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# The Egyptian Arms Industry

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**A Research Paper**

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*NESA 85-10191  
September 1985*

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# The Egyptian Arms Industry



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**A Research Paper**

This paper was prepared by  the  
Office of Near Eastern and South Asian Analysis. It  
was coordinated with the Directorate of  
Operations. 

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Comments and queries are welcome and may be  
directed to the Chief, Arab-Israeli Division, NESA,



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**The Egyptian Arms Industry** [Redacted]

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**Key Judgments**

*Information available as of 1 May 1985 was used in this report.*

Egypt is the only Middle Eastern state other than Israel with a significant arms production capability. Unlike Israel, Egypt's defense industry lacks the modern technological base and manufacturing infrastructure necessary to design and produce its own advanced tanks, aircraft, or missiles. Current production is limited to assembling French- and Brazilian-designed aircraft and to copying many of the Soviet weapons supplied to Egypt before 1975.

[Redacted]

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Egypt is unlikely to realize its goal of achieving self-sufficiency in modern arms production by the mid-1990s because of weak military planning and budgeting systems, inefficient work habits, shortages of skilled management and labor, continued dependence on foreign technology, and an inability to compete successfully in the international arms market.

[Redacted]

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Institutional factors play an important role in delaying further development of the arms industry:

- The lack of a coherent and centralized planning, programming, and budgeting process means weapons production and procurement decisions are influenced as much by the personalities, contacts, and gratuities of the services' "old-boy" networks as they are by any long-range requirements or projected capabilities shortfalls.
- The lack of a marketing organization denies the defense sector the kind of information it needs to develop and market more exportable weapons.

[Redacted]

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Social and cultural factors also constrain arms industry modernization:

[Redacted] unwillingness to accept responsibility, illiteracy, and limited English-language capability among managers and workers preclude the rapid introduction of new technologies and production processes to the defense sector.

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- Neither Egypt nor its foreign partners appears willing to undertake the costly and time-consuming reeducation and training programs necessary to address these skills shortcomings.

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Egypt's foreign partners are likely to deny it the technology necessary to independently design and produce modern weapons because:

- They want to maintain their market shares, reduce competition, and limit unauthorized technology transfers to third parties.
- They are likely to be deterred by the limited prospects of recouping the heavy capital investments required to provide the necessary technology to Egypt. 


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Despite these shortcomings, the military production sector provides several important benefits to Egypt's economy:

- Much-needed employment opportunities for Egyptian scientists and engineers, as well as for larger numbers of semiskilled and unskilled workers.
- The production of civil and military goods and services that Egypt otherwise would be forced to procure from outside sources at higher cost.
- Foreign exchange earned through arms exports. 

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The United States will benefit over the long term as Egypt moves to strengthen its defense production sector:

- There will be greater potential for Western influence as Egyptian managers are introduced to new skills and production processes to replace the old Soviet ones.
- Continued acquisition of Western weapons and technology will reduce Egypt's interest in obtaining spare parts and new equipment from the USSR. 

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### The Egyptian Arms Industry [Redacted]

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Egypt's 27 arms factories employ nearly 100,000 civilian workers in the manufacture or licensed assembly of a wide variety of Western- and Soviet-designed small arms, ammunition, artillery, vehicles, and aircraft.<sup>1</sup> According to Egyptian officials, in 1984 these factories provided about \$350 million worth of goods to the Egyptian armed forces and exported nearly \$200 million worth of arms, principally to Iraq. [Redacted]

In early 1984 Defense Minister Abu Ghazala formed a War Production Authority Board to consolidate and coordinate armaments production requirements and scheduling among the services and with the Defense Ministry staff. Chaired by the Minister of State for War Production, its members include the commanders of the Air Force and Air Defense Force and the chairman of the Defense Ministry's Armaments Authority. The board so far appears to have accomplished little. [Redacted]

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These accomplishments mask serious underlying problems within the defense production sector. Overstaffed, poorly managed, short of skilled personnel, and overly dependent on foreign technology, Egypt's defense industries are incapable of independently developing and producing in quantity the modern arms desired by the Egyptian armed forces. [Redacted]

[Redacted]

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uncoordinated strategy for procuring and producing arms because of the military "old-boy" network and the Defense Ministry's lack of a sophisticated and coherent planning, programing, and budgeting system. Under the "old-boy" system, programs succeed or fail more on the basis of who sponsors them than on their merits, and institutional coordinating mechanisms such as the War Production Authority Board are ignored in favor of direct meetings with well-placed associates or decisionmakers. [Redacted]

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#### Defense Industry Organization and Decisionmaking

The arms industry is organized in a relatively straightforward manner under the Defense Ministry, although we believe planning and decisionmaking probably depend as much on personal contacts as on organizational relationships. The Minister of Defense and War Production provides overall direction and makes final decisions on administration, operation, programs, plans, and budgets. Daily administration and operation of the defense industry probably reside with two other officials. The Minister of State for War Production oversees the 15 factories of the ammunition and armaments sector, while the chairman of the Arab Organization for Industrialization (AOI) administers the 12 factories of the aerospace sector. [Redacted]

[Redacted]

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#### Arms Production Goals: Still Unattained

Egyptian goals for the arms industry have remained remarkably consistent despite disagreements over priorities and changes of personnel. On the basis of our analysis of Defense Ministry documents and official pronouncements, we believe that these goals are:

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- Self-sufficiency in the production of modern arms and ammunition. Egypt intends to expand and update with US and French assistance its existing

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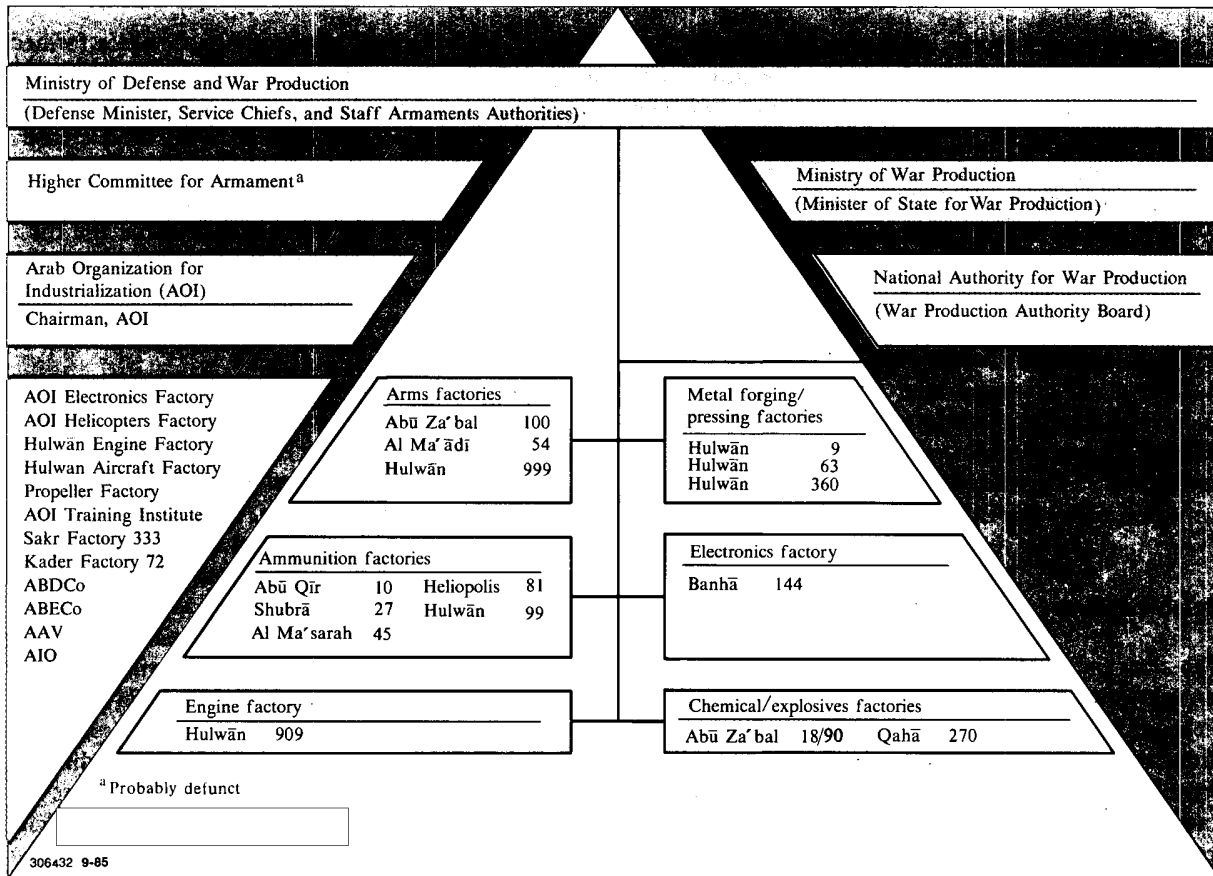
<sup>1</sup> Appendixes A to C describe in detail the history, organization, and capabilities of Egypt's defense production sector. Shipbuilding and chemical/biological weapons are not discussed in this paper. The Defense Ministry uses civilian shipyards—both foreign and domestic—for ship overhaul, maintenance, repair, and construction rather than operate its own facilities. The chemical and biological warfare production facilities are operated independently from the defense production sector. [Redacted]

