIS KALININGRAD".

UAB "ELSIS" is an important supplier of the Lithuanian armed forces, the Hydrometeorological Service and the International Vilnius Airport. The group exports its products to the European Union, Russia and other CIS countries and cooperates with foreign defence-related companies.

"ELSIS" designs, develops, manufactures, distributes and maintains military information and communications systems and tailored software applications, process management systems, radio communications and electronic engineering systems.

"ELSIS" has more than 200 employees, the majority of them with university degrees in technology related fields, and 30 of them working in the company's R&D department. R&D is partially financed by EU funds. The company cooperates in R&D field with Alenia Aeronautica (program "Clean Sky").

6. "The Logistics Service Provider"

Depending on the degree of specialisation, this might be a small, medium-size, or large company. The defence business of the company is almost exclusively oriented towards the needs of national security and defence forces.

Ownership structures of such companies span the full spectrum of possibilities – from fully state owned, to those owned by foreign entities.

The company's strategy does not rely on R&D. The majority of its personnel have vocational education.

Procurement from foreign primes and introduction of policies of outsourcing is conducive to this modality. Local companies utilise the advantages of geographical proximity, language and cultural compatibility, combined with competitive costs.

Military Aviation Works No. 1, Poland

Military Aviation Works No. 1 in Łódź is a company with 60 years of tradition. It was transformed into a joint stock company in 2008, thus signalling the start of the privatization process. Since then the company's strategy is to diversify its products and markets, besides the cooperation with the Polish defence ministry.

The main activity of the Military Aviation Works No. 1 is aircraft overhaul, modernization and maintenance. Among others, all "Mi" helicopters operated by Polish Army (Mi-8, Mi-14, Mi-17, Mi-24) are serviced by the company. The company provides services such as upgrades, adaptation to NATO standards, current and periodical aircraft maintenance, painting and modernization of its interiors. Recent cooperation between MAW No.1 and Virtual Reality Media (a Slovakia-based company) aims to deliver a Mi-17 simulator to local and foreign customers.

In developing aircraft modernization and overhaul technology, MAW No. 1 cooperates with the Air Force Institute of Technology and foreign partners. The company is also involved in long term partnerships with the Institute of Aviation and Military Aviation Depot No.2.

Balkan Star Automotive, Bulgaria

Balkan Star Automotive is a mid-size company, with branches in the three biggest Bulgarian cities. It is 100 percent private, with main line of business the distribution of vehicles and spare parts, and repair and maintenance, primarily for civilian purposes.

As official representative of Daimler AG and Chrysler LLC for Bulgaria, it provides maintenance, repairs, and maintenance training for a variety of wheeled vehicles, procured for the Bulgarian armed forces. Thus, the Bulgarian defence establishment is in practice the only customer for the company's defence-related products and services.

It may be classified as Tier 2/Tier 3 contractor, operating at the margin of the defence sector.

The company does not conduct R&D, and very few of its employees have university degrees in technology fields. That fact, in combination with geographic proximity, allows the company to deliver its services at competitive costs, while focusing on availability, timeliness, and quality of service.

7. "The Low Cost Company"

As a rule, every company tries to limit the cost for delivering its products and services and, thus, to increase its efficiency and return on investments. For some companies, however, cost is the driving factor for assuring their competitiveness.

The low cost company is usually private. It may be in addition partially or fully owned by foreign companies.

The low cost company provides underpinning or systems-related technologies in a small number of related fields. It supplies commodity products and services or functions as part of the supply

chains of primes, at tiers 2 and 3. These primes are oriented towards foreign markets, with only occasional sales to the country's defence forces. Hence, the low cost company barely depends on the national defence environment.

Such companies thrive on the available pool of skilled labour at relatively low costs, while just a few of their employees have university degrees in a technology related field. Their strategies do not rely on R&D.

Among the additional factors, contributing to their cost efficiency, are weak trade unions37, relatively low entry barriers, and moderate national requirements on the environment. The successful among these companies parallel their efforts to keep costs low with introduction of quality management systems.

WSK PZL Warszawa II, Poland

WSK PZL Warszawa II is part of the state owned Bumar Capital Group. Its personnel of 400 is highly skilled and experienced.

The company manufactures different types of electrical, mechanical and electronic devices and instruments. The major types of offered products are aircraft instruments and devices, control units and systems, purpose-built elastic elements, laser emission spectro-analyser. WSK PZL Warszawa II provides components for a number of Polish aerospace industry plants. All products are designed and built in accordance with relevant international and industry standards.

The Engineering Division of WSK PZL Warszawa II performs R&D. It is responsible for development of new products, examinations and tests and implementation of products that may be subject to differing specifications or licensing arrangements. Environmental tests demanded by the aviation industry are also conducted by this Division.

WSK PZL Warszawa II is positioning itself as a company open for cooperation, especially in form of joint ventures. This cooperation can be in full-scale production as well as in research and development opportunities.

Elettra Communications

The company was established in 2004 as a Romanian-Italian joint venture. 51.37 percent are owned by a group of Italian defence sector enterprises (mainly Selex Communications SpA) from Finmeccanica Group.

Currently, the company employs approximately 70 persons.

