THE POTENTIAL OF ARMS PRODUCTION IN TURKEY

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Abstract

Indigenous arms production in developing countries is justified mainly in terms of self-sufficiency. By the early 1980's more than 50 developing countries were producing weapons. This paper discusses the potential of the Turkish arms production in the context of arguments for domestic weapons manufacturing in developing countries. Turkey allocates about 5 percent of its gross national product and 25 percent of its national budget to defense. The analysis shows that Turkey has considerable potential for arms production.

INTRODUCTION

A new development in the military activities of developing countries is the growing importance attached to indigenous arms production.

From the mid-1970's on, several factors have added impetus in Turkey's drive for domestic arms production. These are reducing the dependency on foreign suppliers, saving foreign exchange, creating employment, and updating her military technology. However, producing weapon systems relies heavily on the industrial capability, technological base and human capital.

The thrust of this study is to specify, describe and analyze key features of the arms production base of Turkey emphasizing the industrial capacity.

ORIGINS

The Turkish defense industry began to emerge during the Ottoman Empire[1]. The first cannon and howitzer in history were made during

[1] For more information about the history of the Turkish defense industry see: Aziz Akgül, **Savunma Sanayi İşletmelerinin Yapısı ve Türk Savunma Sanayi**

the reign of Sultan Mehmed II, the Conqueror. In this period, Tophane-i Humayun was established to produce cannons. Engineers Muslihiddin and Sarıca Sekban designed 130 cannons used during the conquest of Istanbul.

Weapons production was improved and developed during the sovereignty of Suleyman the Magnificent. Tophane-i Humayun began to produce relatively modern weapons when Halil Pasha was assigned as a consultant to it.

Caka Bey established the first Turkish naval shipyard and naval base in the eleventh century in Izmir.

In the seventeenth century, Hazerfen Ahmed Çelebi flew from Galata Tower in Istanbul over a distance of about 6,000 meters by using a wing-like device.

Although the Ottoman Empire was the innovator in methods of warfare and weapons, Turkish arms production had fallen behind its counterparts by the beginning of the twentieth century.

In the first years of the Republic of Turkey, military production facilities of Istanbul, Erzurum, Eskişehir and Ankara were reorganized in Ankara in 1921, under the General Directorate of Military Factories (Askeri Fabrikalar Umum Müdürlüğü). In 1950, this establishment in turn reorganized into a state economic enterprise as the General Directorate and Chemical Industries (Makina ve Kimya Endüstrisi Kurumu Genel Müdürlüğü-MKEK).

With the cooperation of Americans, The Kayseri aircraft factory, in 1932, started the production of Curtis Hawk fighters and 10 Fleshing trainers. Production of 15 German Gotha 145 training and transport aircraft, 22 Polish Plz-23 and 25 British Magister trainers followed and the production of these aircrafts continued until 1939 in Kayseri.

In 1936, Nuri Demirağ opened his factory in Beşiktaş and an assembly shop in Yeşilköy near İstanbul. In these facilities, 15 ND-37 trainers developed by Selahattin Alan were manufactured and used for pilot training. The ND-37 was supposed to be followed by the twin-engine, 8-seated ND-38 which was ready for manufacturing, but work ended when the German engineers returned to Germany. For some time the

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(The Structure of a Military Industrial Firm and the Turkish Defense Industry), Başbakanlık Basımevi, Ankara, Turkey, 1986, pp. 109-112; and Aziz Akgül, **Dünyada Savunma Harcamaları ve Savunma Sanayilerinin Yapısı** (The Structure of the World's Defense Expenditures and Defense Industries), Başbakanlık Basımevi, Ankara, Turkey, 1987, pp. 193-196.

factory continued to produce parts for Westland Lysunder reconnaissance aircraft and stopped manufacturing in 1943.[2]

