

Course:

DEFENSE AND SECURITY ECONOMICS

Distance Support Material

TOPIC 5

ECONOMICS OF DEFENSE INDUSTRIAL BASE

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Topic 5



Economics of Defense Industrial Base

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LEARNING OUTPUTS

Students will know:

- Key worlds of defense industrial base area
- Basic classification of defense industrial base

Students will be able to:

- theoretical analysis of defense industrial base
- description of basic models of state – defense industrial base relationship

Students will capable of:

- Discussion of own DIB advantage and disadvantage

ECONOMICS OF DEFENSE INDUSTRIAL BASE

KEY TERMS

Defense industrial base, military industrial complex,

TIME NEEDED FOR CHAPTER STUDY

3 hours

INTRODUCTION

From the historical point of view, in the world of politics and economics of defence industries, there always was some suspicion that practical maintenance of arms arsenal by state owned factories or organizations are the source of inefficiency in public sector. It demonstrates the incompetence of a state to control of defence industry. On the other hand, private sector has also its own internal defects.

Among most serious and permanent deficiencies belong: offering low prices and subsequent raise in outlays, unnecessary sophisticated arms and their expensive production, wrongly calculated outgoings, politically influenced purchases (both of civilian and armed products). We speak about high pace of technological changes, frequent „upgradings“ of arrangements, necessary continuity of systems, their „self-support“, with high level of technological independence, and the maintenance of life cycle. The term „user requirements“ now covers also - apart from military capacities – building-up corresponding national service abilities. Business negotiations between military contractor and civilian provider cannot be characterized by a simple way.

The behavior of Defence Ministry, as a state representative, pushes military official to minimize buying prices. But illegal lobbying of arms industry representatives, i. e. the former top-army officials working in defence industry signalizes that the MoD is more „flexible“ than „people’s representatives“ ought to be. Thus challenges of defence procurement and peace economics reflect in many ways not only economy problems, but also moral state of all society.

1 BASIC CONCEPTS

Arms production has a number of unique features that make the industry rather different to the rest of industry, despite the fact that arms are to a large extent produced within privately owned companies that also produce civilian goods for commercial markets.

The **primary reason** for this difference is the **monopsonistic position of the buyer** of its products. The demand side for military equipment consists primarily of a single customer, the national government and export customers normally represent a rather small share of the total demand for most categories of military equipment.

Thus, the **domestic government has**—through its procurement decisions—a **significant influence** over the **volume of orders, the type of equipment to be produced, and the technology to be developed**.

In addition, through its legislative power, the government can also **control competition and military exports and so industry structure**. On the other hand, the government depends on the defense industrial base for its supplies of military equipment, and therefore tends to protect the arms industry and guarantee it a certain amount of economic viability. Furthermore, the increasing concentration in national arms industries is leading toward oligopolistic and even monopolistic positions of suppliers in certain product areas, which are protected from foreign competition.

Thus, there exists no real competitive “market” for weapon systems, since this “market” by tradition is **monopsonistic**, and is gradually moving toward increasing **interdependence between government and industry**.

This does not mean that there is no competition between companies. On the contrary, **companies make great efforts to win the small number of very large contracts** awarded by their own or foreign governments.

For further understanding this topic, is needed to explain some essential key concepts:

Arms Industry The set of arms-producing companies, which is not a defined sector in industrial statistics but cuts across several of these.

Arms Procurement presents government purchases of military equipment.

Arms Production is the production of military equipment. This term will be explained closely in the paragraphs below.

Arms Producing Company is a company which produces military equipment, often in addition to civil production.

Conversion is defined as the reuse of resources, which previously were tied to arms production, to the production of civilian goods.

Defense economic base is a specific part of the national economy which secure defense and economic requirements of the national defense.

As basis of satisfying all special requirements for goods of defense nature, defense economic base represents an ability of mutually connected branches of national economy – both military and civilian purpose, part of production infrastructure as well immaterial sphere - to secure functioning of national defense economy, both during peaceful time and during endangering of state security (Šefčík, V.) We distinguish four types:

- a) Peaceful
- b) Mobilisation readiness
- c) War economy
- d) Demobilization

Diversification means increasing the variety of manufactured products; civilian diversification involves an increase in the civilian share of total production, either through the reallocation of available resources (conversion), or through an expansion of total production.