It develops and manufactures advanced communication solutions, aeronautic equipment and spare parts for the Romanian defence sector, as well as for Selex and Finmeccanica group.

Energia AD, Bulgaria

Energia AD is part of the Enersys group with headquarters in the USA, and regional headquarters in Europe (Switzerland) and Asia. It employs approximately 650 people.

The company is highly specialised in electrical batteries and fuel cells, serving as a Tier 2 contractor or delivering directly to end users. Its defence line of business is practically independent of the national defence environment.

There is no information on the company's R&D. It can be assumed, that it relies on the corporate group for innovative designs and technologies. A very small percentage of the company's employees hold university degrees in related technology fields. It delivers products at competitive costs.

[37] In comparison to trade unions in most Western European countries.

Przemysłowe Centrum Optyki S.A (PCO), Poland

Przemysłowe Centrum Optyki S.A. employs 430 persons. 80 percent of its shares are held by the Bumar Capital Group, 6 percent by the State Treasury, and 14 percent by the company's employees.

The basic specialization of PCO is in optoelectronic products, observation and aiming devices with application of laser technology, night vision and thermal vision devices, primarily for the needs of the national armed forces. Export constitutes less than 10 percent of the total sales.

The company does not have its own R&D department. Usually the company collaborates with Polish Military Technical Academy/ Institute of Military Technology. PCO partially finances the R&D activities – ca. 50 percent of the value of each project, while the other 50 percent are covered by the Ministry of Defence. The average annual R&D expenditures do not exceed EUR 2,5 million.

8. Utilisation of the approach

There is a variety of modes of sustainable development of the EU12 defence-related companies – some more conducive for the strengthening of EDTIB, others less so.

The current chapter presents six such modalities of operation, identified as a result of the study. The six modalities reflect theoretical constructs that emphasise one or another aspect of the functioning of defence related companies. In practice, companies' strategies may combine features of several of these modalities. On the other hand, some companies may have two or more lines of defence business, corresponding to different modalities.

Nonetheless, the examination in this chapter provides for assessing the sustainability of these modalities (and the respective companies' strategies), policies and conditions under which the respective modalities would be viable, and how they would contribute to the strengthening of EDTIB. Results of the follow-up analysis are presented in the next chapter.

VIII. Conclusions and recommendations

1. Conclusions

The following presentation is based on the data received from questionnaires, case studies and the subsequent analysis conducted, as well as more macro level statistical analyses, in previous chapters. As always this analysis has been informed by hypotheses based on previous experience and conversations with industry and government actors.

1.1 Assessing the current state and the competence of defence-related supplier base in EU12

Our analysis suggests that the defence industry in EU12 covers a wide range of technologies. To a large extent the major capacity is on subsystem and component levels. It is not easy to get a full grasp of the competitive level of defence and related technologies within the companies based on the data available. The overall impression is that there are some relatively high level competencies on component niche technologies. These are however exceptions and it seems that in overall the defence industry in EU12 has low innovative and competitive capacity relative to defence companies in e.g. LOI-6. This said it must be emphasised that several of EU12 have a strong tradition in mid-tech weapons production (e.g. SALW, APCs, artillery), which to higher or lower degree is surviving to the present.

1.2 Finding out the innovative and competitive technological potential of this supplier-base and describing the modalities in which such potential is created, exploited, sustained and accelerated

Our overall assessment of innovative and competitive potential is made already in the above section. One important explanation for the lack of competitiveness in most defence high-tech niches is that most EU12 defence companies have limited R&D capacity. There is little evidence of substantial investments in new technologies and products. At the same time our data indicate that R&D is a high priority among company executives. This discrepancy between ambition and reality may indicate that the financial strength of the companies and new orders from their national customers are rather constrained. In fact, there seems to be few new products developed by defence companies in the EU12 area.

Instead, new products are largely related to offset collaborations with companies from the LOI-6 countries, US and Israel. Even though some EU12 companies have experiences of collaboration with leading companies abroad, the extent of collaboration is limited and does not seem to increase. Partly this may reflect that there are few unique products and competencies that attract the interest of companies from the LOI-6 countries and others.

With the exception of Poland, the analysis also shows that the level of export is rather limited, at least for major systems (Note, however, that in particular Bulgaria is a substantial exporter for the SALW segment.) Further the exports are very seldom to the most demanding markets – Western Europe and North America. This indicates that the defence companies in the EU12 area have relatively low competitiveness on the international market.

It could also indicate that the companies have little experience of export to the mentioned markets and therefore have difficulties entering them.

1.3 Analysing the potential for competitiveness of the defence supplier base of EU12 within the wider European market and the level of existing and potential integration of this base with the West European defence industry

As discussed in the previous section the current level of integration of EU12 in the emerging EDTIB is quite low. The main explanation of this situation is, most probably, their small innovative and competitive potential. But there may also be traditional industrial patterns in LOI-6 that disadvantage the EU12 countries as newcomers to the (West) European defence equipment scene. Something along those lines is indicated in the EDTIB strategy:

"[O]ur vision of a healthy, competitive and integrated future EDTIB will not be realised if our market-opening efforts are perceived to be simply a bonanza for the large prime contractors. With industry's active cooperation, we need to drive the benefits of competition down the supply chain – so that excellent second- and third-tier companies, often SMEs (with their typical flexibility and capacity to innovate), are able to prosper in a European scale of market. This makes economic as well as political sense: the future success of the DTIB in Europe will depend upon effective utilisation of human capital and innovation wherever these are to be found in Europe – in SMEs, and in suppliers not always associated with defence (universities, software houses, providers of dual-use technology), and in the new Member States. We note the slowness of Western European prime contractors to see the new Member States as places to invest, rather than just sell."[38]

Based on our study we tend to see the culture-related barriers to cooperation between EU12 and the traditional West European defence industry as going both ways. In what follows this will be identified as an area for policy intervention.