During the Second World War, Polish engineers emigrating from German-occupied Poland came to Turkey. With their cooperation, an aircraft factory was founded in Ankara, Etimesgut, in 1941. At first, 60 Fouga Magister were produced. Later under the name of Turkish Air League, some other aircraft and gliders were manufactured. The aircraft factory was handed over to MKEK by law. Following this takeover, the Turkish Air Force ordered 100 aircrafts in 1953, but Only 60 MKEK-4 Uğur aircraft were manufactured. The projects of the MKEK-3 Mehmetçik jet trainer and Gözcü artillery reconnaissance aircraft were prepared but manufacturing stopped in 1959. Repair and overhaul work continued until 1965. Five of the twin-engine THK aircrafts were exported to Denmark and three Uğurs were given to Jordan as a present.

On the basis of a licence from de Havilland enginers, the THK aircraft engine factory was founded in 1945 on the basis of a licence from de Havilland engines to produce Gipsy major engines. Manufacturing started in 1948, but later financing became difficult, and the company was turned into a tractor factory in 1955.

THE STRUCTURE OF THE TURKISH DEFENSE INDSURY

In order to improve arms production in Turkey, the Defense Development and Support Administration (DIDA) was put into implementation in 1985 as umbrella organization in the defense industry.

DIDA aims to provide the financial resources, with the purpose of ensuring the selection of the most suitable technologies, securing the necessary coordination between the public, military and private sectors, and supporting and encouraging new defense oriented enterprises.

Organizations in the Turkish arms production can be classified into three categories:

1. Government-owned defense industry plants
2. Armed forces plants
3. Private enterprises.

Government-owned defense industry plants are tasked to meet the needs of the Turkish Armed Forces in the fields of weapons, ammunition,

[2] Aziz Akgül, "Turkey's Defence Industry: Ambitious for Growth," **Asian Defence Journal**, October 1988,, pp. 105-112.

explosives, and electronic equipment. TUSAŞ Aerospace Industry is in process of assembling F-16 C/D combat aircrafts.

The armed forces plants are used for the overhaul of military vehicles. Capabilities include production and maintenance of various items of equipment, components and communications equipment. There are also naval yards which produce and overhaul war ships.

Some companies in the private sector participate in production activities for various types of military trucks, wheeled vehicles, various materials and equipment for the Turkish Armed Forces.

REQUIREMENTS OF ARMS PRODUCTION

There are several socioeconomic and industrial factors that separate developing countries into arms producers and arms non-producers.

Socioeconomic Indicators

Neuman discusses some factors that separate weapon producer developing countries from others. Neuman ranks developing countries in relation to a weighted index of military production capability derived from length of production, production capacity, and technical capabilities and also according to following seven socioeconomic indicators:[3]

1. Population
2. Land size
3. Size of military
4. Gross National Product (GNP)
5. GNP per capita
6. Number of professional and technical workers
7. Number of industrial workers.

In her article, Neuman concludes that in developing countries there exists "a hierarchically shaped arms production system based largely on factors of scale"[4]. Moreover, she states that "the existence of a large military to provide an adequate market, combined with a generous national income and sizable population to support the necessary infrastructure,

[3] Stephanie Neuman, "International Stratification and Third World Military Industries," **International Organization**, Winter 1984, pp. 167-170.

[4] Stephanie Neuman, **Ibid.**, p. 168.

significantly affect a state's long-term ability to produce weapon systems as well as the quantity and sophistication of its product[5].

On the other hand, Looney and Frederiksen incorporate into their analysis other factors that Neuman's analysis excludes such as contact with the world economy, public debt, and growth in foreign trade[6]. In addition, they mention that successes a producer will depend on a highly developed collateral industry, a supportive government and general industrial development[7].

Their result indicates that "although the size of military expenditures is important in determining whether a country will produce a major weapon, the nature of orms production necessitates a certain economic environment for the process to be profitable"[8].