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## The Egyptian Defense Industry



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arms production base that was established by the British, West Germans, Swiss, and Soviets in the 1950s and 1960s. The Defense Ministry believes licensing, coassembly, and coproduction agreements that phase in final manufacturing capabilities are the policies most likely to achieve this goal.

- Increased arms exports. This is both a goal in itself and part of the strategy to achieve arms self-sufficiency. Egypt plans to use reexport agreements for coproduced weapons as the best method to increase its share of the international arms market.

- Reduced civil and military unemployment. This was a major reason President Nasir established the first defense industries in the 1950s. Future arms coproduction and assembly agreements will require that a greater share of the assembly and production be performed in Egypt to increase defense-sector employment.
- Reduced civil-sector imports. This is another goal from the Nasir period. We believe Egyptian officials will use the military's National Service Projects

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**Financial Aspects of the Arms Industry**

*The financial dimensions of Egypt's arms industry are murky. Output of the military production enterprises is excluded from official tabulations of national income and product, and even the operating expenses of these public-sector companies are excluded from the government's budget. Moreover, military exports and imports are not included in official Egyptian balance-of-payments statistics.* [redacted]

*Although the lack of data prevents confirmation, we suspect that the net impact of the public-sector military enterprises on Egypt's operating budget and the economy is only moderately negative. Substantial financial allocations for these industries are balanced by the goods and services they provide the Egyptian military, which otherwise would be forced to procure everything from bullets to batteries from foreign suppliers. These enterprises also produce some civilian products that from personal observation appear to be of higher quality than those produced in nonmilitary Egyptian factories.* [redacted]

*The military production enterprises are also significant earners of foreign exchange. We estimate Egyptian military exports totaled about \$500 million in 1984 and may have reached \$1 billion in 1982 when Egypt provided a large quantity of arms and ammunition to Iraq. These exports, however, include sales of Soviet equipment from Egyptian inventories as well as new production by military enterprises. We suspect that the military has used a large share of these earnings for purchases of non-US weapons, turning funds over to the Central Bank only when foreign exchange is insufficient to cover other important defense-related obligations.* [redacted]

Organization to broker deals with foreign firms to utilize the defense sector's civil production capabilities to manufacture the vehicles, home appliances, electronics, and building materials Egypt otherwise would have to import. [redacted]

**Constraints to Success**

We believe Egypt's failure to reach the ambitious goals it set for its arms industry is due in large part to two policy decisions that undercut the industry at critical points in the past:

- Nasir purchased large quantities of Soviet arms in the 1960s to quickly match Israeli capabilities rather than await the uncertain results of Egypt's costly arms development efforts. This decision virtually shut down the arms industry and led to the cancellation of the most promising aeronautical research and development programs. 25X1
- President Sadat signed a peace treaty with Israel in 1979, which stalled the arms industry just as significant Arab-funded development was beginning. The treaty led Saudi Arabia, Kuwait, Qatar, and the United Arab Emirates to withdraw financing from Egypt's newly created Pan-Arab arms production program, the Arab Organization for Industrialization, and to close their markets to Egyptian arms exports. [redacted] 25X1

These decisions only partly explain Egypt's failure to develop a modern, self-sufficient defense industry. We believe other factors, such as cultural attitudes toward work, excess manpower, shortages of skills and experience, dependence on foreign technology, and the failure to grasp basic marketing concepts have been, and will continue to be, key factors affecting the success or failure of the arms industry. [redacted] 25X1

**Attitudes Toward Work**

US officials report that a combination of low pay, long hours, poor working conditions, and a fatalistic "if God wills it" attitude leads Egyptian workers to [redacted] 25X1

perform only the minimum necessary work. This results in low productivity, industrial accidents, equipment breakdowns, and the production of shoddy, substandard items with a reputation among foreign purchasers for poor quality. In addition to hindering [redacted] 25X1

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arms exports, this reputation has led the Egyptians themselves to prefer more expensive but better quality foreign-produced arms. [redacted]

Egyptian productivity also is hurt by the belief that an academic degree is a better measure of worth than job-related training or work experience. [redacted]

[redacted] academic titles and degrees, rather than productivity, are used to justify positions and salaries at the Banha electronics factory. We believe the practice is widespread in Egyptian industry. The focus on education over experience reinforces the attitude among managers, supervisors, and technicians that theory is superior to practice and that only those who lack education need perform hands-on work. US officials report that this leads management personnel to become aloof and critical in their dealings with subordinates, always willing to expound theories but generally unwilling (and unable) to demonstrate how things should be done. We believe it also facilitates an avoidance of responsibility because each manager passes problems on to the next higher, and supposedly better educated, layer for decision. [redacted]

**Excess Labor, Illiteracy, and Skills Shortages**

Long the employer of last resort for Egypt's unskilled workers and college graduates, the Egyptian Government has burdened factories in both the civil and defense sectors with excess employees. As a result, US officials report most Egyptian arms factories appear overstaffed, often with at least twice as many employees as comparable Western plants.<sup>2</sup> In addition, many of these excess employees serve no productive function. For example, a US official estimated that about 10 percent of each factory's staff consists of messengers, errand boys, and tea servers. These excess employees consume resources that could be used to create the smaller, more highly specialized work force that modern production processes require. [redacted]

We believe that a high level of worker illiteracy will retard efforts to modernize the arms industry because costly and time-consuming retraining will be required before introducing or changing production processes.