It is noteworthy that also intra-EU12 cooperation and export is quite limited inasmuch as we have able to ascertain, in particular for major defence equipment trade. Though the countries concerned are located in one region, in close vicinity and with similar technical capacities, their intra-group cooperation is virtually non-existent. This phenomenon belongs to one of legacies of the former Soviet-led, and Soviet-centred, strategy of developing the defence potentials of the former Warsaw Pact states. The defence investment and procurement decisions of these states were dictated from above with no regard to national interests or the economic or technological opportunities. Now all these industries are in the similar difficult economic state and are looking to EU15 or other Western sources of finance and technologies, often in a competitive way.

The consequence of low export is nevertheless that without export income the opportunities to increase R&D spending are limited. This means that the national markets remain the dominating sources of revenue for these companies.

From the perspective of the heavy dependence on the national markets for most EU12 defence industries it is interesting that the countries are relatively big importers. This indicates that the defence industry in EU12 is having low competitiveness also from the perspective of the needs of their home countries' governments.

But this in combination with the currently comparatively high defence investments in EU12 and the big and increasing share of these imports that are from EU15 also constitutes an opportunity for the EU12 companies to develop their position within EDTIB based on favourable offset deals and other collaborative arrangements. To the extent the governments in the EU12 area use direct and indirect military offset the defence industry can gain access to orders, new technology and important contacts with companies in the rest of the EU (in particular LOI-6). As we shall return to, the key aspect here is to have concrete and in-depth collaboration that really overcomes cultural divides, builds mutual understanding and trust, and achieves two-way knowledge transfer.

To conclude, our analysis suggests that the defence industry in the EU12 area is quite fragmented because companies largely operate on their national markets only. Due to the size of the country, this situation is much less a problem to Poland than to the others.

[38] *A Strategy for the European Defence Technological and Industrial Base*, EDA, Brussels 14/05/2007 (http://www.eda.europa.eu/genericitem.aspx?area=30&id=211)

The integration with defence companies in the EU15 area is limited. In general the evidence seems to point towards a situation characterised by low competitiveness and innovativeness. In what follows we will develop recommendations aimed at improving this situation.

2. Policy challenges

In this section the EDTIB related key challenges we have identified for EU12 are summarised. In most cases the challenges apply in particular to the ten states with a socialist bloc background – the three ex-Soviet republics - Estonia, Lithuania and Latvia, the Warsaw Pact countries – Bulgaria, Hungary, and Poland; the Czech Republic and Slovakia (both Czechoslovak successor states), as well as Romania; and the ex-Yugoslav republic of Slovenia. In addition to the shared – but diverse – Eastern bloc background, these ten also share NATO membership, with the ensuing requirements for defence modernisation.

- EU12 today have defence-related industries that are not fully competitive in a European setting (or in some cases more or less absent). With some exceptions, notably Poland, the competitiveness on other markets is also going down.
- As a whole the EU12 defence investments have grown considerably over the last decade. Currently this means that EU12 are opening up their markets to the EU15 industries in particular and that developments in the EU12 DTIBs is to a large degree driven by offsets on import deals. If done without due concern for the overall EDTIB situation there is a risk of undue duplication of competencies leading to more fragmentation at European level.
- Most EU12 are small in terms of population, all have low GDP per capita by European standards, and there is considerable commonality in defence equipment legacy as well as geographic proximity. This suggests great scope for collaboration particularly in logistic support and upgrading, which seems to be realised only to a limited degree.
- The defence industry managements in the EU12 countries are in many cases used to old-fashioned “top-down” decision-making and planning based in the legacies of the former political and legal system. This means for the perspective of EU12 participation in the EDTIB, on the government side, more responsibility in leading the industry into the framework of EU regulations and practices, and on the enterprise side, more efforts to learn and acquire skills to cope with the new ways of operation and competition within a more demanding market.
- Judging after a relatively slow process of the EU12 defence industries transformations and the low level of interactions between EU12 and EU15, as well as within the EU12 area, and, additionally, the character of response to our questionnaires, we cannot but observe a low level of managerial and “transactional” skills of the industrial leaders – another proof of long-lasting legacy of the past political and economic system.

A meaningful discussion on the potential for substantially strengthening the defence industry in the EU12 area needs to differentiate between countries that today have defence industrial capacity of any size and those that do not. It is reasonable to assume that there is some potential that can be realized in countries such as Poland in particular, but also Romania, the Czech Republic, Bulgaria and Slovakia. It is a plausible scenario that a future defence industry more integrated with defence companies in e.g. LOI-6 may emerge from these countries.

