

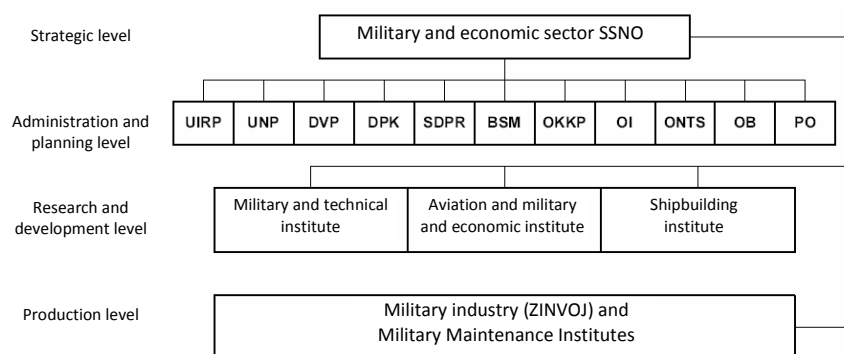
## 10. Analysis of Industry and Structure of Industrial Production in FBiH - Sector of Military Industry

### 10.1. Cross-Section of Production Programs

#### 10.1.1 Introductory Considerations

Equipping one's own armed forces with weapons, ammunition and military equipment with possibilities of relying on our own strengths or on military assistance from abroad is a strategic issue of every state policy. The smaller the country the more important this issue is, primarily due to the interest of major military powers to, in addition to achieving maximum production of weapons, ammunition and military equipment, also achieve maximum profit by selling these products to other countries.

Yugoslavia's military industry in late 1980s functioned through joined industry of arms and military equipment of Yugoslavia, whose operations were coordinated and operated by the Federal Secretary for National Defense through the military and economic sector (VPS). The VPS integrated development, research, production and traffic of arms and military equipment (NVO). A simplified organizational chart of the military and economic sector is presented in Figure 10.1.



**Figure 10.1** Organizational Chart of Military and Economic Sector [10]

Overall coordination between military factories and the Federal Secretariat for National Defense was carried out by the Department for research, development and production of NVO (UIRP) based on the Rulebook on equipping the armed forces of Yugoslavia with weapons and military equipment in peacetime, SSNP, UPRF-1, Belgrade, 1985.

Department for research, development and production of NVO was responsible for research, development and production of weapons and military equipment. It was also obligatorily involved in the implementation of contract on procurement of arms and equipment (NVO) from abroad, and when appropriate also in other phases of this process.

Department for the purchase and sale (UNP) had the task of procurement of NVOs of domestic production for the armed forces, and the sale of surplus and worn out military equipment on the domestic market. Directorate of Aircraft Program (DVP) planned and monitored the implementation of research and development programs for aviation technology and aviation manufacturing techniques. Directorate of Program Kapela-DPK was engaged in organizing and monitoring of conquering and mass production of tank M-84. Federal Directorate for sale and reserves of special-purpose products-SDPR had the task of export and import of NVO and military engineering, military technology transfer, monitoring of military scientific-technical cooperation with other armies. Bureau for Standardization and Metrology-BSM defined military standards, equipped and monitored measurement laboratories. Department for quality control and reliability-OKKP monitored and verified quality and reliability of NVO. Department of Informatics-OI was responsible for establishing and maintaining a unified information system of VPS. Department for Scientific-Technical and Military Technical Cooperation (International)-ONTS had the task to prepare committees, meetings of working groups and monitoring the implementation of conclusions from sessions. Department for Safety-OB was responsible for security in institutes and military industry. Personnel Department-PO engaged in personnel related activities of all organizational units of VPS, including military institutes and officers in military industry [10].

Military technical potentials of Yugoslavia were, due to their size and economic power, extremely large, and they included technical capacities engaged in research, development, production and testing resources of NVO. These capacities were divided into two levels. One level included institutions and organizations dealing with research and development in the field of military technology, and the other the NVO industry that was commonly called designated industry or designated production.

Joint military industry (ZINVOJ) included military factories within which common concepts in negotiations with SSNO were defined. None of the managers of military factories could be appointed without the consent of the Board. Formally speaking, those factories could not operate independently of SSNO and they had a special status (in the choice of managers and CEOs, organizational structure, production program, price determination, export, etc.). They all were under the competence of the Federal Secretariat for National Defense (SSNO) which was situated in Belgrade, Serbia.

Military technical institutes were mainly engaged in repair of assets, but also production of spare parts and NVO assets and R & D activities from its field of work.

Before the breakup of former Yugoslavia, 55-60% of the defense industry of Yugoslavia was located on the territory of Bosnia and Herzegovina [1,2]. Most of the production of weapons and ammunition in BiH today is taking place on the territory of the Federation of Bosnia and Herzegovina, with special focus on products related to ammunition, and maintenance and repair of ammunition and weapons (Table 10.1). The scope of this industry was significant, by providing a wide range of products and services.

**Table 10.1** List of Members of ZINVOJ based in Bosnia and Herzegovina [10]

| Name and location of company                                 | Production program   | Number of employees |
|--|--|---------------------|
| Factory of machinery and hydraulics „Bratstvo“, Novi Travnik | Mortars, artillery guns and multiple-missile launchers   | 1450                |
| ZRAK Sarajevo  | Observation and sighting device and apparatus, parts of the police and electronics for missiles                  | 2150                |
| Professional Electronics „Rudi Čajavec“, Banja Luka          | Police, means of communication, crypto protection, NBK detectors   | 3800                |
| Factory „Soko“, Mostar                                       | Fighter jets and helicopters   | 2630                |
| UNIS – PRETIS, Vogošća                                       | Artillery ammunition, missile projectiles, aircraft bombs  | 4700                |
| UNIS – IGMAN, Konjic   | Small-caliber ammunition   | 1350                |
| UNIS – Slavko Rodić, Bugojno                                 | Lighters for artillery ammunition, gun capsules for artillery ammunition, grenades, mines and prevention devices | 3450                |
| UNIS – „Pobjeda“, Goražde                                    | Initial explosives, capsules and detonator capsules  | 1800                |
| UNIS – „Slobodan Princip Seljo“, Vitez                       | Double component and composite fuels   | 780                 |
| Factory of special vehicles „FAMOS“, Hrasnica                | Armored combat vehicles  | 1050                |
| Factory of special transmissions RO- „FAMOS“, Hrasnica       | Tank transmissions   | 150                 |
| UNIS – RO „Vitezit“, Vitez                                   | Explosives   | -                   |
| Factory of nitrogen compounds UNIS – RO „Azot, Vitkovići     | Explosives   | -                   |
| Factory of sanitary designated production, Sarajevo          | Medical equipment  | -                   |

Collective estimated values of manufacturer of NVO members of ZINVOJ until 1988 to 1990 (first and second group), RO (working organization, company) of the manufacturer of NVO of the third group and military repair institutes by the Yugoslav republics on

31.12.1990 expressed in U.S. \$, and shown in Table 10.2. Table 10.3 gives a summary of the collective estimated values of the military repair institutes in BiH.

