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The Evolution of Chemical and Biological Weapons in Egypt

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Preface

This paper deals with various aspects related to the military chemical and biological capabilities of Egypt, a country whose offensive concept and capacity in these spheres have virtually not been explored at all, let alone comprehensively. Although chemical weapons (CW) and biological weapons (BW) have concurrently been developed by Egypt since the 1960s, the strategic, political and technological aspects included in the present study are in part approached through different methods with regard to the chemical and biological fields, due to the respective dissimilar nature of the existing information.

PART ONE: Chemical Weapons

Developing an Offensive Capability

Egypt was the first Arab state to acquire an offensive chemical capability, and at a rather early stage. According to Cordesman, by the late 1950s Egypt already possessed CW, whereas Schumayer noted unequivocally that the Soviets supplied Egypt with defensive equipment as well as with CW, in the early 1960s.¹ One way or another, it may be presumed that the timing of CW acquisition by Egypt was connected with Egypt's extreme inferiority and vulnerability during its war against Israel in 1956, and with the forthcoming Egyptian employment of CW in the Yemen War. Indeed, a short period of time after acquiring this non-conventional offensive capability, Egypt used it repeatedly during a continuing conflict (in Yemen) and was thus the first Arab state to employ CW.²

In 1963, the Egyptian Air Force first used chemical warfare agents in Yemen, and this, significantly, happened to be soon after Egypt's first CW facility, in Abu-Za'abal, near Cairo, had begun to operate. This facility was named Military Plant No. 801, operating under the semblance of a factory manufacturing chemicals and pesticides (details are presented below). As became apparent over time however, the facility was run by the Egyptian Ministry of Defense and was in fact engaged in the production of chemical warfare agents, in addition to the pesticides and sprays it manufactured for local, domestic use. As a backup to this plant, the Soviets built alongside it the El-Nasr plant for pharmaceuticals and antibiotics (further details and references are given in Part Two – Biological Weapons).

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During the 1960s, the Soviet Union massively supported both the civilian and military sectors in Egypt. It is therefore possible that this became one of the routes for shipping dual-purpose chemical technologies (military and civilian) to Egypt. The outbreak of the Yemen War during that period constituted a clear Egyptian-Soviet interest. Both hoped to save the republican regime in Yemen. The chemical agents used by the Egyptian Air Force in Yemen between 1963 and 1967 included CN tear gas, mustard blistering gas and phosgene asphyxiant.³ They marked the first phase of Egypt's offensive chemical capability, and actually, for that matter, the beginning of chemical weapons capability of any Arab state.

Thus, Egypt procured its CW inventory from several sources:

- A. Soviet munitions: mustard gas-filled KHAB-200 R5 aerial bombs, phosgene-filled AOKh-25 aerial bombs.⁴
- B. Considerable numbers of mustard-filled artillery shells abandoned by the British military in Egypt's Western Desert at the end of WWI (4.5" Howitzer and 60 pr. B.L. guns).⁵
- C. Chemical weapons, including converted disposable aerial fuel tanks, probably produced locally by Egypt during the Yemen War at Military Plant No. 801.

Throughout the 1960s, high-ranking Egyptian officers were trained at the Red Army's Academy of Chemical Defense in Moscow,⁶ possibly gaining through this channel technical knowledge useful for offensive purposes as well.

Furthermore, in addition to the German missile scientists who worked in Egypt in the 1960s, German specialists in biological and chemical weapons also assisted Egypt.⁷ Seemingly, this involvement included an effort to develop missiles in conjunction with CB as well as radiological warheads, yet it was an abortive effort. However, two remarkable toxic compounds that had formerly been developed by German scientists (in Germany) were studied by Egyptian scientists in Abu-Za'abal during the 1960s: fluoroacetate (a lethal substance) and an oxazepine compound (a psychotropic substance)⁸. These steps marked, in general, the first chapter of Egypt's CW course. During even this early phase, Egypt was already putting forward the active military employment of CW against a defined target population in Yemen, and thus turned into becoming the leading Arab state in this field, until succeeded by Iraq in the 1980s.

Egypt's Employment of CW in Yemen and its Repercussions

For five solid years (1963-1967) the Egyptian Air Force used CW in Yemen, mainly delivered by Elyushin-28 planes (of Soviet origin)⁹. The Egyptian president at the time, Gamal Abdul Nasser, probably authorized the use of CW, but concealed the fact (Egypt denied that it had used CW in Yemen. Only in 1990 did a senior Egyptian military intelligence official admit to the fact.¹⁰) As mentioned, the chemical agents employed in Yemen included CN tear gas, mustard blistering gas and phosgene asphyxiant. The first aerial bombs carrying CN were air-dropped on June 8, 1963 by Egyptian Air Force planes. Their targets were the royalist villages south of Sadah, near the border with Saudi Arabia. Scores of villages were hit. In January 1965 close to 100 villagers in the Mt. Urush area were subjected to an air raid of chemical agents. Here, for the first time, CN and mustard gas were disseminated simultaneously. Between March and July, following a short respite, Egyptian Air Force planes struck again, this time in the Sherazeih area, northeast of Sana. On this occasion phosgene and mustard were the agents of choice.