In the case of Hungary its DTIB seems successfully to have transformed to a very small size. The Slovenian defence industry is also very small. Some of its parts converted successfully into the civilian production and the rest, while technologically sound, is based predominantly on foreign license. The remaining five EU12 states have very limited defence industries (even though Estonia once had a very sizeable part of the Soviet military hi-tech sector). For these countries dual use industries capable of functioning also as defence suppliers plus industries for logistic support, upgrading and perhaps system-of-system integration[39] seem the most viable options.

[39] That is integration of new (or upgraded) systems in the overall national military context of such things as doctrine, training, C4ISR and logistic support.

This would seem particularly true for the non-post socialist, non-NATO EU12 states, Cyprus and Malta, which both belong to the group of the three smallest member states (the third member being Luxembourg) with population clearly below 1 million.

Of course these types of industries are also of relevance for the countries having a stronger position in dedicated defence equipment manufacturing.

It has been noticed from our data that there appears to be a strategic intent among several companies to increase the level and intensity of collaboration with companies in EU15. This ambition, however, faces external challenges.

The most critical issue concerns the peculiarities of the defence market. Today companies in EU15 seem largely uninterested in collaboration with defence related companies in EU12. Regardless of lower technology levels the politicized and national-preference oriented logic of the defence market makes it difficult to locate e.g. labour intensive work to EU12 (other than as part of offset deals) even though an economic logic would be in favour of this.

But in addition to the EU15 firms not electing to cooperate with the EU12 suppliers, there seems to be a similar problem regarding cooperation within EU12 as pointed out in challenge #3.

We will end this study by discussing policy options available to support a development where it becomes possibly for EU12 countries' DTIBs to develop towards greater competitive strength and less harmful fragmentation. In sum we find recent initiatives taken by the EC (the defence package) and in the EDA setting going in the right direction, but requiring concerted and sustained implementation efforts.

However, DTIB strengthening policies can only create framework conditions for successful companies to exploit – and this is very true for the EDTIB. Therefore we first discuss our problem from the perspective of the EU12 firms.

3. Analysis and recommendations of policy measures to improve competitiveness and innovativeness of the EU12 defence-related supplier base and facilitate its integration into EDTIB

3.1 Issues for realising the competitive and innovative potential of the defence industry in the EU12 area – the firm's perspective

Chapter VII developed six modalities of the defence industry in the EU12 area. The difference in the potential of the different modalities can largely be analysed from a number of generic strategies. In this section we will therefore first discuss general principles of competitive strategy, then apply these of the realistic development of the competitive and innovative potential of the defence industry in the EU12 area, and finally discuss the six modalities.

3.1.1 General principles of competitive strategy

In order to build a sustainable competitive advantage a company needs to differentiate its market position relative to its competitors[40] and it needs supporting resources, such as technology[41]. A sustainable competitive advantage is in principle achieved either through cost leadership, i.e. being cheaper than its competitors, or through delivering greater value than its competitors. In order to accomplish any of these strategies it is necessary to have fitting internal resources – e.g. production system, logistics and R&D competence.

Arguably, technological competence is a key to competitive advantage in the defence industry. The term technological competence can be defined as knowledge on and skills to use techniques. Concerning complex products this includes substantial theoretical knowledge as well as skills to use e.g. production systems including machinery. These are not just individual knowledge; technological competence is to be seen as an organisational capability.

[40] *What is Strategy?,* Porter, M. E Harvard Business Review, March 1996, pp. 61-78
[41] *Resource-based view of the Company*, Wernerfelt B. A., Strategic Management Journal, Vol. 5, pp. 171-180

A competitive advantage built on technological competence requires the combination the following factors:

- Unique technology relative to what competing companies offer;
- Difficult-to-imitate technology, i.e. it would take competitors substantial time and investments to imitate the technology;
- Valuable technology relative to the customer needs, i.e. there is a market appreciating the technology and its price[42].

Hence, the interesting question is: what does it take to build competitive technological competence? This will be discussed in what follows.

3.1.2 Competitive strategy for EU12

To begin with, without substantial technology transfer and/or R&D investments it is difficult or impossible for the EU12 defence industry to catch up. A critical issue is in this respect how technology transfer and R&D investments can be increased. One way would be to arrange for substantial offset packages and/or national procurement directly from the defence companies in these countries. As we have seen defence procurements have increased lately, but the economic downturn makes the continuation difficult to foresee. Anyway, a broad increase of the innovative and competitive potential of the EU12 defence industry is not likely to happen in the near future. Instead, if the defence industry within these countries is to compete on the international market it is likely to be through investments in niches. Roles such as “Aspiring prime” and “Logistics and service provider” may remain viable on the national markets. However, in what follows we will focus on the potential of the EU12 defence industry in a more integrated EDEM.

We have no data making it possible to predict which niches that could emerge would have a competitive edge. Therefore, we can only discuss principles regarding how niches could be developed. It is reasonable to assume that high-technology niches could be created through the establishment of centres of excellence (CoE), as indicated in the EDTIB strategy. Even though this strategy sees this development as an industry-led process, the establishment of CoEs within the defence area also requires government strategies both in terms of what areas to prioritise and how to make the necessary investments. Hence, it is an issue for member states as well as firms to handle. CoEs could be established between companies both from the EU12 area and in cooperation with other member states. EDA could facilitate the development of a process for identification of areas of technology where member states could benefit from establishing joint CoEs. This would also be an important step in the direction of reducing duplication of defence technology competencies and capacities within the EU.