**Table 10.2** Collective overview of estimated values of RO of the manufacturer of NVO and repair institutes in US\$ [10]

| Republic   | Estimated value of RO member of ZIVNOJ up to 1988 | Estimated value of RO member of ZIVNOJ from 1988 to 1990 | Estimated value of other ROs producers of NVO from 1986 to 1990 | Estimated value of repair institutes | Total 2+3+4+5 |
|------------|---|--|---|--------------------------------------|---------------|
| 1          | 2   | 3  | 4   | 5                                    | 6             |
| BiH        | 2.263.086.280                                     | 26.850.000   | 9.490.000   | 142.000.000                          | 2.441.426.280 |
| Montenegro | 79.756.350  | 0  | 1.990.000   | 204.983.000                          | 286.729.350   |
| Croatia    | 368.873.090                                       | 5.150.000  | 7.040.000   | 205.507.580                          | 586.570.670   |
| Macedonia  | 64.802.030  | 1.130.000  | 1.250.000   | 0                                    | 67.182.030    |
| Slovenia   | 194.406.090                                       | 5.220.000  | 17.910.000  | 43.000.000                           | 260.536.090   |
| Serbia     | 2.013.847.700                                     | 25.330.000   | 18.540.000  | 159.500.000                          | 2.217.217.700 |
| Total      | 4.984.771.540                                     | 63.680.000   | 56.220.000  | 754.990.580                          | 5.859.662.120 |

**Table 10.3** Collective overview of estimated values of military maintenance institutes in BiH in US\$ [10]

| Name of repair institute        | Main Office | Value of equipment in US\$ |
|---------------------------------|-------------|----------------------------|
| Aeronautical institute „Kosmos“ | Banja Luka  | 40.500.000                 |
| Electro Technical institute     | Travnik     | 20.500.000                 |
| Technical repair institute      | Hadžići     | 38.500.000                 |
| Aeronautical institute „Orao“   | Rajlovac    | 42.500.000                 |

Within the complex system UNIS there was Joint military industry with a task to coordinate the work of military factories under the holding company UNIS, to define the participation percentage of each military factory in the manufacturing process of the final product of ammunition (factories PRETIS and IGMAN were in charge for the final production phase, and other military factories within UNIS were the subcontractors to these factories).

Although it was significantly damaged and destroyed, the military industry in the postwar period managed to survive under completely changed circumstances of organization and work (Federal Directorate for designated industry has assumed the task of coordinating operations of military factories) by working exclusively for foreign markets. Significant expertise within the industry remained so that in the past years the value of export of ammunition and weapons gradually increased. Since 1997 to 2001 the value of exports from the Federation has increased tenfold and reached a value of about 12 million Euro a year [4].

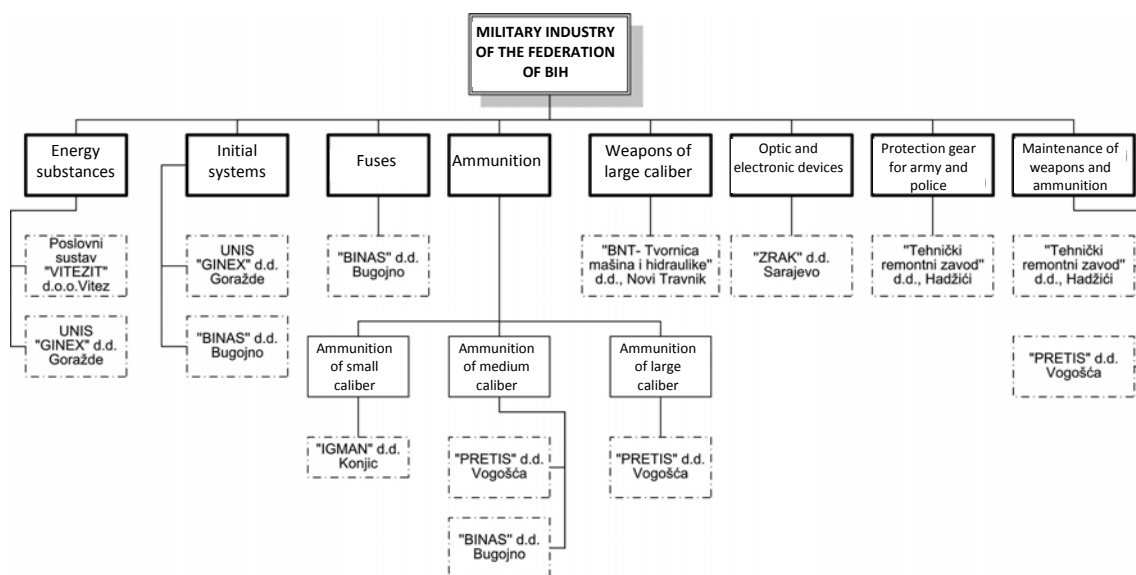
In 2004 according to official figures BiH exported arms and/or ammunition to 39 countries with a total value of 35 million Euro, and in 2005 the total value of exports of

arms and military equipment was around 63.5 million Euros. Export was carried out to a total of 30 countries in the world [5,6].

### 10.1.2 Structure of Military Industry of FBiH

In accordance with the production capacity and range of products in factories, the Military Industry Sector of the Federation of BiH was divided into the following production branches (Figure 10.2):

- Production of energy materials,
- Production of initial devices,
- Production of lighters,
- Production of ammunition: small caliber, medium caliber and large caliber,
- Production of weapons of large caliber,
- Production of opto-electronic devices,
- Production of protection equipment,
- Repair of weapons and ammunition.



**Figure 10.2** Structure of military industry of FBiH

Military industry factories were privatized up to 49% by PIFs and small shareholders. Factories Pobjeda "Rudet" d.d. and Pobjeda "Sport" d.d. are 100% privatized, while only PS "Vitez" d.o.o. is 100% owned by the Federation of BiH [8]. Companies "PROMEX" and "Intrade" sell products of military industry, while all companies manufacturers are authorized to sell military industrial products.

#### **Business system "VITEZIT" d.o.o.Vitez**

Business system "VITEZIT" d.o.o. originated from two UNIS ROs: "Slobodan Princip Seljo" and "Vitezit". The total value of capital in the amount of 50,677,512 KM [7] on

31.12.2007 was 100% owned by the Federation of BiH [8]. In comparison to 2006 there was a reduction in capital value up to 2.64%.

Production program of the factory:

- Military production:
  - Production of double component fuels,
  - Production of composite fuels (for missile engines and gas generators for artillery missiles).
- Civil production:
  - Production of industrial explosives: powder and plastic,
  - Production of detonating cords.

Out of 16,000 t/per year of projected production capacities for the production of industrial explosives used by 6%, while capacities for the production of double base fuels (1,700 t/per year) and production of composite fuels (160 t/per year) are not utilized at all [7].

#### **UNIS "GINEX" d.d. Goražde**

UNIS Factory RO "POBJEDA" split after the war into three companies: UNIS "GINEX d.d. Goražde, Factories Pobjeda "Rudet" d.d. and Pobjeda "Sport" d.d.