<sup>2</sup> Although several workers are assigned to each job, only one usually is present. The others are working at jobs in other factories, on vacation, sick, or "in training." All are paid. [redacted]

On the basis of reports from [redacted] survey teams, personal observation, and official statements from the Egyptian Defense Ministry, we estimate that worker illiteracy could be as high as 75 percent in some of the arms and ammunition plants and at least 50 percent in the AOI's aircraft plants. [redacted]

[redacted]

[redacted] Egyptian managers are more involved in making working-level decisions than engaging in long-range planning like their Western counterparts. In addition, a highly stratified management style denies production management experience and authority to the lower management layers. [redacted]

Another shortcoming that is likely to become increasingly critical is the low level of English-language skills among managers and workers. This slows the absorption of new equipment and technology because additional time and resources are required to ensure full comprehension of written manuals and production processes. We believe this lack of English-language skill and a shortage of qualified translators also explain why Egyptian managers are less well read on management techniques than their Western counterparts. [redacted]

**Dependence on Foreign Technology**

Egypt's efforts to become self-sufficient in the production of modern arms—particularly in the aerospace sector—ironically have increased, rather than decreased, its dependence on foreign technology. Unlike a decade ago, Egypt now relies on countries other than the Soviet Union for technology to produce its advanced weapons. Almost all of this technology is French, but North Korea, China, the United Kingdom, Brazil, and the United States also have important roles or potential roles. [redacted]

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**France.** France became Egypt's primary source for arms production technology after the British withdrew from the AOI in 1979 under pressure from the Arabs after Egypt signed its peace treaty with Israel. The French offered, and Egypt accepted, facilities to assemble under license Alpha Jet and Mirage 2000 aircraft, Gazelle helicopters, and related avionics and engine component subassemblies. The French also provided technical assistance to help Egypt reverse-engineer the Soviet SA-7, RPG-7, and AT-3 weapons, as well as work on development of a mobile anti-aircraft weapon system that would utilize Egypt's reverse-engineered 23-mm gun, the "23rd of July."

Even though the Egyptians now operate their own subassembly and assembly lines for the Alpha Jet and Gazelle, the French still control either critical technologies or key steps in the assembly process. French technicians, for example, continue to supervise assembly operations, and they also perform all quality-control inspections required before final acceptance. Critical components such as avionics, inertial navigation systems, engine compressor blades, and graphite composites are all made in France, as are many of the airframe components critical for maintaining structural integrity. French propulsion and electronics technology also has been critical to improving the performance of Egypt's reverse-engineered SA-7 (the "Sakr Eye") and the mobile 23-mm anti-aircraft gun.

We doubt France will supply Egypt the capability to produce any of the critical items it supplies until either the technology is no longer up to date or is available elsewhere.

**North Korea and China.** Egypt appears to rely on North Korea and China for production assistance on four reverse-engineered weapons: the 130- and 122-mm guns, the 122-mm multiple rocket launcher and rocket, and the 23-mm anti-aircraft gun.

North Korean and Chinese factory technicians and occasional visiting technical delegations have been actively assisting these programs since at least the early 1980s. We believe the North Koreans and Chinese have been assisting the Egyptians to overcome casting, forging,

and assembly problems on the 130-, 122-, and 23-mm guns and ammunition and on case fabrication and fuzing problems with the 122-mm rocket. The Egyptians probably rely on the Chinese and Koreans more because of foreign policy considerations and a desire to maintain arms technology diversity than to obtain specific technical capabilities.

**United Kingdom.** Egypt depends on the United Kingdom for production assistance on the advanced Swingfire antitank guided missile and for development assistance on one of the competing prototype D-30 self-propelled howitzers. With the Swingfire program winding down and the self-propelled howitzer program far from production, we anticipate that Egypt will be dependent for the near term on UK firms only for the technology to produce lasers and night sights at the AOI optronics factory.

**Brazil.** Egypt is rapidly becoming dependent on Brazil for the components and technology to assemble and produce the Brazilian Tucano trainer. Because Egypt's Tucano production lines are not scheduled to be completed at the AOI Kader and Hulwan engine factories until at least 1987, Egypt until then will be as dependent on Brazil for Tucano parts, assemblies, and production technology as it is now on France for Alpha Jet and Gazelle components.

**United States.** The projected programs to coproduce US weapons—many of which we doubt for economic reasons will ever go forward—also would create a total dependence on the United States for production technology and critical components. Like the French, the United States also would retain control of sensitive technologies to prevent unauthorized access or transfer to competitors or hostile powers. Thus, some electronic components on AN/TPS-59 and -63 radars would have to be controlled, as would selected avionics, composites, and engine production technologies for the F-16 and F-20 aircraft. Egypt likewise would have to accept less than complete technology transfer if it was still determined to coproduce an M-1-type tank or improved TOW antitank guided missile.

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**Marketing Difficulties**

[redacted] plan for a defense industry sustained by arms exports will fail as much from marketing difficulties as from cultural, technical, and managerial problems. Among the most serious marketing-related problems are:

- Obsolete defense production equipment and technology. [redacted] thus cannot produce the kinds of modern weapons that sell best in the highly competitive international arms market.
- A reputation for poor quality. Afghan insurgents, the Iraqis, and the Sudanese all have complained—sometimes publicly—about the poor quality arms they have received from Egypt.
- A history of falling behind production schedules. The Franco-Egyptian “Sakr Eye” improved SA-7 missile is already two years behind schedule, and optimistic Egyptian forecasts for producing several thousand missiles in 1985 are unrealistic.
- A weak economy that constrains Egypt from offering prospective customers the favorable credit and financing routinely provided by Soviet and Western arms exporters.
- A continued dependence on foreign technology that permits the sources of this technology—usually other arms exporters—to determine which of their weapons Egypt can export.
- Inadequate market research and a failure to develop a comprehensive marketing plan for Egyptian arms exports. [redacted] either know who their prospective customers are or why they continue to have so little success in the international arms market. [redacted]

**Outlook**

In our judgment, Egypt will continue efforts to create a modern, self-sustaining defense industry despite the economic burden and foreign dependence this will

entail. As a consequence, Egypt will continue to spend more money to assemble or manufacture foreign-designed weapons than it would if it purchased them outright. We also anticipate Egypt will continue heavy expenditures to design and build its own prototype weapons or to reverse-engineer Soviet equipment even though both have limited sales potential. We further believe Egypt will continue its efforts to become the center of a Pan-Arab arms industry, even though Egypt’s isolation in the Arab world as a result of its peace treaty with Israel effectively precludes its access to the required Arab markets and capital. [redacted]

We believe foreign assistance over the next decade will permit Egypt to address—but not necessarily overcome—shortcomings in such critical areas as industrial production processes, electronics and avionics manufacturing, composites fabrication, and metals forging, casting, and bonding. Foreign governments and firms, however, are unlikely to provide the kinds of technology or key manufacturing processes that will permit Egypt to independently produce its own weapons. We believe West European firms will be interested in maintaining Egypt’s dependence primarily to retain their market shares and to forestall Egyptian competition with their exports. [redacted]

Despite these constraints, we expect Egypt to continue to base its arms industry on Western weapons and technology. We anticipate that Egyptian military leaders will continue to prefer technologically advanced Western weapons to less sophisticated Soviet arms. We believe Egypt would consider substantial Soviet or Warsaw Pact defense production assistance only if Western nations deny Egypt—perhaps as a result of another conflict with Israel—continued access to the kinds of production technology and weapons it now receives. [redacted]

Finally, we believe Egyptian work attitudes and shortages of critical skills and experience will continue to retard development of the defense sector. In our judgment, neither Egypt nor its foreign partners will be willing to invest in the expensive, long-term employee education and development programs necessary to overcome these problems. [redacted]

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### Implications for the United States

The United States should benefit over the long term as Egypt moves to strengthen its arms industry:

- There will be greater potential for Western influence at the working level in Egyptian ministries and factories as Western civil and military managers and technicians introduce Western organization management philosophies to their Egyptian counterparts.
- Egyptian production of modern Western weapons provides tangible evidence of the benefits of participation in the Middle East peace process and of being at peace with Israel.
- The Egyptian military is likely to become more self-confident and assured of its capabilities against its radical neighbors as domestically produced, modern Western weapons increasingly supplant obsolete Soviet systems.
- Egypt's interest in obtaining spare parts and equipment from the Soviet Union will lessen as domestically produced Western weapons are integrated into the armed forces.
- Egypt's acquisition of Western weapons and their associated production facilities and logistic organizations will enhance Cairo's capabilities to support US military operations in Southwest Asia and the Middle East.