Downsizing is reduction of production capacity. Both post communistic countries and developed NATO allies had to solve this problem due to aim of peace dividend.

Military Industrial Complex (MIC) is defined as coalitions of vested interests within the state and industry, including the armed services, government politicians and officials, and representatives of the arms industry.

Offsets Compensations by the export country to the import country, in non-monetary forms, including countertrade, sub-contracting, capital investment, and technology transfers.

2 THEORETICAL ANALYSIS OF DEFENSE INDUSTRIAL BASE

The (defense industry) **arms industry has very specific characteristics**. It is usually a monopsonistic market in which the national government is the main customer and regulates exports. This means **its size, structure, and trade are all determined by government policy**. As Dunne (1995) states, the general characteristics of arms production are:

- a) An **emphasis on the performance of high technology weaponry** rather than on cost.
- b) The **bearing of risks by governments** who often finance R&D and in some cases provides investment in capital and infrastructure.
- c) **Elaborate rules and regulations on contracts**, as a result of the lack of a competitive market and to assure public accountability.
- d) **Close relations** between the **contractors**, the **procurement executive** and the **military**.
- e) Outside of the US many companies will be **national monopolies** or close to it.

These characteristics create a market that tends to favour firms who specialise in defence work, as they know their way around the **red tape** and will have the contacts within the military and the procurement executive.

They will focus on **becoming experts at getting money out of government**, rather than being successful in commercial markets. The companies seek involvement in the development programs for technologically advanced weapons systems as the best means of obtaining the subsequent production contracts. This can lead to 'buy ins', where firms understate risk or cost to win initial contracts, making up the losses later. In addition, past programmes have seen 'gold plating' where the military continually ask for extras or continuous technological improvements over the contract period. This allows renegotiation of contracts or additional payments, usually to the advantage of the contractor. The granting of large R&D contracts with risk borne by government together with specific types of production contracts with guaranteed cost coverage has created a tendency toward high profitability in spite of low efficiency in production.

As a result of the structure of the market there are both barriers to entry and barriers to exit which led, to the Cold War defence industrial base (DIB) showing remarkably stability in terms of its composition of main contractors. These barriers, market, technological and procedural, mean that not only has it been difficult for companies to enter into the defence sector to produce weapons systems, or to upgrade from subcontractor status, but also that it is difficult for the defence companies to leave the industry. The emphasis on performance and the large scale of R&D programs are associated with a trend of rising costs of research and development (R&D), which in turn has made it increasingly difficult for single companies or even single countries to develop new advanced weapon systems. This has created a pressure in the arms industry toward concentration into fewer and larger companies, and toward international collaboration in arms production (Dunne et al, 2007).

The links between these large contractors, the state and the military has been described as a military industrial complex (MIC), reflecting the interrelation between the groups with a vested interest in arms production irrespective of rational considerations of national security. In addition, while most manufacturing industries, went multinational, the arms industry remained national and smaller countries, which could not afford the large fixed costs, imported major weapons systems.

With the fall in demand, following the end of the Cold War, the ability of even the major countries to maintain a domestic defence industrial base was called into question.

Governments had to decide whether to allow mergers and acquisitions which would reduce competition and in particular whether to allow mergers and acquisitions which involved foreign partners. They were also in a situation where the change in the security environment made it harder to justify previous levels of support for the industry and 'competitive procurement policies' aimed at value for money were introduced in a number of countries (Dunne **et al**, 2007).

3 STRUCTURE OF DEFENSE INDUSTRIAL BASE

The **DIB is industrial complex that includes hundreds of thousands of domestic and foreign entities and their subcontractors performing work for DoD and other departments and agencies**. Defense-related products and services provided by the DIB equip, inform, mobilize, deploy, and sustain forces conducting military operations home or worldwide.