The total value of capital of the factory UNIS "GINEX d.d. Goražde was 16,884,010 KM [7] on 31.12.2007 with the following ownership structure: Federation of BiH (51%), PIF MI GROUP (28.17%), PIF BOSFIN (7.73%), HUBJER DAMIR (6.97%) and HIDROGRADNJA (1.24%) [8]. In comparison to 2006 the capital value increased by 5.26%.

Production program of the factory:

- Military production:
  - Initial capsules for small caliber ammunition,
  - Detonator and duplex capsules for artillery ammunition,
  - Lighter for hand grenade,
  - Electro-inflammable heads, electric initiators for lighting and pyrocartridges for missile systems,
  - Production of ECO capsules without heavy metals for small caliber ammunition (three types of capsules).
- Civil production:
  - Initial and detonator capsules for civil purposes,
  - Decelerators for detonating cords.

The projected production capacities for the initial capsules for small caliber ammunition (400,000,000 pieces/per year) were used up to 80%, capacities for detonator and duplex capsules for artillery ammunition (10.000.000 pieces/per year) were used up to 20%, while capacities for lighters for hand grenade (2.000.000 pieces/per year) and electro-inflammable heads, electric initiators for lighting and pyrocartridges for missile systems (500,000 pieces/per year) are currently not used [7].

### **"BINAS" d.d. Bugojno**

The factory was built from the prewar UNIS RO "Slavko Rodić" Bugojno.

The total capital value of the factory was 29,155,439 KM on 31.12.2007 with the following ownership structure: Federation of BiH (51%), PIF BIG (18.69%), PIF BONUS (14.88%), PIF NAPRIJED (2.55%), PIF BOSFIN (2.33%) and others (10.55%) [8].

Production program of the factory:

- Lighters for artillery ammunition from 60 mm to 155 mm,
- Cannon capsules for artillery ammunition,
- Hand grenades,
- Ammunition 40 mm grenade launcher.

Table 10.4 shows the projected annual production capacities for work in one shift in the company "BINAS" d.d. Bugojno.

**Table 10.4** Projected annual production capacities in the company "BINAS" d.d. Bugojno [8]

| Name of the line             | Installed capacities (piece) | Used in 2007 (piece) |
|------------------------------|------------------------------|----------------------|
| Ammunition 40 mm             | 250.000                      | 0                    |
| Lighters and cannon capsules | 500.000                      | 0                    |
| PT mines                     | 100.000                      | 0                    |
| Hand grenade                 | 600.000                      | 0                    |

### **"IGMAN" d.d. Konjic**

The total value of capital of the factory was 21,813,884 KM [7] on 31.12.2007 with the following ownership structure: Federation of BiH (51%), PIF BONUS (23.29%), PIF BOSFIN (13.50%), PIF MI Group (7.61%), PIF BIG (4.02%) and others (0.67%) [8]. In comparison to 2006 the value of capital decreased to 11.96%.

Production program of the factory:

- Military production:
  - Ammunition 5.56 x 45 mm, ammunition 7.62 x 39 mm, ammunition 7.62 x 51 mm, ammunition 7.62 x 54 mm, ammunition 7.62 x 63 mm, ammunition 12.7 x 99 mm and ammunition 12.7 x 108 mm,

- metal segment/joint for batching ammunition.
- Civil production:
  - hunting carbine and sports ammunition,
  - cannon ammunition.

Projected production capacities for ammunition 5.56 mm and 7.62 mm were utilized up to 75%, while the ammunition 12.7 mm production capacity was used up to 100% [7].

### **“PRETIS” d.d. Vogošća**

The total capital value of the factory was 52,852,259 KM [7] on 31.12.2007 with the following ownership structure: Federation of BiH (51%), PIF BOSFIN (30%), PIF NAPRIJED (12.54%) and others (6.46%) [8]. In comparison to 2006 value of capital has not significantly changed.

Production program of the factory:

- HE (high explosive) artillery ammunition caliber 76 to 155 mm,
- Illuminating artillery ammunition 105 mm and 155 mm:
  - 105 mm, ILL, M314 and 155 mm, ILL,
- Smoke artillery ammunition 105 mm and 155 mm,
- Counter-armor artillery ammunition:
  - 125 mm, HEAT and 125 mm, KE,
- HE mortar ammunition 60, 82 and 120 mm,
- Illuminating mortar ammunition 60, 82 and 120 mm,
- Missile projectiles for multiple missile launchers: 122 mm (HE and DPICM) and 128 mm (HE and DPICM),
- Rifle grenades (HE).

Table 10.5 shows projected production capacities in company “PRETIS” d.d. Vogošća.

**Table 10.5** Projected production annual capacities in company “PRETIS” d.d. Vogošća [7]

| Name of product  | Projected capacity (piece) | % Use |
|--|----------------------------|-------|
| Mortar ammunition, all types                           | 10.000                     | 80    |
| Mortar ammunition – forging projectile body, all types | 100.000                    | 80    |
| Rifle grenades (HE)                                    | 30.000                     | 100   |
| Ammunition, 105 mm, HE M1                              | 5.500                      | 100   |
| Ammunition, 105 mm, ILL M314                           | 11.000                     | 30    |
| Ammunition, 155 mm, ILL                                | 1.000                      | 30    |
| Ammunition, 155 mm, SMOKE                              | 5.500                      | 30    |



**"BNT- Factory of machinery and hydraulics" d.d., Novi Travnik**

Since its founding 1949 the factory produced weapons and military equipment for ex-Yugoslavia and its armed forces. Production capacities were greater than demand, so that a part of the production was intended for export.

The total capital value of the plant was 107,487,950 KM [7] on 31.12.2007 with the following ownership structure: Federation of BiH (51%), PIF BIG (32.06%), PIF BOSFIN (12.83%) and others (4.11%) [8]. In comparison to 2006 the value of capital decreased to 12.97%.

Production program included the following resources:

- artillery weapons 76 mm to 155 mm caliber,
- missile systems 128 mm and 262 mm caliber,
- mortars from 60 mm to 120 mm caliber,
- counter-armor weapons 44 mm, 82 mm and 100 mm caliber,
- tank guns 100 mm and 125 mm caliber.

Part of the program for civilian use refers to the production of hydraulic large-sized cylinders for hydro-power plants and mining.

In the post war period the implemented production programs were the production of artillery weapons of 122mm caliber for the Armed Forces of BiH, production of mortars for export and production of spare parts for weapons from the production program.

**„ZRAK“ d.d. Sarajevo**

The total capital value of the factory was 16,753,619 KM [7] on 31.12.2007 with the following ownership structure: Federation of BiH (51%), PIF MI GROUP (16.50%), PIF BOSFIN (21.76%) and others (10.87%) [8]. In comparison to 2006 the value of capital was significantly reduced to 38.96%.

Production program of the factory:

- Military production:
  - Observation and sighting devices for infantry weapons,
  - Observation and sighting devices for artillery weapons,
  - Observation and sighting devices for tanks and armored transporters.
- Civil products (magnifying glasses, hunting snipers, refract meters etc.).

Table 10.6 shows projected annual production capacities of certain product lines which were used in 2007 for the work in one shift, in company "ZRAK" d.d. Sarajevo.