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## Appendix A

### Origins of Arms Industry

The Nasir government established Egypt's first modern arms factories in 1954 with the objectives of aiding full employment and economic development and achieving self-sufficiency in arms. Nasir's arms production program involved an across-the-board effort to manufacture as many types of Western arms in as many turnkey plants as possible. Ammunition factories were the first priority, followed by aircraft production at the Hulwan complex, armored vehicle production at the Kader Factory, and finally surface-to-surface missile production at Heliopolis. Despite claims of arms self-sufficiency, Egypt recognized its dependence on Western aerospace technology only after West German scientists in Egypt ended their work on advanced aircraft and surface-to-surface missiles and withdrew shortly before the 1967 Arab-Israeli war. This overdependence, in addition to inefficiency, bad planning, overcapacity, incompetent marketing, and lack of coordination with the military, finally led Nasir to abolish the Ministry of War Production and declare that the arms plants were to manufacture civilian goods under the auspices of the Ministry of Industry. [redacted]

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President Sadat restored the Ministry of War Production in 1971. He initiated new arms and ammunition licensing agreements with Britain and France to supplement Moscow's agreement in December 1970 to permit licensed production of Soviet weapons. Sadat's decision, following the 1973 Arab-Israeli war, to use the arms industry to provide employment for a peacetime military and obtain needed foreign exchange through arms sales was the impetus that led to the formation of the Arab Organization for Industrialization (AOI) in 1975. Opportunities for sales to Arab states dried up when Egypt signed its peace treaty with Israel in 1979. The Iran-Iraq war and Western willingness to assist Egypt in producing arms to replace its inventory of aging Soviet weapons continue to nurture the belief among Egyptian officials that Egypt may yet become the arms supplier to the Arab world. [redacted]

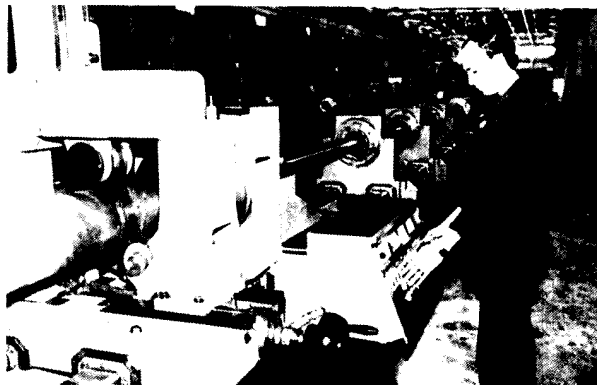
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**Appendix B**

**Egyptian Military Factories**

The Egyptian Ministry of Defense operates some 15 military factories in and around Cairo and Alexandria. Operating under the auspices of the Minister of State for War Production and under the nominal control of a National Authority for War Production, these factories supply arms and ammunition to the Egyptian military and for export. A catalog produced by the National Authority shows these factories organized into six groups: arms, ammunition, chemicals and explosives, metal forging and pressings, engines, and electronics. [redacted]



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**Arms Factories**

The *Al Ma'adi Company for Engineering Industries* (Military Factory [MF] 54) produces small arms, machineguns, and edged weapons for the military and sporting arms and surgical instruments for the civil sector. [redacted]

*Heavy machinery used in the manufacture of gun tubes at Abu Za'bal Factory 100. [redacted]*

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[redacted] the factory is underutilized and overmanned. Even factory officials admit they are capable of producing four times their current annual level of 50,000 AKM ("Misr") rifles. [redacted]

program, and the competition between the French firms Dassault ("Sinai 23") and Thompson-CSF ("Nile 23") to develop a mobile air defense system that uses the "23rd of July" 23-mm gun. [redacted]

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[redacted] the factory produces acceptable quality weapons despite operating Soviet-designed machines built to Polish specifications that process materials manufactured under Czechoslovak, French, Polish, and Soviet standards. [redacted] the factory will continue to encounter resistance to its products from foreign customers unless its estimated 6,000 workers take more pride in their work and produce better quality weapons. [redacted]

US industrial survey teams and reliable sources of the [redacted] complex report the factory is neat, clean, and orderly by Egyptian standards. They also report it is equipped with numerous good-quality Czechoslovak, East German, Swiss, and Yugoslav machine tools. Production management concepts have been described as outdated but proven, while the plant management has been characterized as one that sets realistic objectives to achieve quality production. [redacted]

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The *Abu Za'bal Company for Engineering Industries* (MF 100) is Egypt's most modern arms factory. The plant's approximately 2,000 workers assemble Egypt's reverse-engineered Soviet 23-mm ZU-23M antiaircraft gun (the "23rd of July") and 122-mm D-30 howitzers and also are working on a prototype of the North Korean version of the Chinese 130-mm M-59-1M gun. The factory has been involved with the 105-mm gun upgrade program for Egypt's T-54/55 tanks, production of 115-mm gun barrels for the T-62 upgrade project, the US/UK 122-mm D-30 self-propelled howitzer competitive prototype development

[redacted] the factory is dependent on foreign technical assistance and that some products have a reputation for poor quality. [redacted]

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[redacted] the factory working on the 130-mm gun, and at least a half dozen Chinese technicians assisting in the manufacture and assembly of the 23-mm antiaircraft gun. All specialty steels must be imported, a dependence that sometimes leads to production bottlenecks.

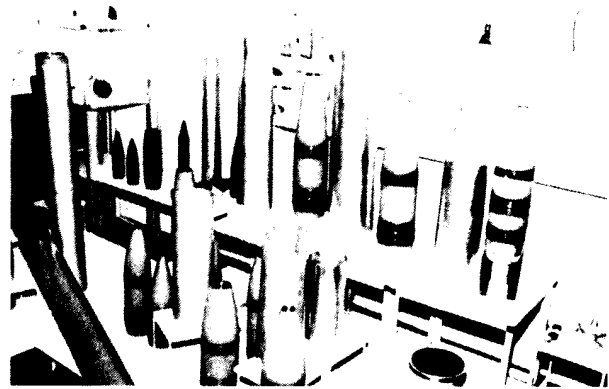
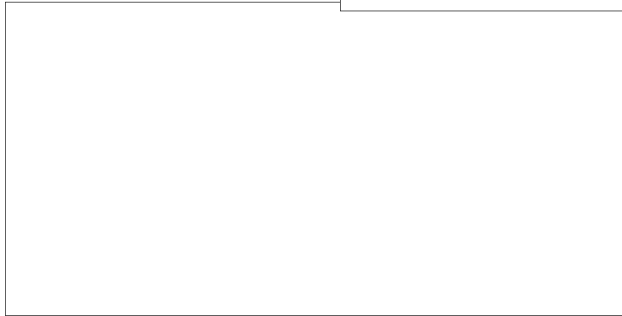
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capable of only 500 rounds daily. X-ray quality-control procedures were described as adequate, although not to US standards. [redacted]



Display of ammunition manufactured by Hulwan Factory 99. [redacted]

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The *Hulwan Company for Engineering Industries* (MF 99) is Egypt's principal manufacturer of mortar shells, shell casings, bomb casings, and associated metallic parts. It also produces fire extinguishers, regulators, pistons, gun parts, and gasoline pumps for the civil sector. [redacted]