In the case of the EU12 states, although there are substantial differences between them, it is questionable to strive for a competitive position in mature defence technologies where the country does not already have a position. Instead, if a niche strategy should be successful, the focus of attention and effort should turn to: a) emerging technology areas where established defence industry does not have a strong position already, and b) where the country/countries have supporting industries and research institutions.

It is commonly argued that the EU12 countries’ defence industry could take positions as low-cost manufacturing suppliers. In principle, if current initiatives towards the establishment of EDEM are successful this would be an alternative. Clearly, such roles would generate job opportunities in the EU12 countries. It could support a long term development towards more competitive positions and also help develop the industrial networks with EU15. However, there is a risk that such strategy, if it is the only one, leads to permanent positions as manufacturers without development capacity of any substance.

[42] *Firm Resources and Sustained Competitive Advantage*, Barney J., Journal of Management Vol. 17, 1991, pp 99-120

It is important to keep in mind that manufacturing without R&D does not build sustainable positions. Hence, competitive advantage would in the long run require investments in R&D. As mentioned this could be accomplished through focused investments in CoEs. Offset requirements with R&D content are one way of supporting such development. The EU12 countries could use joint procurement of defence equipment in order to gain shared offset deals that could provide technology transfer and high technology development to the CoEs. Participation in procurement programs together with other EU countries will also strengthen the role as equal partner in relation to companies from EU15. Hence, the development of CoEs is by and large dependent on strategic and co-ordinated actions of the EU12 governments. This is absolutely essential if the competitive and innovative potential of the defence industry in these member states are to be improved.

EDA could actively play a role as valuable facilitator of dialogues between member states in the process of finding joint investment opportunities. The work with a common data base over new defence projects is certainly one valuable contribution. There is also a potential for increased and systematic sharing of experiences between different collaborative projects between member states. For instance, important areas of experience exchange are contractual issues, security of information, intellectual property, and principles for division of work between participating parties, as well as the organisation and governance of effective collaborations. If EDA would strengthen its role in this respect, it is reasonable to believe that it would benefit member states both from EU15 and EU12.

There is a need for some actions to be taken by EDA in order to promote its own activities together with respective government bodies of the Member States, e.g.: training events or conferences for management boards, publications. Obviously, such activities are statutory ones for EDA, however, it would be worth to develop a range of activities focused specifically on companies of EU12.

3.1.3 Competitive strategies for the six modalities

"The Niche Competitor"

This mode of operation seems sustainable to the extent that companies stay focused and continue to combine their traditional strengths with sizeable investments in R&D and innovation.

States may contribute to the sustainment of this mode through investments in related R&D, testing and evaluation, and provision of export guarantees. The functioning of such companies does not depend strongly on defence investment budgets. Nevertheless, of particular value would be the specialisation of national armed forces in defence capabilities that utilise technologies and products of niche competitors.

The competitive advantage of the companies may be enhanced if they attract foreign investments—from EU15 or elsewhere—bringing advanced business management practices, technologies and/or marketing advantages.

While this modality cannot be seen as integration into EDTIB *per se*, successful niche competitors strengthen the European defence technological and industrial base and may provide robust equipment well-suited for international Crisis Management Operations also for EU15 countries.

Note that Niche Competitors typically operate in mid-tech niches, for hi-tech see below.

"The Aspiring Prime"

These companies are considered 'national champions' and enjoy privileged relationships with national defence establishments.

To be sustainable, this mode of operation requires considerable national investments in new technologies and equipment. For medium-sized countries such investments cannot be made

across the board but have to be focused. Although 'national champions' traditionally were developed mainly for the home market, today they must be based also on export. However, one way to focus defence investments is through specialisation of the national armed forces in a set of defence capabilities that build on equipment and technologies provided by the 'national champion'.

In other lines of their defence business, such companies may cooperate with Western primes – in joint R&D and procurement projects or as Tier-2 and Tier-3 contractor. This could be in the context of the country participating in collaborative procurement projects in the EU framework, or as part of offset arrangements.

"The Intermediary"

This mode of operation is not viable in long-term. The increased involvement of EU12 in the European Security and Defence Policy will require enhanced interoperability, with the respective demands for compatible decision-making processes, operational arrangements, weapon systems and equipment. Similar requirements stem from the membership of ten of the target countries in NATO. With time, Soviet-type legacy system will come to the end of their life cycle. It can also be expected that EU12 countries will start to participate in cooperative procurement projects. As a result, the importance of nation-specific weapon systems, equipment, infrastructure, C2 arrangements, etc., will strongly diminish.

However, companies that function in "The Intermediary" modality as one of their lines of businesses, participate in the transfer of business practices, technologies, and know-how, and the interim period may provide further opportunities to deepen their relationships with Western primes, understand in depth cooperation requirements, and become part of their supply chain. The capacity of current "intermediaries" to cooperate with Western primes and their competitiveness may be enhanced through participation in direct and/or indirect offset programmes and projects.