**Table 10.6** Projected annual production capacities of company „ZRAK” d.d. Sarajevo [8]

| Name of line                   | Installed (piece) | Used in 2007 (%) |
|--------------------------------|-------------------|------------------|
| Processing of optical elements | 100.000           | 20               |
| Thin optical coatings          | 100.000           | 20               |
| Mechanical processing          | 200.000           | 15               |
| Photolithography               | 10.000            | 30               |

**"Technical repair institute" d.d. Hadžići**

The total capital value of the factory is 6,825,054.60 KM on 31.12.2007 with the following ownership structure: Federation of BiH (51%), PIF BOSFIN (24.99%), PIF EURO FUND (5.00%) and Meho Mujić and others (19.01%) [8].

Production program of the factory:

- Repair of infantry and artillery weapons,
- Repair of armored combat vehicles,
- Production of military protective gear: vest, visor, helmet.
- Services:
  - repair and servicing of passenger, off-road, freight and special vehicles;
  - technical inspection of motor vehicles;
  - certification of motor vehicles;
  - machine processing (scraping, milling, grinding).

Table 10.7 shows the projected annual production capacity for work in one shift in the company "Technical Repair Institute" d.d. Hadžići.

**Table 10.7** Projected production annual capacities of company "TRZ" d.d., Hadžići [8]

| Name of line                     | Installed capacities (no. of hrs) | Used in 2007 (no. of hors) |
|----------------------------------|-----------------------------------|----------------------------|
| Repair of armored combat devices | 300.000                           | 0                          |
| Repair of artillery weapons      | 20.000                            | 0                          |
| Repair of infantry weapons       | 200.000                           | 0                          |
| Repair of special vehicles       | 30.000                            | 10.000                     |

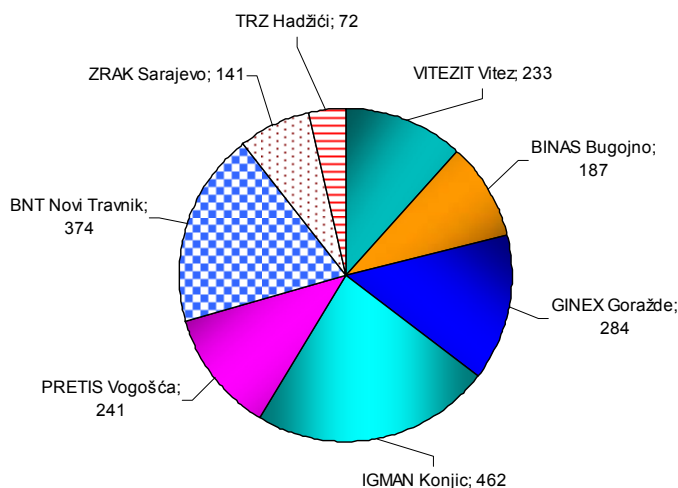
### 10.1.3 Analysis of the Current State of Production in Factories

For the purpose of the complete analysis of the current state in the military industry factories, a review of business results in 2006 and 2007 was presented.

The following companies are included through the direct contact with management and the visit of production facilities:

- "IGMAN" d.d. Konjic
- UNIS "GINEX" d.d. Goražde
- "PRETIS" d.d. Vogošća
- "ZRAK" d.d. Sarajevo
- „BNT- Factory of Machinery and Hydraulics" d.d., Novi Travnik
- Business system "Vitezit" d.o.o. Vitez

#### Human resources indicators

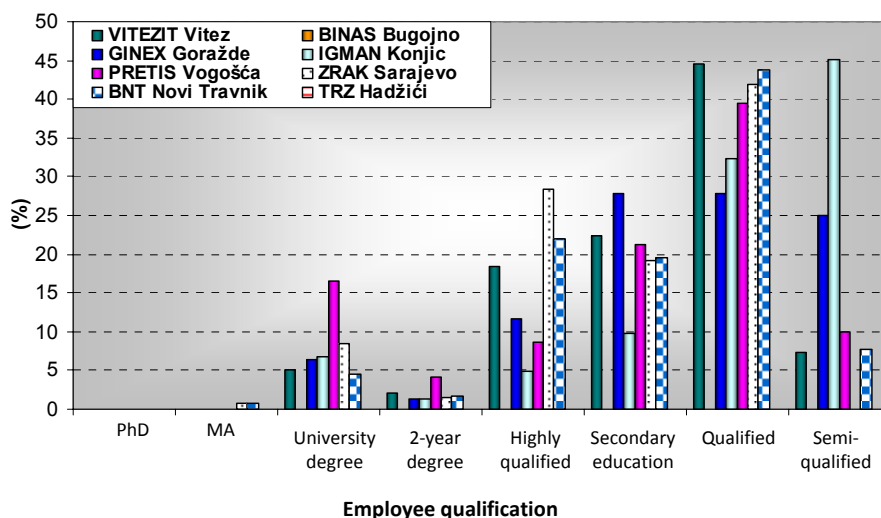


In the factories under survey there were 1994 employed workers in 2007 (Figure 10.3).

**Figure 10.3** Number of employed workers in factories in 2007 [8]

A very unfavorable staff and age structure of employees is visible in (Figure 10.4):

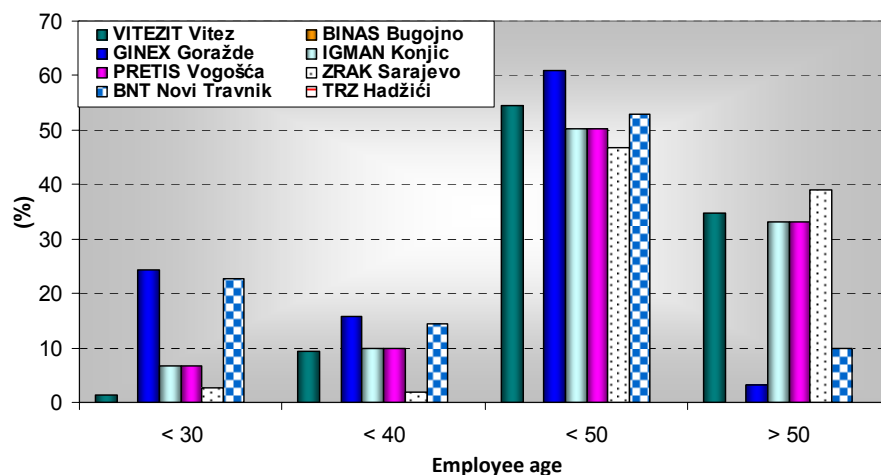
- Lack of highly professional staff who by their educational or overall qualities may work as system engineers whose skills are needed for the conduct and implementation of complex weapons systems.
- In some of the plants there was a lack of highly skilled workers, which became a limiting factor in accepting the offered jobs.
- Number of university education and highly qualified workers is under European standards.



**Figure 10.4** Employee qualification structure [7]

Only about 3% of workers are employed in the development sector. Out of the military industry factories, before the war, only 3 factories were able to engage in the development of program from their overall program orientation. These are: PRETIS, ZRAK and "Slavko Rodić" Bugojno. Only these firms had a development sector, while other firms had a department for technological development. In order to maintain their own range of products, these departments began to engage in product development.