[redacted] the factory sold nearly \$90 million worth of military equipment in 1983, and it anticipated that sales of some 300,000 "items" would bring in over \$100 million by the end of 1984. [redacted]

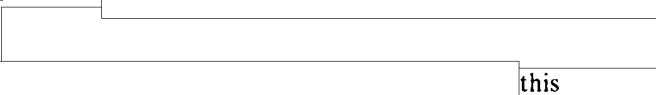
[redacted] plans were under way to double production in 1985. [redacted]

[redacted] who have visited the facility report that housekeeping is uniformly poor and that the factory uses primarily old equipment and obsolete, but proven, manufacturing methods. [redacted] the factory's production rate is good, despite quality assurance problems caused by shortages of trained metals engineers, technicians, and middle-level production managers. The factory's managers indicated it employed about 7,000 workers. Personality conflicts between managers and with the management of Heliopolis Factory 81 also affected production quantity and quality. [redacted]

[redacted] the Defense Ministry's Armaments Authority has taken action to circumvent some of these problems. For example, the factory has been authorized to procure US tungsten penetrators for use in the Egyptian-produced US 105-mm tank round because a similar penetrator could not be successfully or economically produced in Egypt. More significantly, another [redacted]



supply the plant with some 30,000 122-mm artillery casings. [redacted]



[redacted] this particular agreement reflects the Armaments Authority's doubts about the plant's ability to produce either the quantity or quality of shell casings needed to support Egypt's arms sales to Iraq. [redacted]

**Chemical and Explosives Production Factories**

The *Abu Za'bal Company for Specialized Chemicals* (MF 18) employs 3,000 workers to manufacture single- and double-base powders, dynamite and other explosives, mortar charges, solvents, and extruded and cast double-base rocket propellants. We believe the plant also may have formerly produced napalm. [redacted]

[redacted] old, limited-capacity equipment appeared responsible for restricting production primarily to small-quantity propellant lot sizes. [redacted]



Adjacent to MF 18 is the recently completed *Abu Za'bal MF 90*. This facility was constructed specifically to supply the triple-base propellant for the US-designed 105-mm tank round produced by Heliopolis

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[redacted] it possessed advanced physical, chemical, and calibration laboratories and was similar in configuration and management procedures to US facilities. He also described the work force as competent and knowledgeable. [redacted]

**Qaha Company for Chemical Industries (MF 270)** produces primers, blasting caps, dry batteries, and tracers, flares, and other pyrotechnics. The facility also appears to be Egypt's most poorly laid out, badly maintained, inefficient, and unsafe military factory. [redacted]

[redacted] equipment breakdowns are common because most of the machinery in use dates back to the late 1940s. [redacted] only the plant's limited production kept the accident rate down, since the machinery was poorly maintained and the factory littered with trash. [redacted]

[redacted]

Production capability was 180,000 to 240,000 primers and 50,000 to 100,000 tracer units per eight-hour shift. [redacted]

**Metal Forging/Metal Pressings Factories**  
**The Hulwan Company for Ferrous Products (MF 9)**, recently modernized with new equipment, provides general and precision cast iron and steel forgings for diesel engines, automobile crankcases, and gun carriages. [redacted] military business represented only a small part of the 25,000 tons cast in 1983. This probably indicates the facility has not yet broadened its output into the more specialized steels now in demand by the other arms factories. [redacted]

[redacted]

The companion to the iron foundries is the **Hulwan Company for Nonferrous Products (MF 63)**. Although its equipment is old, [redacted] the company still

retains its reputation for expert, well-crafted copper, brass, and aluminum extrusions. [redacted] 25X1

Refrigerators, stoves, cutting charges, and metallic mine components are the major civil and military products made by the **Hulwan Company for Metallic Apparatuses (MF 360)**. [redacted] 25X1

**Engine Factory**  
**The Hulwan Company for Diesel Industry (MF 909)** is Egypt's major producer of civil and military diesel engines, diesel-electric generators, and air compressors. [redacted] 25X1

[redacted] the plant is capable of producing 3,000 engines per year, although in 1982 it only produced 2,000, half of which were for the military. [redacted] 25X1

[redacted] 25X1

[redacted] 25X1

**Electronics Factory**  
**The Banha Company for Electronics Industries (MF 144)** and its "Al Nasr" civil component assemble small radio transmitters and receivers, printed circuit boards, and other small electronic components. [redacted] 25X1

[redacted] 25X1

[redacted] Banha's 2,500 employees include 300 engineers, all of whom speak fluent English, and about 400 technicians, only about a third of whom speak any English at all. Pay and benefits are about a third higher for Banha employees than for other, comparable civil electronics factories. Banha also has sought to develop its own work force through a technical training program, and it is one of the few Egyptian defense-related firms that employs women on a production line. [redacted] 25X1

[redacted] 25X1

[redacted] 25X1

Egyptian management practices and low worker motivation hamper production at Banha. [redacted] 25X1

[redacted] low employee motivation was evident through poor housekeeping and [redacted] 25X1

[redacted] 25X1

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Workers assembling components at the Banha Electronics Factory 144. [redacted]

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unsafe worker practices. Quality-control procedures did not appear clearly defined, and the factory's poor documentation practices required the Army to perform its own quality-control inspection before accepting Banha's products. [redacted]

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another reason for the quality-control problem was the lack of a system to provide backups for absent workers. [redacted]

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Despite these problems and a lack of environmentally controlled facilities, we believe Banha has the potential to expand production beyond its present assembly of small radio transceivers. Banha's managers and employees are intelligent and generally well educated, and they appear willing to learn new production methods and to adopt new management styles. We also believe Banha would complement the AOI's electronics factory if the Defense Ministry rationalized military electronics production by assigning the telecommunications and radar sector to Banha and avionics production to the AOI. [redacted]

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**Table 1**  
**Major Products of Egypt's Military Factories**

	Abu Za'bal Engineering (100)	Al Ma'adi Engineering (54)	Hulwan Machine Tools (999)	Hulwan Engineering (99)	Heliopolis Chemical (81)	Shubra Engineering (27)	Abu Qir Engineering (10)	Al Ma'sarah Engineering (45)
<b>Arms</b>								
Daggers, knives, axes		X						
Flare gun		X						
Flamethrower		X						
Hulwan 9-mm pistol		X						
Mizr (AKM) rifle 7.62 x 39 mm		X						
Suez light machinegun 7.62 x 39 mm		X						
Port Said submachinegun 9-mm P.B.		X						
Aswan medium machinegun 7.62 x 54 mm		X						
60-mm light mortar			X					
82-mm light mortar			X					
120-mm heavy mortar			X					
23-mm AA gun (ZU-23M)	X							
122-mm SP howitzer	X							
122-mm D-30 howitzer	X							
130-mm gun (M-59-1M)	X							
<b>Ammunition</b>								
.303 ball							X	
7.62 x 39 mm						X		
7.62 x 51 mm							X	
7.62 x 54 mm							X	
9-mm P.B. and blank						X		
.5" API/APIT						X		
12.7-mm API/APIT						X		
14.5-mm API/APIT						X		
20-mm AA HEI (Hispano Oerlikon)								X