For defense industrial base structure description we can use segment, subsegment and component approach (see Table 1, 2)

Table 1 Defense industrial base segments and sub-segments

| Segments | Sub-segments | Segments | Sub-segments |
|------------------------|--|----------------|--|
| Ammunition | <ul style="list-style-type: none"> Bombs and Warheads Cartridges & Fuses Explosives | Missile | <ul style="list-style-type: none"> Tactical Missile Torpedo Strategic Missile |
| Weapons | <ul style="list-style-type: none"> Small Medium Large | Aircraft | <ul style="list-style-type: none"> Fixed Wing Helicopter Unmanned Aerial Vehical |
| Information Technology | <ul style="list-style-type: none"> Command, Control, Computers, and Intelligence Information Security Trainers & Simulators Computer Peripherals | Troop Support | <ul style="list-style-type: none"> Soldier Systems Clothing & Textile Subsistence/Medical Smoke Obscurant Nuclear, Biological, Chemical Systems |
| Shipbuilding | <ul style="list-style-type: none"> Surface Ship Subsurface | Space | <ul style="list-style-type: none"> Launch Vehicle Satellite |
| Electronics | <ul style="list-style-type: none"> Electronic Warfare SONAR RADAR | Combat Vehicle | <ul style="list-style-type: none"> Tracked Vehicle Tactical Vehicle |

Sources: *Defense Industrial Base (Critical Infrastructure and Key Resources, Resources Sector-Specific Plan as input to the National Infrastructure Protection Plan)*. Washington: Department of Homeland Security, Department of Defense, 2007. p. 5-6

Table 2 Defense industrial base components

| Mechanical | | | |
|--|--|--|--|
| <ul style="list-style-type: none"> Diesel Engines Rocket Engines Turbine Engines Aircraft Transmission | <ul style="list-style-type: none"> Automotive Transmission Landing Gear Bearings Pumps & Compressors | <ul style="list-style-type: none"> Nuclear Components Hydraulics | |
| Structural | | | |
| <ul style="list-style-type: none"> Forgings Castings | <ul style="list-style-type: none"> Depleted Uranium Armor Ceramic Armor | <ul style="list-style-type: none"> Composites Precious Metals | |
| Electrical | | | |
| <ul style="list-style-type: none"> Electrical Motors Batteries Thermal | <ul style="list-style-type: none"> Auxiliary Power Units Low Smoke Wire & Cable | <ul style="list-style-type: none"> Aircraft Circuit Breakers Switch Gear | |
| Electronics | | | |
| <ul style="list-style-type: none"> Optics Guidance/Control Communication | <ul style="list-style-type: none"> Digitization GPS Receiver Semiconductors | <ul style="list-style-type: none"> Traveling Wave Tubes Circuit Boards Software | |

Sources: *Defense Industrial Base (Critical Infrastructure and Key Resources, Resources Sector-Specific Plan as input to the National Infrastructure Protection Plan)*. Washington: Department of Homeland Security, Department of Defense, 2007. p. 5-6

The DIB is subdivided into Segments, Sub-segments, and Commodities that produce weapon system platforms, components, and expendables. This taxonomy is used to classify the contributions of particular DIB assets, as well as to analyse the criticality using subject matter experts from each of the areas. This categorization is most applicable to the analysis of impact on DoD mission accomplishment, but it may also contribute to the economic, life, and health consequence areas.

We are able to realize the **description of the defense industrial base by characteristic of defense firms**, too. We can use the **four** appropriate **criteria** for their distinguishing:

- a) Type of production
- b) Variety range of arms products
- c) Level of dependence on military production
- d) Position in structure of the value chain

3.1 Type of the production

The simplest delimitation of the DIB structure can be realized by the four core sectors that can be identified in the defence economy: **Aerospace, Land equipment, Naval and Defence electronics**.

3.2 Variety range of arms products

Typically, aerospace companies were amongst the largest in the group, **supplying a range of defence products and equipment such as aircraft, electronics, missiles and small arms** (e.g. **BAE; EADS; Saab; Thales**). Their size and range of products suggests that such firms might be exploiting economies of scale, learning and scope. Few aerospace companies **specialised in one arms product** and these included Rolls-Royce (engines); Dassault in aircraft; AgustaWestland and Eurocopter in helicopters (being subsidiaries of Finmeccanica and EADS, respectively). By way of this criterion we can differentiate firms into two groups:

- specialized on one commodity production or
- realized multi-commodity production.