Turkey has a unique geographic location with an area of nearly 800,000 square kilometers. The population of Turkey is about 55 million and she has over 800,000 trops.[9] In 1985, the GNP of Turkey was $50,850 million and GNP per capita was slightly over $1,000[10]. In 1988, the total debt of Turkey is $39,100 million.[11]

Overall, Turkey allocates about 5% of its GNP and 25% of its national budget to defense.[12] This allocation highly stimulates the indigenous arms production.

Industrial Base

Weapon systems with high technology are produced from many different kinds of industrial metals, materials, components and parts. A weak industrial infrastructure together with inadequate technological level and technical personnel impose limitations on domestic arms production. Therefore, creating industrial base, human capital and technological base are pre conditions for initial arms production[13].

[5] Stephanie Neuman, **Ibid.**, pp. 185, 186.

[6] Robert E. Looney and P.C. Frederiksen, "Profiles of current Latin American arms producers," **International Organization**, 40, 3, Summer 1986, p. 746.

[7] R.E. Looney and P.C. Frederiksen, **Ibid.**, p. 746.

[8] R.E. Looney and P.C. Frederiksen, **Ibid.**, p. 752.

[9] "Turkey in Özal's Second Term," **Defense and Foreign Affairs**, February 1988, p. 9.

[10] US Arms Control and Disarmament Agency, **World Military Expenditures and Arms Transfers**, ACDA, Washington DC, 1987, p. 80.

[11] State Planning Organization and Turkish Central Bank.

[12] İbrahim Türkgenci, "Towards a Turkish Defense Industry," **Nato's Sixteen Nations**, December 1987-January 1988, p. 30.

[13] M. Brzoska **et al., Transnational Transfer of Arms Production Technology**, IFHS (Study Group on Armaments and Underemployment) Hamburg, Federal Republic of Germany, 1980, p. 38.

Arms production has technical linkages with certain industries rather than the total industrial capability[14]. Industrial employment in defense production in the United Kingdom which point to the following industries as being the most important[15]:

1. Explosives and firearms
2. Iron and steel
3. Steel tubes
4. Light metals
5. Metal working
6. Engineers small tools and gauges
7. Industrial engines
8. Other machinery
9. Ordinance and small arms
10. Other mechanical engineering
11. Scientific surgical and photographic instruments
12. Electrical machinery
13. Insulated wires and cables
14. Telegraph and telephone apparatus
15. Radio and other electronic apparatus
16. Other electrical goods
17. Ship-building and ship-repairing
18. Metal industries
19. Rubber.

Kennedy[16] and Wulf[17] stress the importance of seven major industrial categories of manufacturing within the International Standard Industrial Classification (ISIC) that encompass the above list for domestic arms production:

1. Iron and steel
2. Non-ferrous metals

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[14] Saadet Deger, **Military Expenditure in Third World Countries: The Economic Effects**, Routledge & Kogan Poul, London, 1986, p. 164.

[15] Ron Ayres, "Arms production as a form of import-substituting industrialziation: the Turkish case," **World Development**, vol. 11, no. 9, pp. 816-817.

[16] G. Kennedy, **The Military in the Third World**, Duckworths, London, 1974, pp. 296-297.

[17] H. Wulf, "Developing countries," in N. Ball and M. Leintenberg, eds., **The Structure of the Defense Industry: An International Survey**, Croom Helm, London, 1983, p. 324.

3. Metal products
4. Machinery
5. Electrical machinery
6. Ship-building and repairing
7. Motor vehicles

This framework is referred to as Potential Arms Production Base (PAPB) by Wulf[18] and the Potential Defence Capacity (PDC) by Kennedy[19]. Henceforth we will use the term PAPB. If it is compared to total manufacturing capacity then an indication can be obtained of the viability of a country's arms production programmes[20]. Obviously, the higher the ratio, the greater the potential to produce weapons.

Table-1 shows the share of PAPB sectors in whole manufacturing capacity for Turkey.