About 85% of workers over 40 years of age are employed in factories (Fig. 10.5). Therefore, there was a need of the surveyed factories to employ staff with a university degree, but also with the high school diploma with different specialist professions for the field of military industry.



**Figure 10.5** Employee age structure [7]

## Financial indicators

Lack of working capital is a serious obstacle to launch production, especially the one intended for export. Burden of obligations and significantly affected solvency decreased the credit ability of companies and foreign banks avoid (impose a ban) financing military production.

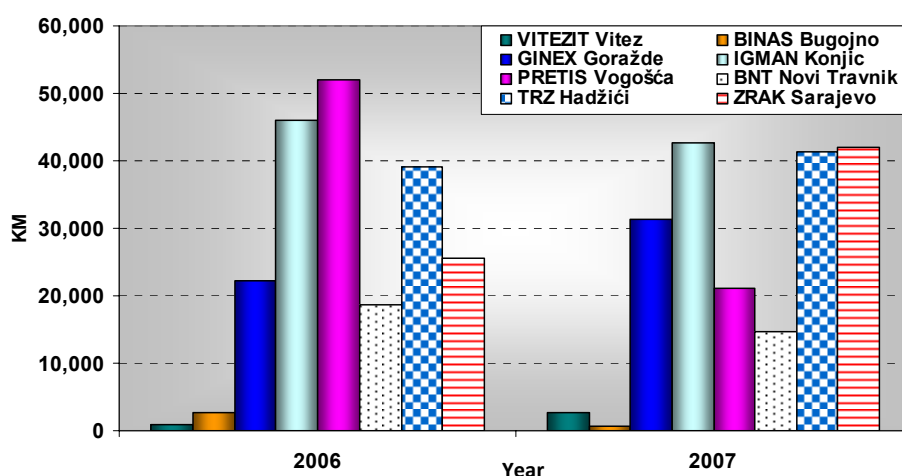
The bidding process where both financial power and turnover in previous years were evaluated was preprogrammed to fail, regardless of the relatively good and acceptable level of quality and performance of assets that are subject of bids. A special difficulty is the provision of a guarantee for return of advance payment and well performed work.

Military industry companies do not have adequate financial support for their business operations, or a strong bank support that would provide intensification of production and foreign trade turnover.

Total revenue of the surveyed factories in 2006 amounted to 55,079,719.00 KM, and in 2007 49,625,140 KM. Total average revenue per employed worker in 2006 and 2007 (Figure 10.6) was around 201,725 KM.

Out of this amount around 60% refers in the last two years to the income from exports (Fig. 10.8). In 2006, the total export value amounted to 39,685,689 KM, and in 2007 there was a decrease in exports to a value of 28,747,117 KM (Fig. 10.7).

Imports are mainly related to the procurement of raw materials for production (Fig.10.9).



**Figure 10.6** Total revenue per employee [7,8]

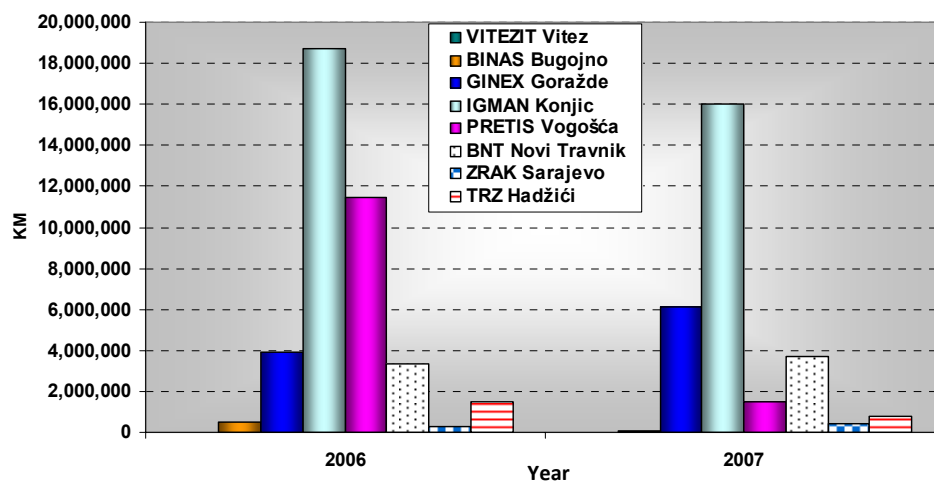


Figure 10.7 Total exports [7,8]

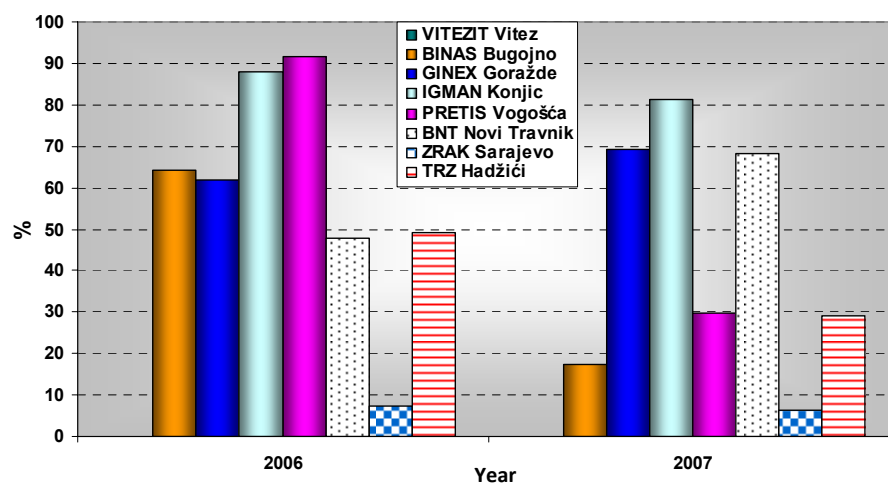
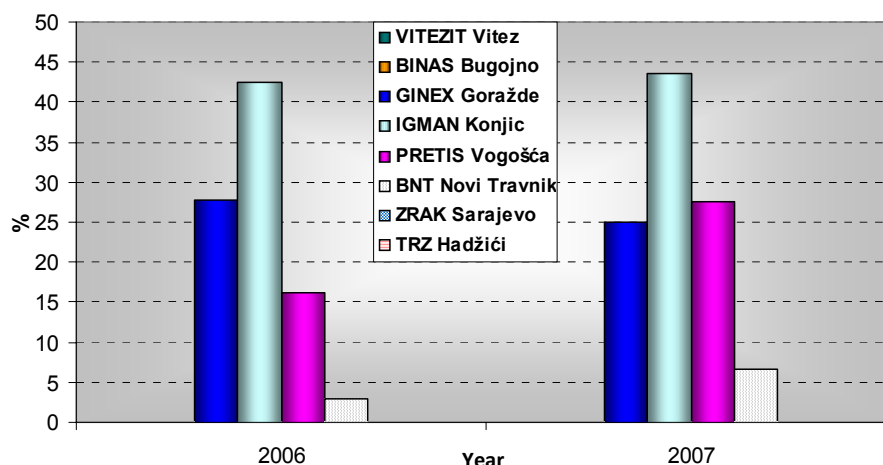


Figure 10.8 Ratio of total exports to total income [7,8]



**Figure 10.9** Ratio of total imports to total income [7]

Installed capacities in the military industry factories are not used to the extent required. All firms are burdened with obligations incurred internal claims (judicial and executive judgments in actions of employees) and debts incurred during the war and postwar period and high costs of production preparation.