3.3 Level of dependence on military production

This criterion enables us to structure defence industrial base into three groups of firm which are (see Table X, next page):

- **Fully-dependent** on military production (100% share of military production on overall production)
- **Medium-dependent** on military production (90% - 50% share of military production on overall production)
- **Low-dependent** on military production (less than 50% share of military production on overall production)

Few firms are **100% defence-dependent** (BAE Systems Inc: US subsidiary of BAE Systems; Elettronica; MBDA (subsidiary); DCN; Nexter; MBDA Italia (subsidiary); Oto Melara (subsidiary); Santa Barbara Sistemas (subsidiary); Thales Nederland (subsidiary): some of these are subsidiaries). If the 'cut-off' is lowered to arms sales accounting for 75% - 99% of total sales, the number of firms with such defence-dependency rises to a further twelve (including subsidiaries: e.g. BAE Systems with a 95% arms share; Agusta Westland; Saab; Patria; QinetiQ; Ultra Electronics).

Almost half of the arms firms which are 100% defence-dependent are single arms product firms (e.g. electronics; missiles; motor vehicles; ships). Also, there were 20 European arms firms which were single product arms firms representing 60% of European arms firms (including others group but excluding subsidiaries).

3.4 Position in structure of the value chain

The **types of companies** operating in this sector can be classified as:

- Prime contractors
- Tier 1 contractors
- Tier 2 contractors
- Tier 3 contractors

Prime contractors are lead systems integrators, platform producers and producers of weapon systems): in the EU these are mainly large companies (primarily national champions), specialized on 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.

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

Tier 2 contractors are producers of components and supply services: 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 subcontractors), 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.

Tier 3 contractors 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, externalised 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 and often pursue, in addition, non-defence product lines.

4 MODELS OF RELATIONSHIP BETWEEN STATE AND DIB

Governments can choose to exert a positive influence on the structure and capabilities resident in their defence industrial bases at both a general level i.e. the overall attractiveness of the defence business environment, and at the specific level, to achieve defence outcomes in particular capabilities or technology domains. The levers can be grouped into **5 types**:

- a) Government as Investor
- b) Government as Planner
- c) Government as Customer
- d) Government as Supporter of Industry
- e) Government as Regulator

Government as Investor: government investments in defence-related research and development while foremost directed at meeting military needs can also increase the level of innovation in the industrial base. ·

Government as Planner: forward defence planning at both the strategic(capabilities) and the equipment program level can provide the domestic industry with an reference base for making business and investment decisions (when such planning is done jointly with industry, a high level of alignment of government (military) and business interests can achieved).

Government as Customer: the choice of acquisition models can influence the decision of suppliers whether or not to engage in the defence procurement process (e.g. the available profit margins, the ability to organize into consortia and at what stage in the procurement life-cycle).

Government as Supporter of Industry: employing targeted programs and financial tools (e.g., helping companies to fund infrastructure and capital assets, investing in the R&D activities of companies, financing the training and development of employees, providing export credit guarantees) and activity based measures (e.g. organizing and participating in trade promotion events, furthering industry participation in international collaborative programs).

Government as Regulator: controlling ownership and access to IP, imposing/relaxing controls on industry's agility and profitability, controlling defence exports.

Except models of relationship between government and defense industrial base, we are able express the models of defense industrial policies. Afterwards the countries we can generally divide into those that have well-articulated defence industry policies/strategies and those that have lesser stated policies in respect to their defence industrial bases. Most countries, whether having a formally stated defence industrial policy or not, employ the specific policy tool of 'Offsets', to gain economic benefits when they procure their defence equipment from foreign contractors (see Image XX).

5 RESOURCES OF DIB FINANCING

One of the hardest obstacles of defense market entrance is **high input costs**. This fact strongly influences possible structure of resources available for defense firms. So resource financing of defense firms production could be a bit different from other firm with non-military production. We can express following list of financing resources:

1) OWN SOURCES

- Funds gained from **realization own production** (undistributed profit)

2) OUTSIDE SOURCES

a) *PRIVATE*

- **Means derived from capital market**

- Short term credit
- Long term credit

b) *PUBLIC*

- **Investment means mainly from budgetary sources**

- **Direct** subsidy (government loans, irretrievable aids, government grants)
- **Non-direct subsidy** (tax relief)
- Non-direct subsidy by way of **credits guarantee** (i.e. export credit guarantee)