Table — 1. The share of PAPB in total manufacturing in terms of employment, output, and value added, 1984

ISIC	Industrial group	number of Average producers employees (thousands)	Output in producers' prices (billion TL)	Value added in producers' prices (billion TL)
371	Iron and steel	46.0	705	153.9
372	Non-ferrous metals	21.6	247	73.5
381	Metal products	37.5	276	106.6
382	Machinery	37.6	550	162.1
383	Electrical machinery	35.0	454	178.0
3841	Shipbuilding and repairing	6.0	29	17.8
3843	Motor vehicles	33.8	467	161.4
	Total PAPB	227.5	2,728	691.9
	Total Manufacturing	820.9	10,750	3,357.0
Total PAPB as a percentage of total manufacturing		27.7%	25.4%	20.6%

Source: Department of International Economic and Social Affairs, Statistical Office of the United Nations, **Industrial Statistics Yearbook 1985**, United Nations, New York, vol. 1, 1987, pp. 542, 545-546.

[18] H. Wulf, **Ibid.**, p. 324.
[19] G. Kennedy, **Ibid.**, p. 296.
[20] Ron Matthews, "The Development of the South African Military Industrial Complex," **Defense Analysis**, vol. 4, no. 1, 1988, p. 15.

If one takes employment, output or value added as the proportion of total manufacturing capacity in the PAPB group is considerable. This is the case whether the index is measured in terms of employment (27.7%), output (25.4%) or value added (20.6%).

According to the analysis of one researcher, Turkey has a better potential for arms production than countries like Israel, Indonesia, Egypt, Pakistan, Singapore and Greece, just to mention a few which produce at lest one major weapons systems[21].

In a period of about ten years, from almost zero level, Brazil has moved to become the third largest arms producer and seller[22] among Third World countries[23]

The share of the potential defense capacity of Turkey in total manufacturing in terms of emylopment, output and value added is considerable and higher than it was for Brazil when it was building up its defense industry in the 1960's[24].

There are both public and private sector enterprises in the iron and steel industry. Public sector plants include the steel mill of MKEK and iron-steel plants of Karabük, Ereğli and İskenderun. Karabük plant has been operating since 1936 with a capacity of 0.6 million tons and İskenderun integrated factory has been functioning since 1976 with a capacity of 2.2 million tons. The third entity is Ereğli which has a 1.8 million tons crude steel processing capacity. Total capacity of integrated plants is 4.6 million tons per year[25].

Furthermore, there are 15 private factories with total capacity of 2.7 million tons per year ranging from 50,000 to 1,000,000 tons each[26].

The total steel production has reached to 4.9 million tons in 1985. The export of iron-steel products was $519.8 million in 1984 and $864 million in 1985. On the other hand, Turkey imports semi-finished products

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[21] Saadet Deger, **Ibid.**, p. 170.

[22] It is estimated that annually, Brazil sells one thousand armored and other vehicles in transactions against oil from Middle East and Africa. Brazil's main sales lines are the amphibian Urutu, the Osorio tank which is similar to the U.S. M-1 model, the Cascavel armored car and the Jaracca light reconnaissance vehicle.

[23] Saadet Değer, **Ibid.**, p. 171.

[24] Ron Ayres, **Ibid.**, p. 817.

[25] Akın Çakmakçı, "Why you should invest in Turkey for the Defense Industry," The Ministry of Industry and Commerce, Ankara, Turkey, 1987, p. 16 (Unpublished paper).

[26] Akın Çakmakçı, **Ibid.**, p. 16.

(i.e. blum, slab), hot rolled sheets, special quality steel, and seamless pipes in considerable quantities.

Since 1960, integrated aluminium, copper and zinc facilities has been set up for the production of non-ferrous metals. The aluminum production capacity of Turkey is about 60,000 tons per year.

Public and private plants light and heavy diesel engines for vehicles in land transportation, engines for locomotives, and for all kinds of tactical and armored vehicles.