Thus, although the modality is not sustainable, the successful integration of such companies in the supply chain of EU15 primes – and their transformation into other modalities – will contribute directly to the strengthening of EDTIB. It can also be observed that the intermediary role is a necessity for any development project that involves Warsaw Pact legacy systems. Therefore it is a unique selling point for incumbent EU12 defence industries to get access to an EU15 company supply chains.

"The Logistics Service Provider"

Companies functioning in this modality build on the advantages provided by geographical proximity, language and cultural compatibility, and lower costs of service. When the national defence environment is conducive to the procurement of sizeable numbers of weapon systems and other platforms, these advantages will continue to provide opportunities for sustainable defence business.

Traditionally offsets are instrumental in building local capacity for provision of key logistics services. It is possible that the new procurement directive will provide alternative ways for enforcing requirements of at least some local presence in logistic support.

Furthermore, currently local logistics service providers are oriented exclusively to the needs of national security and defence forces, and as a rule provide their services on the territory of the country. Two developments present additional opportunities:

1. to provide logistics services across borders, in particular when nearby countries use the same or similar equipment, and
2. outsourcing part of the logistics support to deployed forces, both national and forces of other countries (the opportunity in the latter case is known as provision of third-party logistics support /TPLS/).

Such expansion of the portfolio of "The Logistics Service Provider" may increase the interest of EU15 primes and service providers to the extent that they decide to acquire—fully or partially—local companies functioning in this modalities.

Whatever the ownership structure of such companies, they tend to strengthen EDTIB.

"The Low Cost Company"

Companies functioning in this modality utilise the advantages of relatively low (compared to EU15) costs of skilled labour, moderate national requirements on the environment and other factors specific for the current stage of development of EU12.

Many of these specifics will diminish in importance or disappear in the process of the full integration of the EU12 countries in the European Union and the implementation of the EU legislation, e.g. related to environmental protection. On the other hand defence production requires a level of political control that makes further off-shoring to even more low-cost countries – otherwise a pervasive problem with low cost manufacturing strategies – difficult other than in connection with further enlargement of EU.

Hence, there is a window of opportunity that such companies may use to strengthen their competitiveness, e.g. through introduction of advanced management practices and investment in new technological processes and thus to contribute to the strengthening of EDTIB.

"The Flexible High-Tech Company"

In order to preserve their competitiveness, companies functioning in this modality – or aspiring to develop in towards it – must invest increasing amounts in R&D and innovation.

Their integration in the supply chain of Western primes would be facilitated by transfer of technologies and know-how through participation in collaborative international R&T and procurement projects and programmes. This can also be achieved within offset arrangements.

As discussed above an important challenge for EU12 is transforming Intermediaries into "high-tech companies". Another is widening the scope of civil high-tech companies to also encompass defence (sub-)systems. In both cases such transition processes should typically be in the context of emerging technologies, since entering well-entrenched niches is always very difficult.

High-Tech Companies should strive for CoE status, typically in networked CoE:s containing both the EU15 and EU12 members.

3.1.4 Industry organisations

In many of EU12 the defence industry enterprises organised themselves in various associations. In some countries there are more than one of such organizations (for example, three in Poland, two in the Czech Republic), in a few other there is none. Looking into their membership, statutes and practices reveals their inherent weaknesses: they do not cover all enterprises in the national defence industry, many were established only recently thus lacking a long-standing tradition and experience, their main focuses are different as they respond to specific conditions in the industry or a country concerned. Sometimes they are unwilling to cooperate fully with the sister organizations in the same state. Some of them pay attention to the on-going developments on the European market and in the European institutions but in most cases they are preoccupied with the current national legislative processes, offsets regulations, labour conflicts and social conditions of employees. All of them undertake an international cooperation though, once executed, it has more formal, "diplomatic" character than a pragmatic, production-orientated one. None has a permanent representation in the EU institutions or an institutional, systematic mode of interaction with these institutions. The situation looks better in case of the aeronautical (aerospace) industries, led by the European Aerospace and Defence Association. Though the role of NDIAs is of great importance to the respective industries and countries, it seems their

capabilities in fostering pro-European attitudes within their membership, management and workers alike, is not utilized in full.

3.1.5 General observations

The above observations enable us to formulate more general recommendations on an enterprise level:

- the critical issue is the assurance of technology transfer to the enterprises. This can be achieved by increased R&D efforts (local, corporation, national) perhaps in connection with offsets agreements.
- a key way of improvement in the competitiveness and innovativeness of any defence industry is the engagement in collaborative project with technologically more advanced partner
- the best chance for enterprises' survival and development in the long term is intensive investment in niche capabilities having a potential competitive edge over prospective competitors.
- such niches – centres of excellence – cannot be established quickly and easily, but require a dedicated and prolonged effort. Doing this for already entrenched niches is almost impossible for the "newcomer" – the practical option is to go for emerging niches
- DTIB centres of excellence require consorted efforts by government and the industry itself.
- moreover, centres of excellence should usefully be organized jointly across borders hence helping to avoid duplication of efforts and to foster a synergy of the effort. This is true both within EU12 and between the EU12 and EU15 states
- the modalities of "the Intermediary" specialising in legacy systems and the "low cost company" specialising in low-cost manufacturing are not viable in the long term. They can, however, play a useful transitory role.
- the EU12 defence industries associations are not effective in spreading out the notion of EDTIB or any other EU or EDA initiatives in the area of defence industry and defence market. They may become a powerful tool of such a European-wide policy effort, if and when they become less fragmented and more conscious of the new challenges created by integrating, more competitive and demanding, defence market. This requirement demands a joint initiative of the governments (inspiration), the associations, and their members, that is, the individual enterprises.