- **Other forms of subsidies**

- Ordering of unnecessary government contract
- State promotion of export (retrieval business partners, lobbying, supporting of export activities /credit, insurance, guarantee/)
- Compensation of armament trade embargos

6 DIB DEVELOPMENT INFLUENCE FACTORS

The DIB operates in a certain regime, within a specific socio-economic context. This regime is subjected to important drivers for change that will alter the nature of the DIB, and its development. Among these factors we can included:

a) Political factors

- EU policy driving factors
- National (Member States) political driving factors

b) Economic factors

c) Societal factors

d) Technological factors

6.1 Political factors

EU policy driving factors

These drivers include the policy trends that are developed within the political context of the EU and may impact the structure of the DIB. For defence, these are mainly EU policy and the EDA.

National (Member States) political driving factors

The EDTIB is currently very much influenced by its national context. That is why this driver category will include the trends that are discussed within the national policy environment. These will mainly comprise national defence policies, but also increasingly the general industry policy.

6.2 Economic factors

Economic driving factors

The economic drivers for change will include the economic developments that will exert pressure on the DIB structure. Here, basic economic characteristics are used, as well as some more defence-oriented factors like dual use and the business strategy of the 'prime'.

6.3 Societal factors

Societal driving factors

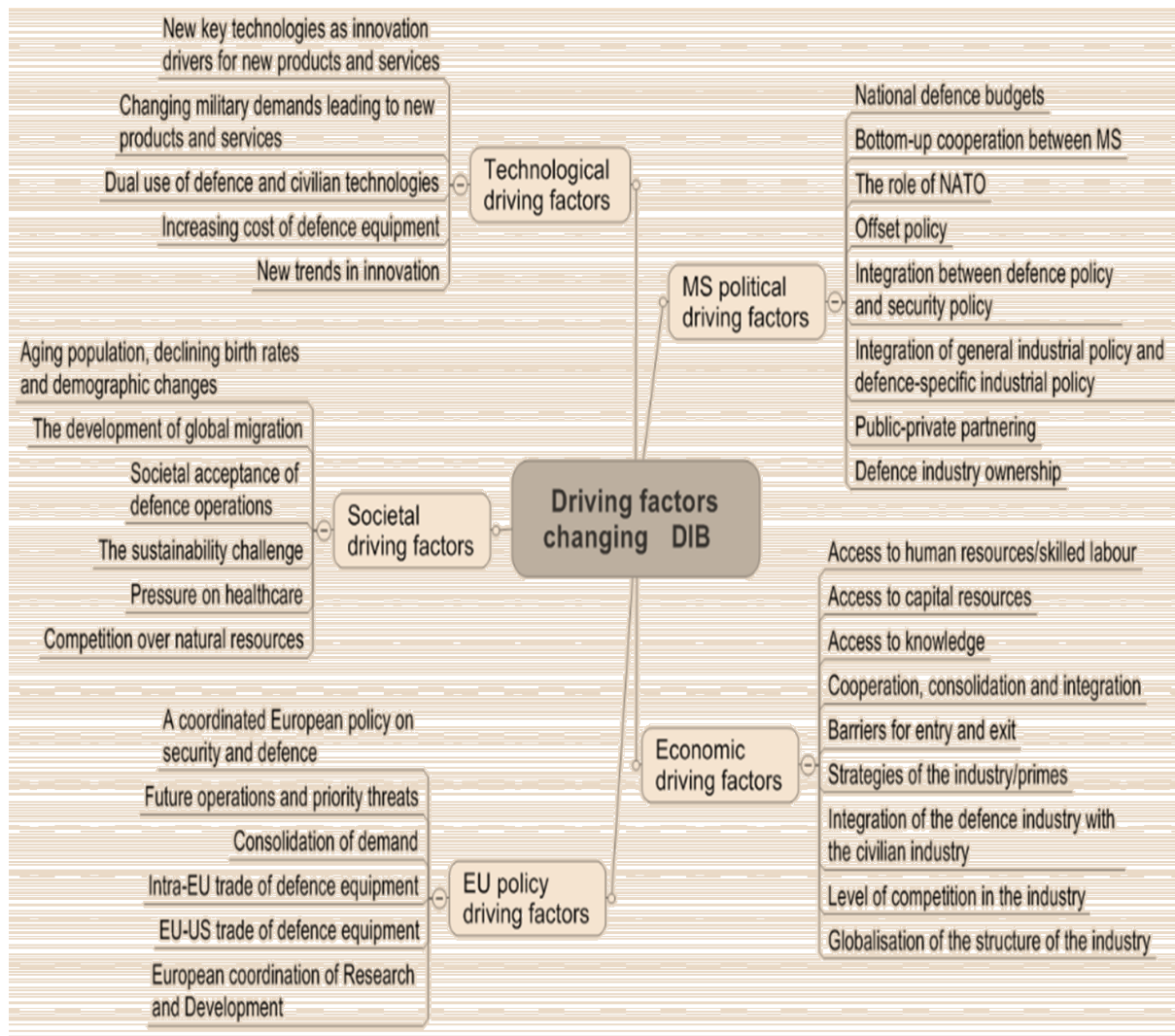
This category includes the changes in societal norms and values, as well as the more structural societal trends which are of importance to the development of the DIB. Some of these trends in society are important driving factors for defence.