Moreover, small and medium size hydraulic turbines, generators and electrical motors, all kinds of gears and transmissions, various of gear pumps and accessories for hydraulic equipment and control systems, all forged parts and undercarriage of excavators, and all the special steel material requireemnts of automotive industry are produced in Turkey.

In the shipbuilding industry, the ship construction capacity has reached 70,000 DWT[27].

Military electronics Industry, Inc. (ASELSAN) produces VHF/FM vehicles, personnel and stationary type devices for the military purposes.

Considerable amounts of electromechanical components, transformers, bobbins circuit elements, resistors, capacitors, communication instruments, and industrial electrical devices are produced in Turkey.

Automotive industry begin having importance in total industry. Its efforts became towards manufacturing instead assembly in 1960's. Currently, more than 300 large establishments manufacture in this sector. The production was about 140,000 units in 1986. In the same year, 19% of the production was exported[28]

Turkey has always welcomed foreign investment[29], and especially those engaged in high technology production. A major reason for this is that much of its potential arm production capacity represents the consumer-good machinery and assembly industries.

A large proportion of the manufacturing sector's process machinery still has to be imported. In 1986, 31.2% of the Turkey's imports represented

[27] Akın Çakmakçı, **Ibid.**, p. 7.

[28] Akın Çakmakçı, **Ibid.**, pp. 14-15.

[29] The basic law regulating foreign investment in Turkey conveys to foreign investors the same rights and privileges as to the Turkish investors and guarantees the freedom to transfer profits, fees and loyalties, and repatriate capital in the event of liquidation or sale. Virtually, all sectors of business activity in Turkey are open to foreign investment.

investment goods .The share of industry in total export has been increased from 36% in 1980 to about 72% in 1986[30].

The design manufacture and assembly of most weapons requires skilled manpower. In 1984, Turkey had 117,500 engineers in various branch of engineering, more than 100,000 technicians and about 200,000 skilled workers[31]. Scientists and engineers that worked in research and development at the beginning of 1980's were about 9,000 persons[32].

Productive Performance of PAPB Sectors

Between the end of 1970's and the beginning of 1980's Turkey's PAPB industries, saving mainly iron and steel industry, enjoyed a considerable growth. Tables 2 through 5 provide the data on the productive performance of these industries over the period 1977-1984.

Table-2 shows that the real growth rate of the PAPB sectors' value added amounted to an annual average of 0.7%. Except iron and steel, and shipbuilding and repair industries, it can be seen that all sectors produced growth. Similarly, saving these two industries, Table-3 indicates that labor efficiency in all sectors rose over the 7-year period.

Table — 2. Productive Performance of PAPB Industries, 1977-1984*
(Value added)

Industrial group	Value added in producers' prices (billion TL)				Annual average growth (%)
	1977	1979	1982	1984	
Iron and Steel	20.6	36.8	96.3	153.9	−11.5
Non-ferrous metals	3.7	11.4	31.0	73.5	1.7
Metal products	5.0	16.4	59.5	106.6	2.7
Machinery	6.5	19.0	89.9	162.1	5.1
Electrical Machinery	6.3	16.3	70.4	178.0	7.0
Shipbuilding and repairing	1.1	2.8	18.6	17.8	1.2
Motor vehicles	8.6	16.1	77.3	161.4	0.9

* Data for value added expressed in current prices; the annual average growth rates are in constant prices (1963=100).

Source: Department of International Economic and Social Affairs, Statistical Office of the United Nations, **Industrial Statistics Yearbook 1981**, UN, New York, vol. 1, 1983, p. 525; and **Industrial Statistics Yearbook 1985**, UN, New York, vol. 1, 1987, p. 546.

[30] Akın Çakmakçı, **Ibid.**, pp. 1-2.
[31] Akın Çakmakçı, **Ibid.**, pp. 28-30.
[32] H. Wulf, **Ibid.**, p. 327.