3.2 Issues for realising the competitive and innovative potential of the defence industry in the EU12 area – the public policy perspective

In this section we discuss the relevance with regard to the above-mentioned policy challenges of the main DTIB-relevant policy instruments.

3.2.1 Policies for transparency and market access at prime contract level

A complex of current European policy initiatives can be characterised as aiming at increasing the scope for Europe-wide[43] competition on defence equipment by restricting the scope for governments to misuse the exemption from public procurement rules provided by Article 296 (TEC), i.e. against using it as pretence for other purposes than national security interests.

Needless to say the national security relevance of defence industrial assets may be a contentious issue. Therefore it is not surprising that criticised practices here are not attacked head-on by EC

[43] Normally, under WTO regulation, public procurement should be open to global competition. This is, however, a very problematic notion in defence considering requirements like security of supply, security of information, and export controls.

(as custodian of the internal market), i.e. by litigation in the Community court system but by a more step-wise process.

In this process EC's Interpretative Communication aims at more clearly defining the domain of use of Art 296; the proposed directive for defence and security public procurement aims at creating a non-Art 296 option for handling some of the real issues making standard public procurement a non-option in many defence procurement situations (e.g., security of supply, security of information, cf. below); and EDA's intergovernmental regime (Code of Conduct on Defence Procurement; CoC) strives to create a measure of transparency for the remaining Art 296 cases (as does the new EDA offset CoC, cf. below).

Arguably, these developments provide an overarching context for all more specific measures: With more transparent processes, dubious practices would be exposed and therefore are less likely to happen in the first place, hence opening up for real competition. And with procedures more adapted to the realities of military acquisition in place, again, need to invoke Art 296 should be reduced.

From the EU12 perspective a first comment is that one of the countries, Romania, has not yet subscribed to the EDA CoC. Generally, considering the above-mentioned developments from the vantage point of some of the least competitive Member States – unless they elect not to have any DTIB ambitions – it is of paramount importance that EDTIB policies not be perceived as a disguise for LOI-6 to promote their domestic DTIBs by invoking Art 296, while prohibiting others to promote theirs in a more limited sense, e.g. by requesting offsets[44]. Therefore, it is important that EU12 tenderers do win the EU15 contracts when their offering is the most cost-effective one.

3.2.2 Policies for transparency and market access at subcontract level

As we have seen above, the EU12 industries would in many cases act as subcontractors to defence primes from, e.g., LOI-6 rather than as primes in their own right. The relevant market access then is not a matter of public procurement regulations and practices, but under the control of the primes' sourcing decisions. Alleged difficulties of non-traditional actors getting such market access on normal market conditions is an often iterated argument for offset.

It must also be underlined that national legislation on transfer of defence equipment as well as requirements on security of information and security of supply is important hindrances for sourcing to new companies and new countries. Therefore many of the developments discussed in the above sub-section are also of relevance to subcontract level market access.

However, you can lead a horse to water but you cannot force him to drink; in the end the possibilities for a policy head-on attack here are limited since the prime contractor firms are the decision-makers on their supply chains. Admittedly, EDA's initiative CoBSC – a regime for prime contractors – is an attempt at getting agreement from "the horses" here. But, as discussed in the previous main section, the fundamental problem is one of trust between prime and subcontractor. Building such trust is active processes that will not come about save for mutual commitment.

3.2.3 Policies for transparency and market access in offset arrangements

Offsets can be of many different types. A subset of offsets means that companies in the recipient (i.e. buying) country get intensified access to qualified industrial networks, either functioning as subcontractor to the prime of the underlying defence equipment contract (or their subcontractors), or engaging in other types of collaboration with the prime and its network (relating to other military or civil products or perhaps to R&D into emerging technologies)[45]. In view of the great importance this study has identified for strengthening industrial networks this would seem of high value. On the other hand offset is criticised by many as a market distorting practice.

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[44] *Study on the effects of offsets on the Development of a European Defence Industry and Market*, Final Report, E. Anders Eriksson with contributions by Mattias Axelson, Keith Hartley, Mike Mason, Ann-Sofie Stenérus and Martin Trybus, FOI, SCS, 2007, p 69.
[45] *Ibid.,* Chapter 8.

EDA's recent offset CoC is an attempt at restricting offsets to legitimate purposes, like the above-mentioned building of internationally competitive industries in the receiving country. Many of EU12 have the ambition to achieve this – and also problems with opaque offset practices. As with EDA's CoC on Defence Procurement, one of EU12 – Romania – has not subscribed to this CoC.