These debts caused by the factories are very costly so most companies operated at a loss in the previous two years (Table 10.8). Only the company "GINEX" Goražde, "PRETIS" Vogošća and "TRZ" Hadžići in the last two years operated with profit.

**Table 10.8** Total income or loss of factories in 2006 and 2007 in KM [7,8]

| Factory          | 2006          | 2007           |
|------------------|---------------|----------------|
| VITEZIT Vitez    | 740.674,00    | -1.373.240,00  |
| BINAS Bugojno    | -3.501.473,00 | -1.829.061,00  |
| GINEX Goražde    | 26.011,00     | 843.505,00     |
| IGMAN Konjic     | 6.288,00      | -2.963.273,00  |
| PRETIS Vogošća   | 3.547,00      | 6.126,00       |
| BNT Novi Travnik | 2.741,00      | -2.969.399,00  |
| ZRAK Sarajevo    | -5.473.929,00 | -11.524.590,00 |
| TRZ Hadžići      | 1.148,00      | 1.648,00       |

Outstanding pre-war receivables of the military industry in FBiH amount to:

- Company Jugimport-SDPR from Serbia (Table 10.9) 212.320.643,50 USD
- Ministry of Defense of the Republic of Croatia 11.126.044,90 USD

The signee of contracts with JUGOIMPORT-SDPR on behalf of the factory under items 1-5 was the company UNIS-PROMEX Sarajevo.

Outstanding pre-war receivables of the company UNIS-PROMEX Sarajevo for direct export to Iraq amount to 25,000,591.94 USD.

**Table 10.9** Outstanding pre-war receivables of the military industry in FBiH from the company JUGOIMPORT - SDPR from Serbia [8]

| Factory  | Company JUGOIMPORT-SDPR Serbia (USD) |
|--|--------------------------------------|
| 1. UNIS "PRETIS-NIS" and factories emerged from the former factory UNIS-PRETIS | 101.066.266,18                       |
| 2. "BINAS" and factories emerged from the former factory UNIS-SRB              | 17.534.147,15                        |
| 3. "IGMAN"   | 6.153.614,00                         |
| 4. UNIS "GINEX" and factories emerged from the former factory UNIS-POBJEDA     | 3.081.799,00                         |
| 5. «VITEZIT»   | 2.152.314,17                         |
| 6. «ZRAK»  | 23.100.524,00                        |
| 7. «TRZ»   | 4.829.400,00                         |
| 8. «BNT»-HOLDING   | 53.402.579,00                        |
| <b>Total:</b>  | <b>212.320.643,50</b>                |

## 10.2. State of Technology and Technological Systems

Military Industry of FBiH until 1992 in terms of technological equipment did not lag substantially behind in comparison to technologies used in Western European countries. Compared to other countries from the former Yugoslavia, in addition to Serbia, it had the most modern technologies and technological systems and the largest number of investments was implemented in these two former Republics.

Based on the visit to commercial entities in the field of military industry and based on submitted questionnaires by these entities there is an overview of technologies and their state in relation to competing firms (Table 10.10).

A large part of technological equipment was purchased by the end of the 1980s and through the war and postwar period, their maintenance was very difficult because of large financial resources required, and one part of equipment was depreciated through this period.

Installed technological equipment ensures a wide range of production possibilities, but the equipment was mostly depreciated so that it comes to a stoppage due to frequent breakdowns. Therefore, there is a need for an advanced preventive and investment maintenance through a plan, but the limiting factor is lack of funds.



**Table 10. 10** Overview of technologies and technological systems in factories for military industry

| Factory          | Technologies that are applied in production   | State of technological systems | Investments in new technologies/environment protection (KM) |
|------------------|---|--------------------------------|---|
| VITEZIT Vitez    | Batch process of explosive production   | Obsolete                       | None  |
|                  | Discontinuous and continuous way of production of double component missile fuels  | Obsolete                       |   |
|                  | HERCULES technology in the production of composite fuels  | Destroyed                      |   |
| BINAS Bugojno    | -   | -                              | -   |
| GINEX Goražde    | Processing by plastic deformation in cold state   | Obsolete                       | 2.000.000,00 / 300,000,00                                   |
|                  | Processing by cutting   |                                |   |
|                  | Thermal processing of non-ferrous metals and steel  |                                |   |
|                  | Chemical processing of non-ferrous metals   | New                            |   |
|                  | Synthesis of initial explosives by continuous and discontinuous procedure   |                                |   |
|                  | Production of pyrotechnic mixtures for initiators, production of pyrotechnic mixtures without heavy metals  |                                |   |
| IGMAN Konjic     | Processing by deformation in cold state   | Obsolete                       | None  |
|                  | Processing by cutting   |                                |   |
|                  | Thermal processing of non-ferrous metals and steel  |                                |   |
|                  | Chemical processing of non-ferrous metals   |                                |   |
| PRETIS Vogošća   | Technology of cutting, forging in hot state, forging in cold state, cold rotational extrusion, mechanical processing, thermal processing, chemical protection, dyeing, pressing of explosives, casting of explosives. | Modernized                     | 7.000.000,00 / 1.000.000,00                                 |
| BNT Novi Travnik | Processing by cutting: scraping, milling, drilling, planing, deep drilling, scorning, rifling, broaching  | Obsolete and modernized        | None  |
|                  | Forging, cold rotational extrusion, welding, thermal processing, surface protection   |                                |   |
| ZRAK Sarajevo    | Technology of preliminary processing of optical components: from cutting to polishing   | Obsolete                       | None  |
|                  | Technology of post processing of optical components: optical thin layer, photo procedure,   |                                |   |
|                  | Technology of machine processing of metals, technology of thermal processing of metals, technology of galvanizing protection  |                                |   |
| TRZ Hadžići      | -   | -                              | -   |

### 10.3. Possibilities of Revitalizing and Modernizing of Technologies

Investments in modernization of existing technologies and equipment were carried out to a smaller extent. Only the companies GINEX and PRETIS carried out investment in procurement of new and modernization of existing equipment.

Due to the irresponsibility of the previous management of **PS „VITEZIT“ Vitez** it came to the alienation of the equipment on production lines for double component and composite missile fuels. Also, laboratories for testing of components and finished products were partially destroyed. Required funding for the reconstruction and modernization amounted to approximately 3.000,000.00 KM.

Equipment of the company **„GINEX“ Goražde** is older than 20 years, but it is well maintained so that it is in good condition and able to produce the product range that is demanded on the market. Last modernization of equipment for production of mechanical parts of the initiators was carried out by reconstruction of basic tools on mechanical cam presses with the construction of new working tool in 2006. In the next five years the management plans to introduce new technology on laboration initiator (damp process) and develop new products that have a perspective on the world market (initial caps with a pyrotechnical mixture without heavy metals).