Table — 3. Productive Performance of PAPB Industries, 1977-1984
(Average number of employees)

Industrial group	Average number of employees (thousands)				Annual average growth (%)
	1977	1979	1982	1984	
Iron and steel	55.1	60.2	55.1	46.0	−2.3
Non-ferrous metals	19.7	20.4	21.6	21.6	1.3
Metal products	31.0	37.2	40.9	37.5	2.8
Machinery	40.2	46.6	52.4	47.6	2.4
Electrical Machinery	28.1	31.1	33.1	35.0	3.2
Shipbuilding and repairing	7.1	8.8	8.9	6.0	−2.4
Motor vehicles	32.4	31.0	30.1	33.8	0.6

Source: Department of International Economic and Social Affairs, Office of the United Nations, **Industrial Statistics Yearbook 1981**, UN, New York, vol. 1, 1983, p. 523 and; **Industrial Statistics Yearbook 1985**, UN, New York, vol. 1, 1987, p. 542.

As Table-4 provides, saving the performance of iron and steel, and metal products, there was a real growth trend for capital productivity. The remarkable 11.3% growth in gross fixed capital formation was due to the buildup of capacity in aircraft and shipbuilding industries.

Table — 4. Productive Performance of PAPB Industries, 1977-1984*
(Gross fixed capital formation)

Industrial group	Gross fixed capital formation (million TL)				Annual growth rate (%)
	1977	1979	1982	1984	
Iron and steel	1,801	10,024	20,309	20,950	−5.8
Non-ferrous metals	543	695	6,152	25,253	14.9
Metal products	636	1.311	6,417	10,707	−0.7
Machinery	693	1,831	9,982	22,624	9.2
Electrical machinery	542	762	6,809	30,083	17.8
Shipbuilding and repairing	29	121	2,769	3,653	32.4
Motor vehicles	1,195	2,920	14,475	43,957	11.1

* Data for gross fixed capital formation is expressed in current prices; the annual average growth rates are in constant prices (1963=100).

Source: Department of International Economic and Social Affairs, Statistical Office of the United Nations, **Industrial Statistics Yearbook 1981**, UN, New York, vol. 1. 1983, p. 525; and **Industrial Statistics Yearbook 1985**, UN, New York, vol. 1, 1987, p. 546.

On the other hand, Table-5 shows that the real growth rate of the PAPB sectors' profitability was 1.6% in the period under consideration. Largely because of the profits that some Western multinational companies showed no reluctance to participate in Turkey's industrial expansion. For instance, in 1986, the foreign investment approvals amounted to 1,670 million dollars and 536 foreign companies (220 of them in manufacturing industry) have been operating according to the foreign capital law. At the same year, the foreign capital share in total capital was 34.7%[33].

Table — 5. Productive performance of PAPB Industries, 1977-1984*
(Value of stocks)

Industrial group	Value of Stocks at the end of period (billion TL)				Annual average growth (%)
	1977	1979	1982	1984	
Iron and steel	10.14	18.76	71.7	129.1	−4.5
Non-ferrous metal	2.77	7.44	24.6	64.0	3.9
Metal products	3.29	9.36	32.4	51.8	−1.6
Machinery	5.34	16.69	72.3	111.2	2.4
Electrical machinery	3.63	10.19	37.5	83.9	3.9
Shipbuilding and repairing	0.49	0.88	7.3	13.1	6.1
Motor vehicles	5.12	12.61	41.7	85.8	−0.7

* Data for value of stocks at the end of period is expressed in current prices; the annual average growth rates are in constant prices (1963=100).

Source: Department of International Economic and Social Affairs, Statistical Office of the United Nations, **Industrial Statistics Yearbook 1981**, UN, New York, vol. 1, 1983, p. 526; and **Industrial Statistics Yearbook 1985**, UN, New York, vol. 1, 1987, p. 547.

Weaknesses

A serious domestic supply deficiency concerns high-precision machine tools. Although it is crucial to arms production, domestic machinery industry having the capacity to produce a broad range of advanced machinery has not developed them in Turkey. New products are mainly introduced into the market through licensed production of foreign designs.