3.2.4 Collaborative procurement

One important role for EDA is to help Member States achieve collaborative procurement. Among EU15 there exists a relatively extensive such experience, e.g. in the context of OCCAR. As we have seen EU12 engage very little in such practices, while many factors would suggest the opposite. Using EDA as vehicle for collaborative procurement – as recently, and visibly not very successfully, discussed idea of upgrading the EU12's fleet of helicopters of Soviet origin – would seem highly pertinent.

3.2.5 Relaxed juste retour-like practices

A traditional problem in collaborative procurement is the requirement for the firms of each participating country to receive a share corresponding to that of their country in the overall contract. This is obviously a hindrance for effective specialisation patterns to emerge. An often proposed solution is to apply the juste retour not to each contract, but to whole sets of contracts. In offset there are related practices like offset banking. In the EU12 setting this type of approach would seem particularly useful.

3.2.6 Security of supply

A very important argument for domestic defence sourcing is to ascertain security of supply, both in an operational urgency setting and in the form of "operational sovereignty", i.e. the ability to upgrade one's equipment. Security of supply regulations have been developed in the EDA setting and are also an important element in EC's defence package. LOI-6 also has a security of supply regime.

While more mutual dependencies can help create European-level security of supply it most be noted that the credibility of such regimes is in the final analysis a matter of high politics. With more political EU integration security of supply commitments will gradually become stronger. The willingness of richer and stronger member states to rely on commitments by poorer and weaker states is here a litmus test.

3.2.7 Security of information

Security of information is, like security of supply, a strong traditional argument for domestic sourcing, and similarly the subject of interest in the defence package, as well as the subject of a LOI-6 regime. While of course also a matter relating to high politics, security of information also needs a well-developed technical-legal implementation (while for security of supply this is essentially a matter of ordinary procurement contract law). Our study indicates that security of information may be an important area of mutual distrust among EU12 and between them and EU15.

3.2.8 Intellectual property

Intellectual property is the commercial counterpart of security of information between states. Again we understand this as an area of mutual distrust among EU12 and between them and EU15.

3.2.9 R&D investments

We have above identified more R&D investments as crucial for increased competitiveness and innovativeness in the EU12 DTIBs. This can come as part of equipment development, e.g. in the form of collaborative procurement, and as part of offset agreements. EDA also operates R&T programmes of various types, one way or another based on Member States own money. But there are also other possibilities, particularly if considering investments in dual use technologies.

EU's Framework programmes for research, from 2007 also including a security theme, is an important case in point and an area where successful proposals may lead to a member state gaining more funding. Another possibility is the structural funds, which can fund R&D along with, e.g., investment in physical infrastructure.

3.2.10 State aid practices

Government funding of industrial R&D is a form of state aid already commented. Other relevant forms include restructuring grants under limited periods of time and export promotion. Such activities can have their relevance but do not affect the fundamentals of competitiveness and innovativeness.

3.2.11 Ownership policies

Direct state ownership as well as more limited forms of governmental influence on firms (golden, shares, control regimes of foreign investments and Mergers and acquisitions) exist in EU15 – not least in LOI-6 – and in EU12. State ownership incurs obvious risks of market distortion. Our study, however, gives no firm grounds for more detailed comments in this regard.

3.2.12 Collection and dissemination of standardized data

Less than satisfactory response to our questionnaires lead us to conclude that in order to establish a sound data-base on defence industry within the EU and to permit a proper statistical and policy-oriented analysis of the situation and the developments within this realm, the Community needs to widen and deepen the statistical reporting on defence market and production.

In order to obtain some detailed statistics, it would be useful to develop some reporting standards finding compromise between market monitoring needs and confidentiality requirements (e.g.: periodical submitting of standardized reports through customized internet data gateway).

3.2.13 Summary and recommendations

- Many of the defence industry policy initiatives taken by EDA and EC are useful in creating framework conditions for a good EDTIB development in EU12. The efforts to reduce the need for invoking Art. 296 by means of the new procurement directive is one case in point, the transfer directive another.
- Transparency in procurement processes has to be strengthened as a wide range of deals and engagements among the pMS producers escape the open public tenders.
- Of at least equal importance is increased access to the big primes' supply chains for non-traditional suppliers, e.g. from EU12 – here the CoPPSC is one attempt to achieve a positive development.
- Not only new directives and agreements at generic level are required but also more hands-on implementation activities, e.g. regarding security of supply and security of information.
- Cooperation intra-EU12 is of great importance both in achieving cost-effective in-life support and upgrading capabilities for the future, and in best exploiting the opportunities for using ongoing force modernisation efforts for developing industrial and technological assets of maximum value for EDTIB, i.e. not unduly duplicating assets that already exist elsewhere in Europe.
- Collaborative procurement has a very high potential for EU12, not least in view of the limited defence investment budget available to most of the countries (and despite in many cases quite high efforts in terms of percent of GDP). EDA's initiatives in this respect may help to strengthen such approach to the construction of EDTIB. More thorough analysis of well known obstacles to such procurement (security of supply, security of information, *juste retour* practices) should be subjected to a wider debate and amelioration.

- Policy measures that promote network building by providing scope for concrete collaboration across traditional boundaries – in particular between EU12 and EU15 – are of particular value. Such measures can be collaborative R&T and procurement and also offset arrangements that contain hands-on collaboration either as direct or indirect offset.

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