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	Abu Za'bal Engineering (100)	Al Ma'adi Engineering (54)	Hulwan Machine Tools (999)	Hulwan Engineering (99)	Heliopolis Chemical (81)	Shubra Engineering (27)	Abu Qir Engineering (10)	Al Ma'sarah Engineering (45)
23-mm ZU AA HEIT								X
30-mm AA HET (Hispano)								X
37-mm AA HEIT								X
40-mm AA (Bofors)								X
57-mm AA/AP/HE					X			
60-mm HE mortar					X			
81-mm HE mortar					X			
82-mm HE/IL mortar					X			
85-mm HE/AA/AP					X			
100-mm HE/AA/AP					X			
105-mm HEAT/APFSDS-T				X	X			
115 HE/Sabot					X			
120-mm HE mortar					X			
122-mm HE (H-38/D-30)					X			
122-mm (BM-21) rocket with launcher					X			
130-mm HE (M-46)					X			
155-mm HE					X			
Shell casings, mortar shells, metallic parts				X				
Plastic and metal AP/AT mines					X			X
Detonators, fuzes, blasting caps					X			X
Smoke grenades/explosive charges					X			
Artillery/rocket fuzes								X
Percussion caps and primers								X
Handgrenades								X
<b>Protective equipment</b>								
Gas masks					X		X	
Filters					X		X	

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**Table 1**  
**Major Products of Egypt's Military Factories (continued)**

	Abu Za'bal Chemical (18, 90)	Qaha Chemical (270)	Hulwan Nonferrous (63)	Hulwan Ferrous (9)	Banha Electronics (144)	Hulwan Diesel (909)	Hulwan Metallic (360)
<b>Chemicals and explosives</b>							
Single-base powders	X						
Double-base powders	X						
Mortar charges	X						
Extruded and cast double-base rocket propellant	X						
Explosives	X						
Flares, pyrotechnics		X					
Primer caps, tracer tubes		X					
Dry batteries		X					
<b>Metals fabrication</b>							
Rods, wires, cable			X				
Castings				X			
Crankcases				X			
Gun carriages				X			
<b>Metallic pressings</b>							
Cutting charges							X
Metallic mine components							X
<b>Field service equipment</b>							
Diesel engines						X	
Diesel generators						X	
Pumps, compressors						X	
<b>Electronics</b>							
Radios					X		
Switchboards					X		
Mine detectors					X		
Printed circuit boards					X		

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### Appendix C

#### The Arab Organization for Industrialization

The Arab Organization for Industrialization (AOI) was established on 29 April 1975 when Saudi Arabia, Kuwait, Qatar, and the United Arab Emirates provided nearly \$2 billion to underwrite a Pan-Arab arms development organization based in Egypt. In return for this funding, Egypt was responsible for providing some 16,000 workers in five former military factories to serve as the production base, and for obtaining and managing new joint ventures with Western firms. The AOI promptly negotiated a series of coproduction agreements with Western firms, and four joint-venture companies (Arab-American Vehicles, Arab-British Dynamics, Arab-British Engines, and Arab-British Helicopters) were established by the end of 1978. [redacted]

Egypt's peace treaty with Israel not only ended Arab funding for the AOI but also led to successful Saudi pressure on the British to withdraw from the Lynx helicopter assembly program with Arab-British Helicopters. British participation in other AOI ventures continued, however, and French participation in the AOI increased in the late 1970s with contracts to assemble Alpha Jet trainers, jet engines, and electronics. Despite the Arab pullout, Egypt has continued the AOI as a functioning entity, citing charter provisions requiring unanimous consent to dissolve the organization. According to the AOI, its original Arab funds remain untouched in interest-bearing accounts, awaiting the return of the original partners. [redacted]

#### Organization

Though nominally an independent, Pan-Arab organization, the AOI in reality is little more than the aeronautical and high-technology side of the Defense Ministry's military factory system. [redacted]

The *Arab-American Vehicles Factory* (AAV), located in the Almaza section of Cairo, produced its first American Motors (now AMC-Renault) Jeep CJ vehicle in December 1979. Although the plant is capable of producing some 10,000 vehicles per year, it probably produces less than one-fourth of that number due



*Inventory of Jeep vehicles at the Arab-American Vehicles Factory.* [redacted]

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to limited military demand. [redacted] Egypt sold about 1,000 Jeeps to Iraq in 1983 and that Defense Minister Abu Ghazala anticipates completion of a sale to Iraq of another 4,000 (worth some \$40 million) by August 1986. [redacted] all of these vehicles have come from AAV's stockpile of nearly 10,000 unsold vehicles. We estimate local content in the Jeeps is probably closer to 25 percent than the 50 percent claimed by the AOI. [redacted]

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*Arab-British Dynamics Company* (ABDCO), also located at Almaza and adjacent to AOI's Sakr Factory, produces only the British-designed, 1960s-generation *Swingfire* antitank guided missile. [redacted]

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[redacted] some 70 percent of the missile is local content, including major components such as the rocket motor and control unit. The hollow-charge warhead, however, is made in the United Kingdom. [redacted]

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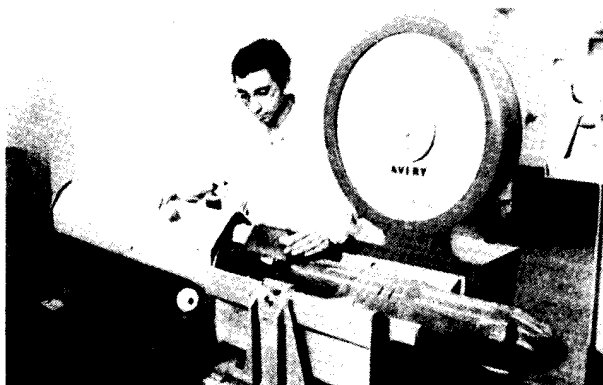
After a visit to the [redacted] [redacted] appeared to be clean, well managed, and equipped with modern numerically controlled machine tools in several areas. At that time

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Final checkout and insertion of a Swingfire anti-tank guided missile into its launch canister at the Arab-British Dynamics Company. [redacted]

the plant's approximately 600 employees and 40 British technicians, advisers, and managers were involved in producing some 200 missiles per month on a second Egyptian contract for 65 launchers and 3,000 advanced Swingfire missiles. [redacted]

ABDCO appears to have a North Korean connection.

[redacted]

AT-3 Sagger antitank guided missiles at the facility in early 1984. [redacted]

[redacted]

This improved SA-2 missile, identified by ABDCO as the "Early Bird," was displayed at the 1984 Cairo International Arms Exhibition. [redacted]

The Arab-British Engines Company (ABECO), located at Hulwan, was created as a joint venture with Rolls-Royce in 1978 to produce engines for the Lynx helicopters that were to be assembled by AOI's Arab-British Helicopters Factory. Despite the 30-percent share Rolls-Royce retains in ABECO, the factory and its approximately 400 employees now assemble, repair, and overhaul the French Turbomeca Astazou XIV-H engines used on Egypt's Gazelle helicopters. It also repairs and overhauls the Soviet TV2-117A/B and TV3-117A engines used on Egypt's MI-8 helicopters. The AOI intends to develop the engine factory

into a major regional engine overhaul and repair facility and has expressed an interest in developing the capability to do work on the T55-L-11D (CH-47), T56-A-15 (C-130), CT64-GE-820-4 (DHC-5 Buffalo), Gnome H-1400-1 (Westland Sea King/Commando), and the Turbomeca Makila I-A (Super Puma). We believe, however, that extensive capital improvements, particularly to the engine test cells, are necessary before any of these other programs can be undertaken. [redacted]

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The AOI Helicopter Factory, formerly Arab-British Helicopters, began in 1978 as a joint venture to produce the Westland Lynx helicopter. The AOI sued its former partner for breach of contract after the British unilaterally withdrew under Saudi pressure in 1979. The factory later was completed with French assistance, and today it assembles the Aerospatiale SA-342L Gazelle helicopter at a rate of about two per month, with a maximum capacity of about four per month. The helicopters arrive in Egypt as kits with all the major components already assembled. The factory's position as a subcontracting final assembler to Aerospatiale and the French Government ensures French quality control of the final product and has permitted the AOI to master fairly quickly the assembly operation. The factory's first helicopter was accepted by the Egyptian Government in December 1983, a little more than six months after the first kit arrived in Egypt. [redacted]