6.4 Technological factors

Technological driving factors

One of the core elements of the DIB is its technological base. This is highly influenced by developments in science and technology (supply), as well as by changes in the functionalities of the defence equipment needed (demand).

Chart 1 Overall summary of factors which influence DIB



Sources: Looking at these (sub)categories (see Chart X), the following drivers were identified that have a strong influence on the developments in the DIB:

National defence budgets

An influential changing factor is the further development of the national budgets-for defence, both R&D and other expenditures.

Bottom-up cooperation between countries

Cooperation can be organised on a European level, but separate countries can also take the initiative to organise cooperation between individual nations.

The role of NATO

Being an important international defence organisation structure, the strength and role of NATO can also have an impact on the strength of the EDTIB.

Offset policy

One of the main mechanisms for cooperation between US and EU are the offset agreements, connecting national procurement to industrial orders.

Integration between defence policy and security policy

The link between defence and security is becoming so strong that a distinction cannot be made with ease. This also will have its effect on the industrial and technological base.

Integration of general industrial policy and defence-specific industrial policy

Traditionally, the defence industrial policy stands apart from the more generic industrial policy (due to the special role of government). The opening of markets and the further increase of interlinkages will also help to integrate both policies.

Public-private partnering

In the past, the organisation of defence operations was exclusive government business. A trend is to be seen towards increased servicing of goods (e.g. leasing of products).

Defence industry ownership

In some countries a significant part of the national defence industry is owned by the government. This is an important factor that stimulates national procurement and may be an impediment to the creation of multinational firms.

CONCLUSION

Defense industrial base is quickly developing area of national economy. It is possible to expect an development to high-tech technology. This development will influenced by budget conditions, anticipated form of future conflicts and afford protect human capital both on own side and on side adversary.

TASKS FOR SELFSTUDY



1. Explain meaning of following terms: Defense Economic Base, Defense Industrial Base, Military-Industrial Complex, Armament Industry, Military Industry, Military Production. Does the connection exist among them? Try to identify differences among them?
2. Think, do the countries need a Defense Industrial Base? Express, economic and politic arguments for maintaining national DIB.
3. Try to characterize armament market. Describe the demand and supply side of armament market production. Why do the military firms strive to enter the armament market? Think, What are the barriers to entry market of armament production?
4. Try to describe the past, present and future development of world armament production (defense industry), can we find some differences between USA and European defense industrial base development?
5. Try to describe defense industrial base and policy in arbitrarily chosen country (Describe DIB structure, give an examples well-know products and producers, position in armament trade etc.).
6. Choose some example of executed military project (i.e. F-117 Stealth, F-35 Joint Strike Fighter /version A, B, C/; Eurofighter Typhoon, Gripen,) and describe its development, numbers of planned and taken pieces, acquisition price developed weapons, costs of weapon development and production and so on).
7. What are the offsets? Try to explain meaning of this term. Describe history this economic support tool of domestic defense industry. Make clear why were the offsets introduced as economic support tool and explain their importance. You can choose some examples of realized offsets as an illustration.

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ADDITIONAL STUDY RESOURCES



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