The existing equipment of the company **IGMAN Konjic** originates mostly from specialized manufacturers of equipment from France and Germany and only partly from domestic manufacturers and one's own production before the war in BiH. The equipment is older than 20 years, but it is in a good exploitation condition. That equipment is sufficient for production of the product range that is demanded on the market. There is the possibility of revitalizing and modernizing equipment. The required funding amounts to approximately 3,000,000 EUR to purchase modern equipment on which integration of multiple deformation processing operations were carried out with automated process control. Procurement of this equipment would increase the capacities, reduce labor costs and raise quality to a higher level.

Pre-war production capacities of the company **PRETIS Vogošća** were destroyed and devastated during the war, and looted immediately after the war. Management of the factory managed to repurchase a part of the stolen production capacities, so that that equipment was modernized in the period from 2002 to 2008. Part of the modernization and repair of mechanical and hydraulic components are made by the company itself, while numeration and electronics were done by various producers. There is adequate equipment that enables production of current programs in the factory; however it is necessary to increase the capacities in order to meet production volume. For the production of pre-war product range and the new products some other strategic capacities need to be repaired and equipment for the testing of finished products needs to be purchased.

Some weapons from production programs, **"BNT" Novi Travnik** are obsolete and are not of interest for further production. Part of these products was made in cooperation with other factories or materials for their production were purchased. In order to realize some of these production programs one needs cooperation and a factory outside the territory of BiH.

Due to the variety of production programs and the variety of caliber weapons it is necessary to make the selection of products that will remain in production programs, and the other will be "put out"- for which there is no real market demand. Many weapons from the production program have suffered modifications and improvements, so that the demand is directed towards weapons with better features. In order to improve weapons one needs certain investments, which the factory it is not able to provide at present. There is a possibility of revitalizing and modernizing equipment through repairs of equipment whereby one would install more recent numerical control devices on the equipment that is damaged or that is still in operation. Generally speaking, the equipment is still usable with the need for modernization, which would amount to 2,100,000.00 KM for the technological equipment in the BNT TMiH.

The equipment in the company **"ZRAK" Sarajevo** is largely appropriate for the current market, which would be more efficient for production with certain advancements. Measuring equipment is obsolete because there are increasing demands for quality. There is a smaller part of equipment that definitely needs to be replaced due to obsolescence and dysfunction (production equipment in optical plants). There is a possibility of revitalizing and modernizing equipment. Required funding amounts to approximately 470,000.00 KM.

## 10.4. Internal and External Limitations

Identifying strengths and weaknesses, opportunities and constraints, is an important prerequisite for setting up and assessing the feasibility of development goals of the military industry. Results of the SWOT analysis for the military industry sector can be summarized with the following points:

### **Strengths**

- Military industry in Bosnia and Herzegovina has a long term experience and rich tradition in the production of weapons and ammunition. This experience has been acquired over fifty years, and the products, services and technologies were exported to over thirty countries worldwide.
- The military industry has systemic knowledge in the field of military technologies and production, and has experts and specialists with extensive experience in research, development and production of weapons and ammunition.
- The military industry is mainly oriented to export of products and achieves a significant foreign currency surplus.

- Military industry makes a large work contribution with its products (technology, experience), while large exporters make small work contribution but more energy (aluminum) or natural resource (wood).

### **Weaknesses**

- Inadequate process of restructuring of the ownership structure in the military industry factories.
- Difficulties in timely provision of necessary raw materials for the execution of concluded contracts.
- Difficulties in securing working capital for the preparation of production for export.
- Judicial and executive court decisions upon workers' claims.
- Obsolete technology and equipment, and lack of funds for the purchase of new technologies and equipment.
- Lack of training grounds.
- Unfavorable age and staff structure.
- Reduction of investment in development and insufficient liaison with universities.
- Insufficient social impact, especially at the level of high politics.

### **Opportunities**

- In addition to the complementary Law on Production and Maintenance of Armaments and Military Equipment and the Law on Export and Import of Arms, adopted on the level of BiH, and the adopted Law on Production and Maintenance of Arms and Military Equipment in FBiH, this particularly important area of economy is fully regulated by legislation, which created conditions for increasing exports, recapitalization, and primarily the introduction of full control of the state of BiH in this area and avoiding any risks of violation of international norms.
- Supply possibilities of Armed Forces of BiH (AFBiH) with products of military industry and maintenance of products that are used by AFBiH.
- Monitoring of development trends of defense products in the council and the development of weapons, ammunition and military equipment for the possible needs of AFBiH.
- It is important to emphasize that the military industry can provide the sale of transfer of technologies and knowledge acquired through long-term production of defense products, that it is ready to develop jointly with other countries those products for which it already has systemic knowledge and a certain degree of experience.
- Partially secured foreign market.
- Future integrations into NATO will enable Bosnia and Herzegovina a more equal position and supply of a large number of countries with weapons and ammunition.
- The latest technical and technological achievements are always introduced in this industry branch, which are later capitalized in the market economy.
- Connecting more businesses for the development of modern products.
- Need for a greater cooperation with universities in Bosnia and Herzegovina in order to develop new resources and staff trainings.

**Threats**

- Today's BiH was established by Dayton Peace Agreement, with two entities and strong powers of the International Community through the High Representative and the Stabilization Forces. Very complex state structure, with profound internal political differences is not a good environment for the functioning of the military industry.
- Given the strong position of the United States in establishing and maintaining peace in BiH, factories on the territory of FBiH comply with the U.S. embargo in addition to the UN embargo. U.S. embargo covers a much larger number of countries where there are greater chances for export of arms and ammunition.
- Slow and complicated procedure to obtain export licenses and permits for transportation and shipping of finished products to customers.
- Prewar staff structure is weakened, but a critical mass remained, which is necessary for the operation and future plans, without developing more complex products and technologies.
- Lack of working capital and unfavorable loans.
- Legal limitation when it comes to foreign investment in military industry factories.

## **10.5. Possible Strategic Development Goals**

Taking into account the current situation in the military industry of FBiH, which is export oriented, the direction of the future development is based on the following grounds, objectives and tasks:

### **1. Area of work productivity and competitiveness of products and companies on local, European and world markets:**

- Repair internal debt of the military industry factories in the Federation of Bosnia and Herzegovina through recapitalization by the Government of the Federation of BiH or with the participation of private capital or the sale of surplus property.
- Prewar receivables and war and postwar obligations need to be reviewed for each factory and optimal solutions found for the inclusion of funds for recapitalization.
- Establish quality control of imported products to protect domestic producers by introducing military standards and EU standards (the measure is primarily related to imported products).
- In order to provide import of quality products, particularly explosives, in cooperation with universities, it is necessary to establish a laboratory for testing these products and the certification for these products.
- Establish the appropriate departments for implementation of quality control in the military industry factories in the FBiH. This department must be independent from the development and production sector.
- Modernization of existing industrial capacities by introducing new technologies (in production of shells for ammunition for small and large caliber).