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The AOI Training Institute, also referred to as the Arab Institute for Aerospace Technology, was created in the early 1980s to provide technical and upgrade training for AOI workers. The AOI has long-range plans to convert the Institute from a simple technical training facility into what it hopes will become a major regional aerospace academic and research complex. [redacted]

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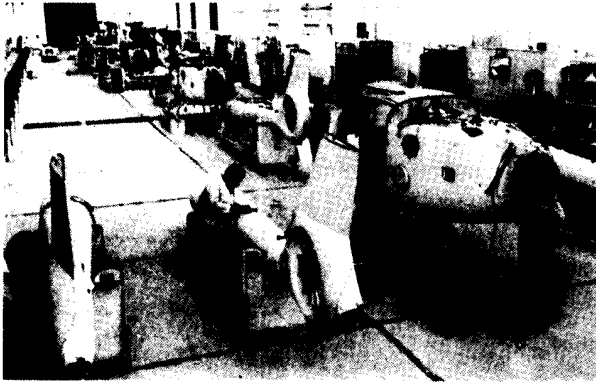
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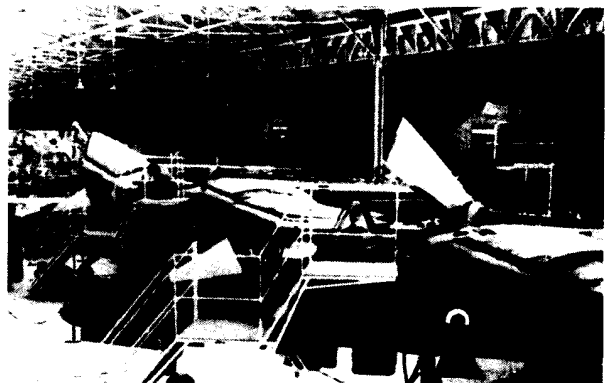
AOI's Electronics Factory is colocated with the AOI Kader Factory in Nasr City. Created in 1979 to supply electronics components for AOI missiles and rockets, the factory's 120 workers and 30 engineers instead primarily have produced telecommunications equipment. This light assembly operation produces

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*Gazelle helicopter assembly at the AOI Helicopter Factory.* [redacted]



*Alpha Jet assembly at the AOI Hulwan Aircraft Factory.* [redacted]

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field telephones, West German-designed television sets, Yugoslav-designed switchboards and field telephones, and Thompson-CSF and TRT radio altimeters and radios for Egypt's Alpha Jet trainers and Gazelle helicopters. According to AOI officials, electronics sales to other AOI units and to the Egyptian military reached \$9 million in 1982-83, up \$2 million from the previous year. [redacted]

[redacted] the factory in 1983 [redacted] was well equipped to produce single- and double-layer printed circuit boards but was not yet able to manufacture multilayer boards. [redacted]

[redacted]

the Brazilian Tucano trainer once assembly and manufacturing began at AOI's Kader Factory, and it has been designated to assemble French Mirage 2000 fighters for the Egyptian Air Force. According to the AOI, the factory employs some 3,500 personnel, of whom 150 are graduate engineers. Aviation press sources reported that this large work force is one of the factory's greatest strengths, since most of it has worked together for more than 20 years on Egyptian aeronautical projects, including the design and prototype manufacture of two Egyptian military aircraft in the late 1960s. In contrast to many Egyptian factories, [redacted] the Hulwan factory as neat, clean, well managed, and equipped with many modern machine tools. [redacted]

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*Arab International Optronics* is a joint venture formed in 1983 with the British firm United Scientific Holdings. This AOI unit will begin the incremental licensed manufacturing of optical instruments, second-generation night-vision devices, and laser range-finders once its pilot plant in the Cairo suburb of Heliopolis is completed. AOI plans eventually to turn this pilot plant into the research and development facility for a larger main plant to be built nearby. [redacted]

The *Hulwan Aircraft Factory* (formerly Military Factory 36) is involved in the component assembly, final assembly, and flight-testing of the French Alpha Jet. It also will provide components and assemblies for

The aircraft factory's major project since 1982 has been the component and final assembly of the Alpha Jet MS-1 trainer and MS-2 light attack aircraft. Egypt's contract with France provided that 26 of the 30 MS-1 aircraft were to be built in Egypt, as were 11 of the 15 MS-2 aircraft. Egypt was to receive a 10-percent offset on the MS-1 contract and a 30-percent offset on the MS-2s. Major offset items have included Egyptian manufacture of rudders, flaps, ailerons, fuselage tail cones, engine exhaust pipes and bypass ducts, and avionics racks for both Egyptian and French Alpha Jets. [redacted]

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[redacted]  
[redacted] Production of both versions has averaged about 1.5 aircraft per month, although that rate was recently slowed to just under one per month to stretch out delivery of the final seven aircraft to the last quarter of 1985. Egyptian officials have expressed concern that the factory has no contracts other than assembly work on the Tucano with the Kader Factory to keep its large work force gainfully employed until some planned Mirage 2000 work later in the decade. [redacted]

The Mirage 2000 deal with France involves an initial purchase of 20 aircraft (four trainers and 16 fighters), with delivery to begin no later than the last quarter of 1985. [redacted] agreement has been reached (but no contract yet signed) for an additional purchase of 20 aircraft, and an option has been retained for a further 20. Egypt has stated its desire to assemble 16 of the first 40 aircraft, with at least 10 percent of the aircraft's components assembled in Egypt. [redacted]

The *Hulwan Engine Factory* (formerly Military Factory 135) and its approximately 3,800 employees assemble the French Turbomeca-Snecma Larzac 04-C5 engine for the Alpha Jet. In addition, the factory is preparing to assemble under license some 150 Pratt and Whitney (Canada) PT6A-25C turbo-prop engines for the Brazilian Tucano trainer at a planned rate of four per month. The factory also will probably assemble the French Snecma M53-P2 engine should Mirage 2000 assembly begin at the Aircraft Factory later in the decade. [redacted]

[redacted] the Engine Factory remains underutilized despite the expenditure of some \$1 million to upgrade tooling to produce the Larzac engine. [redacted] the factory produces gears, valves, brakes, turbine blades, diesel injectors, and other parts for diesel engines in order to utilize its spare capacity. Its extra personnel are involved in conducting accident investigations for the Egyptian Air Force, testing engines that have been overhauled at the Air Force's overhaul facility at Hulwan, and performing testing and analysis on foreign- and domestic-manufactured engine components. [redacted]

[redacted] the Engine Factory lacks the necessary experience, leadership, equipment, capital, and access to financial resources to produce or assemble a modern jet engine. [redacted]

We believe the *Factory for Helicopter Propellers* is the old Hulwan Machine Shops. This plant's approximately 300 workers manufacture rotor roots and rotor blades and also rebuild gear boxes for Egypt's Soviet-supplied tanks. [redacted]

[redacted] in 1984 [redacted] the facility and its equipment appeared old, yet well maintained. [redacted]

The *Kader Factory for Developed Industries* (formerly Military Factory 72) is located in the Nasr City area of Cairo. Its primary products until recently were the Walid armored personnel carrier (APC), a copy of the Soviet BTR-152 produced with Polish and East German assistance, and the Gomhuria basic trainer aircraft, a copy of a World War II German design. The factory now is working on two new products, the Fahd (Panther) APC and assembly of the Brazilian Tucano trainer. [redacted]