In 1986, over 90% of all imports were for investment goods and raw material[34], precisely the inputs required for arms production. Moreover, one of the most important reason of the negative real growth rate in the iron and steel industry is importation.

[33] Akın Çakmakçı, **Ibid.**, pp. 24, 26.
[34] Akın Çakmakçı, **Ibid.**, p. 2.

ARMS PRODUCTION STRATEGY

The following projects[35] have been selected to fulfill the needs of the Turkish Armed Forces, to create an adequate technological base in the arms production and for export military hardware:

1. F-16 C/D combat aircraft
2. Light cross-country vehicles
3. Low altitude air defense system
4. Stinger and Maverick missile
5. Multiple-luanch rocket systems
6. Armored combat vehicles
7. Transportation aircraft and helicopters.

Policymakers in Turkey have agreed that joint venture with economic offsets would allow for an expansion of the domestic arms production. Also this will facilitate the transfer of military technology to Turkey and enhance Turkey's status in the international arms market.

The key requirement of joint venture, coproduction and licensing agreements should be a provision that permits export sales of the military product to third parties. In addition, arms production agreements should require that the foreign investor be the minority shareholder in any joint venture with Turkish firm. For instance, one-third participation by government capital, one-third by the foreign firm, and one-third by Turkish private enterprise may be put into implementation as a policy.

Turkey has limited research and development capacity and relatively dependant industrial sector. Therefore, instead of having a desire to become self-sufficient in broad range of equipment, Turkey should be specializing in military products in which she can develop a competitive advantage.

After acquiring a certain level of military technology and experience in production of weapon systems, Turkey then should apply engineering strategies[36] in the indigenous arms production. Because, developing new

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[35] İbrahim Türkgenci, **Ibid.**, pp. 31-32.

[36] For detail discussion of "engineering strategies" see: M. Brzoska, "South Africa: evading the embargo," in M. Brzoska and T. Ohlson, eds., **Arms Production in the Third World**, SIPRI, Taylor & Francis, Philadelphia, 1986, p. 206; Ron Matthewes, **Ibid.**, p. 12; and M. Brzoska and T. Ohlson, "Conclusions," in M. Brzoska and T. Ohlson, **Arms Production in the Third World**, SIPRI, Taylor & Francis, Philadelphia, 1986, p. 283.

technology is very costly. Furthermore, technologically sophisticated products rapidly become obsolete, forcing the producers to modify and improve on a continuous basis.

One of the engineering strategy that Turkey may follow is "add-on engineering". Application of this strategy will start with existing weapon technology which is first transferred and then produced under license or other means. The designs are then may be studied, modified and adopted to the requirements of the Turkish Armed Forces. In this strategy, efforts are put at updating and improving the existing military technology rather than investing scarce resources into the development of new designs.

The second strategy that Turkey may follow is "add-up engineering". The Turkish defense industry may put together components available from any outside sources to a system not available elswhere. Therefore, the basic source of technology is not one specific system. This strategy requires the availability of the major components and more technical capability than add-on engineering.

In order to gain popularity with both developing and developed nations, Turkey may follow the strategy that facilitates the production of weapon systems with competitive prices, low operational costs, quality and relative simplicity.

CONCLUSION

Turkey has relatively sufficient arms production potential in terms of skilled manpower and industrial base. Yet there is a need for technical support.

Rather evolving into a pattern of dependent development, joint with multinational corporations will enable Turkey to acquire foreign military technology and in the process to attain increasing self-sufficient in domestic arms production.

Based on the acquired military technological base, Turkey should apply add-on and add-up engineering strategies in the development of indigenous arms production in the next decade.

Turkey would not sustain a domestic defense industry without arms exports. However, exports of weapons can only be achieved in the international market if the domestic arms production is efficient, its product of good quality, simple, and its prices competitive.