- Improvement and expansion of existing capacities.
- Conversion of a part of the capacity of the military industry to civilian production (based on the development of products for general use, according to market needs on existing technologies and employment of technological capacities).
- Market orientation towards the domestic and foreign markets and intensifying activities related to finding new markets.
- Modification and improvement of products from existing production programs.
- Development of modern products that have a competitive export potential, low level of costs for development based on the use of existing technological capacities without major investments, maintaining continuity of engagement of national experts, which are attractive from the aspect of possible future equipping of AFBiH.
- Forming and equipping training grounds for internal testing in every factory, and in cooperation with the AF of Bosnia and Herzegovina form training grounds for ballistic testing of artillery and missile ammunition and weapons.
- Improve the level of environmental protection, working and environment conditions, with a maximum application of legislation governing individual areas of protection.
- Joint onset of military industry of the Federation of BiH at the foreign market via a single transport organization to promote and sell products and purchase new technologies more efficiently.
- Joint development and conquering the market with production of weapons, ammunition and military equipment of several companies from the sector of military industry.

## **2. Area of research activities and technological development**

One of the key strategic objectives of development of the military industry is certainly research and development (R&D) within the modernizing of production program of the military industry and armed forces. Factory currently have very few staff engaged in the development sector and very little funding has been allocated for development so far. It is necessary to establish an institution that would deal with development of new products and would offer support to all factories of the military industry.

Objectives of research and development institutions:

- be the leading scientific institution of the scientific and professional work in Bosnia and Herzegovina and beyond in cooperation with universities, at a comparable level with other European institutions;
- be the primary source of technical, scientific, business, normative and other information needed by military industry factories;
- have the necessary, especially information infrastructure at its disposal;
- create necessary financial basis for business activity.

Tasks of research and development institutions:

- establishment of partnerships between the military industry factories, the armed forces and the scientific research environment in the country and abroad;

- initiating and conducting research and development projects directed towards the needs of military industry factories in developing new tools and technologies;
- managing the design, inspection and testing of weapons, ammunition and military equipment;
- implementation of military standards prescribed by NATO and the USA and new technologies: processing, production and service.

In the phase of forming this institution provide full cooperation with universities in the Federation of BiH, particularly in the field of defense technologies in order to achieve objectives and tasks of such institution. It is necessary to make the proposal of applicable scientific research and development projects funded by the Ministry of Education and the responsible ministry.

Cooperation, common development and conquering the production of weapons, ammunition and military equipment with military industries of other countries for the joint appearance in third markets.

By modernizing and restructuring the capacities of the defense industry, special emphasis should be given to small-caliber ammunition, certain types of artillery ammunition, mortars and mortar ammunition, devices for antitank combat, devices for personal and collective protection, explosives, cannon and missile fuels. In addition, the priority emphasis is put on the development of weapons that have high performance: mobility, accuracy and effect on target.

After recapitalization of military industry factories, forming an institution that would deal with research and development, with created material and staff preconditions by military industry factories and the Government of the Federation of BiH, one needs to start the implementation of previously adopted plans of development and production of new products according to the following items:

- Development of artillery ammunition and arms of extended range:
  - Development of weapons with tube length of 45 and 52 caliber and increased fuel combustion chamber. Focus on 105 mm and 155 mm calibers that are standard calibers according to NATO standards.
  - Development of new types of fuels and charging systems with greater quantity of fuel.
  - Development of new artillery missiles with a new design of missiles with the possible application of Base Bleed, or missile propulsion.
- Development of mortar ammunition and arms of extended range based on:
  - Application of mortar tubes with larger plastic,
  - Application of new fuels and greater quantity of fuels,
  - New design of missiles,
  - Application of missile propulsion.
- Development of HE artillery (calibers 105 mm, 122 mm and 155 mm), mortar and missile ammunition with increased efficiency based on:

- use of high fragmentation steel (HF-1),
  - refragmentation of the missile body,
  - new types of explosives (of larger the energy characteristics and IM),
  - use of proximity fuses.
- Development and introduction into mass production of 125mm ammunition:
  - ammunition HEAT-T M08 with increased penetrability,
  - modified APFSDS-T M88M1ammunition with an arrow from tungsten,
  - ammunition APFSDS-T M08 with an arrow from tungsten with penetrability of over 550 mm of bullet-proof steel.
- Development and production of weapons and ammunition of medium caliber:
  - Ammunition 40 mm of short and long range based on NATO standards.
- Development of small caliber ammunition without lead and initial caps with pyrotechnical mixture without heavy metals.
- Development and production of protection and demining equipment.

### **3. Area of knowledge and professional training of the existing and new workforce**

- It is necessary to introduce a continuous and organized system of permanent (specialized) education through universities in the FBiH, particularly in the field of military technologies.
- Education and training of skilled staff in the military industry factories should be realized through employment of experts with high academic titles with long term experience in research, development and production, and by conducting university teaching.
- Provide ongoing scholarships for students at undergraduate and graduate study with the aim of providing professional staff in high demand by military industry factories, and the responsible ministry.
- Special attention should be given to modernization of study programs and designing the new ones, in accordance with the demand of the changing market.

### **4. Export of finished products**

- FBiH as the majority owner of military industry factories should through the Government of the FBiH and the responsible ministry provide a fund of material reserves for a smooth production (dependent on raw materials and half assembled products from abroad) and it defines the following:
  - Loan program of financial restructuring of factories,
  - Loan program for preparation of goods for import and export sectors and to facilitate the development of military industry sector;
- Subsidies to exporters of finished products;
- Income tax reduction for new employment;
- Subsidies for the introduction of innovative technologies;



- Working on finding affordable modalities of adjustment of tariff system of electricity for production companies, or complex of metal industry, in terms of regulating the price of peak power-load, and that electricity price in the export business is the same-equal to the export price of electricity;
- Reducing administrative barriers by simplifying administrative procedures, particularly for goods intended for export.

## **5. Other areas that are directly or indirectly connected with competitiveness of the economy**

- One of the key strategic objectives of the military industry is to ensure changes of defense policy of Bosnia and Herzegovina and that the military industry is included into the Law on Defense of Bosnia and Herzegovina.
  - Strategic doctrinal document of Bosnia and Herzegovina is the WHITE PAPER OF DEFENSE OF BOSNIA AND HERZEGOVINA (from 2005), which promotes commitment of Bosnia and Herzegovina to join European and Euro-Atlantic integrations [9]. Unfortunately, according to this document defense policy of Bosnia and Herzegovina does not rely on one's own military industry.
  - The NATO program called "Partnership for Peace" plays a special role because it enables cooperation between the states that are not in this alliance (in the political, security and defense segment). Partnership and cooperation refer also to the military-industrial complex, because the system of collective security can be made by those who, among other things, also meet military and technological requirements.
  - For the purpose of modernizing, development and production of NVO (state military defense), especially of the complex and highly sophisticated devices, there is a need for the necessary scientific and technological bases, scientific and professional staff that is organizationally institutionalized and technically equipped, for adequate raw material basis and industrial-production infrastructure, economic opportunities and absorption power of domestic and foreign market, which Bosnia and Herzegovina, and in particular the Federation of BiH, have at their disposal in many ways.
- Coordinate activities between the ministries involved in the implementation of investment projects.
- Increase the competitiveness of domestic producers of finished export products.

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