The Fahd is an indigenously developed, four-wheeled APC that was exhibited in prototype at the 1984 Cairo arms exposition. The status of its development and production is uncertain. Like the Walid, the Fahd may have been designed more for export than to fill an Egyptian Army requirement. [redacted]

The AOI signed a \$181 million contract with Brazil in December 1983 to assemble under license 120 EMB-312 Tucano light attack trainers at the Kader Factory. Forty of these aircraft are for the Egyptian Air Force, with the remainder to be sold to Iraq. The AOI has a further option on 60 aircraft, only 20 of which are to be sold to Iraq. In addition, the AOI obtained nonexclusive sales rights for the Tucano in the Middle East. The tentative production schedule at Kader calls

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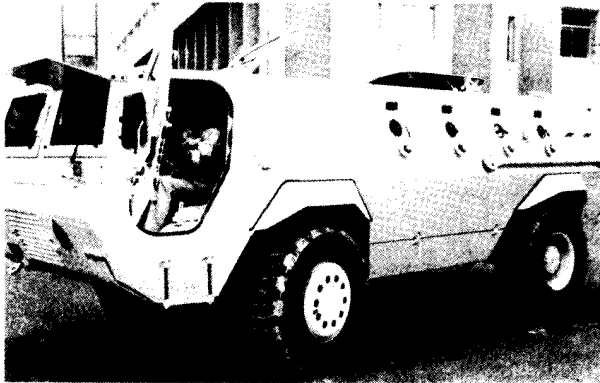
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The Fahd armored personnel carrier developed at the AOI Kader Factory. [redacted]

for the provision of 10 Brazilian-manufactured planes to Egypt no later than mid-1985, to be followed later in the year by Egyptian assembly of aircraft from kits. Egyptian assembly of complete aircraft is scheduled for 1987, with the contract to be completed by 1989. [redacted]

The Sakr Factory for Developed Industries, formerly Military Factory 333, is located in the Almaza section of Cairo near the Arab-American Vehicles plant and Arab-British Dynamics. The factory emphasizes research, development, and production of rockets, missiles, and propellants. [redacted]

products, often with foreign assistance. Its current line is restricted to occasionally improved copies of old Soviet weapons such as antitank grenades, 80-, 120-, and 122-mm artillery rockets, the RPG-7, K-13 (Atoll) infrared air-to-air missile, and the SA-7. The AOI claims, nevertheless, that Sakr made \$116 million in sales of these items to the Egyptian military in 1982-83, up \$16 million from the previous year. [redacted]

Foreign assistance has been critical to Sakr projects, both for production processes, equipment, and supplies and for assistance in reverse-engineering old Soviet weapons. [redacted]

[redacted] Dynamit-Nobel supplies at least 15 percent of the propellants used in the Sakr-30 improved 122-mm artillery rocket, while the West Ger-

man firm of Bayern Chemie casts the propellants for both the Sakr-30 and the SA-7 Sakr Eye missile. French and US firms have been involved in reverse-engineering studies and prototype development of the SA-7 Sakr Eye, K-13 Atoll, AT-3 Sagger antitank guided missile, and the PG-7 Nader, Sakr's copy of the Soviet RPG-7. Aerospace media report Romania has provided machine tools to Sakr and has assisted in the production of the RPG-7. [redacted]

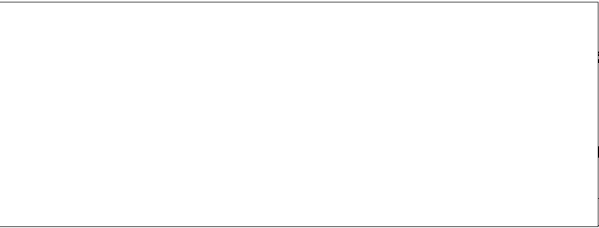
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Sakr is involved in four programs of interest to the United States: improvement of the K-13 Atoll air-to-air missile; retrofitting older Soviet-supplied SA-7 missiles; the development of the Sakr Eye reverse-engineered SA-7; and research on a short-range ballistic missile. [redacted]

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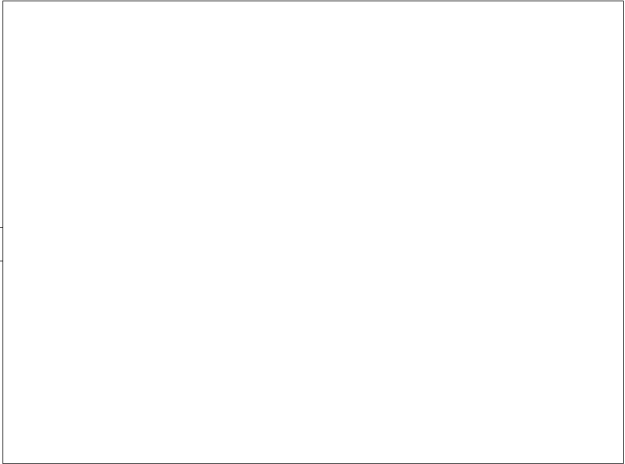
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the Air Force preferred new US AIM-9 Sidewinder missiles over an improved K-13, while initial Army support for using the missiles in a ground-launched role (similar to the US Chaparral) snagged on questions of cost effectiveness and on the tantalizing prospect of reverse-engineering Soviet SA-9 Gaskin missiles that might be obtained from Iraq. [redacted]

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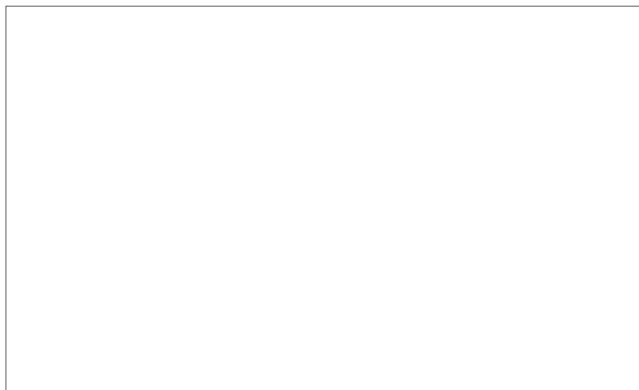
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**Table 2**  
**Major AOI Coproduction/Coassembly Projects**

Program	Foreign Partner	AOI Factory	Status/Remarks
Jeep vehicles	United States/France	Arab-American Vehicles	In production.
Swingfire ATGM	United Kingdom	Arab-British Dynamics	In final production run.
Improved SA-2	North Korea	Arab-British Dynamics	Protocol signed in 1983 for joint production.
Gazelle helicopter	France	Helicopter Factory, Arab-British Engines Company	In production.
Alpha Jet	France	Hulwan Aircraft Factory, Hulwan Engine Factory, Electronics Factory	In final production run.
Mirage 2000	France	Same as above	Negotiations continue for production this decade.
Laser rangefinders/night sights	United Kingdom	Arab International Optronics	Factory and pilot plant under construction.
Tucano	Brazil	Kader Factory, Hulwan Engine Factory	Production scheduled to begin late 1985.
Sakr Eye (SA-7)	France	Sakr Factory	Production scheduled to begin late 1985.
Ballistic missile	?	Sakr Factory	Under research and development.

[Redacted]

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Sakr's last major project also is its most interesting:  
 development of a short-range ballistic missile. [Redacted]

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Swiss firm of Oerlikon-Buehrle is developing a static test stand for Sakr that is capable of testing solid fuel engines for surface-to-surface missiles. [Redacted]

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