The last year of the war, 1967, was the year in which Egypt's use of chemical weapons in Yemen peaked. The shipment of chemical weapons to Yemen was accelerated. The CW were stored in an airfield in Hudeida, on the shores of the Red Sea, which was controlled by the Republican forces. The sorties of Elyushin planes carrying chemical bombs commenced at the beginning of January, continuing through July. On January 5, 1967 nine Egyptian Elyushin-28 planes, almost a quarter of the total of Egypt's fleet of 40 such bombers, took off from Hudeida carrying a cargo of chemical warfare agents. Their destination was Kitaf, a royal village with a population of 600. A total of 27 aerial bombs were dropped, leaving in their

wake an affected area of approximately 2 square kilometers. At the time, about half the population of the village was in the vicinity. Almost all were exposed to the phosgene agent. Severe lung injuries caused by the phosgene resulted in the death of some 150 people.

The attack on Kitaf created a particularly big international stir due to the severity and horrendous nature of the injuries sustained by the villagers. This stir was, to a large extent, due to the relatively easy access to the affected area, which enabled many reporters, and an official International Red Cross investigating team, to reach it. On January 31, the British Prime Minister announced in the House of Commons that he had clear evidence that chemical warfare agents had been used in Yemen. This was a serious development from the point of view of the Egyptian government. The following day the Egyptians took pains to draft a statement, released by the Egyptian Information Minister, denouncing the accusations made against Egypt and denying the use of any CW by Egypt.

The Egyptians, however, were not deterred by the international commotion, and the air raids continued. On May 10, 1967, a formation of 8 Elyushin planes took off in the direction of the royalist stronghold near Wadi Hiran, just 3 kilometers from the royalist headquarters. They were carrying a cargo of CW. The Egyptian government was pleased with the results of this attack, consequently deciding to extend the use of CW to Saudi Arabia proper. Two Saudi sites near the Yemenite border were selected as targets, and these were bombed on January 14, 1967. The fragments of aerial bombs scattered across these sites had Cyrillic inscriptions on them. A number of additional similar raids were conducted in Yemen between January and May of that year. The famed American journalist Jack Anderson noted that the CIA presented the White House with reliable and classified intelligence reports on the use of CW in Yemen by the Egyptians, but that these did not receive any public airing since it was in the interests of the United States to secure a cease fire.

Militarily, the CW were aimed principally at those royalists who had found shelter in the caves in the mountainous region, where waging a conventional war could have achieved little. This was, therefore, an opportunity for Egypt – and apparently for the Soviets, as well – to examine the actual effect of the CW in its arsenal in an armed conflict. In this respect, this was a considerable local success. Egypt ratified the 1925 Geneva Protocol prohibiting the use of poison gas in warfare in 1928 and has not added reservations. Hence, the Egyptian employment of CW in Yemen is in violation of this ratification. Egypt's repeated employment of CW, and the obvious success it had targeting an unprotected population with them, the relative ease with which Egypt both manufactured and used these weapons and the moderate reaction with which all this activity was met by the international community, spurred Egypt to increase its stockpiles of CW.

Other Arab states, specifically Iraq and Syria, also similarly impressed by all the above, acted accordingly.¹¹ It should be noted that, contrary to its frequent and continuous use of CW in Yemen during the 1960s, Egypt made no attempt to use CW against the IDF that invaded Egypt during the Six Day War (1967). That is to say, the invasion and conquest of the Sinai Peninsula by the IDF, and its successful destruction of a large segment of the Egyptian army, were conducted under an existing threat of an Egyptian reprisal involving CW. Yet, despite direct hits being sustained by Egyptian strategic assets of obvious value, Egypt avoided using this option. This is most probably due to its fear of a counter reprisal. However, following the Six Day War, Egypt saw fit to further increase its arsenal of both chemical and biological weapons, particularly in the period prior to the Yom Kippur War.

Build Up Towards the Yom Kippur War (1973) and Subsequently

The Yom Kippur War was the most rigorously prepared war ever planned by Egypt. Hence, it can reasonably be assumed that when the decision was first taken to attack Israel, in what came to be known as the Yom Kippur War (October 1973), the chemical and biological option was regarded as a rather crucial component in Egypt's strategic configuration, particularly in light of the absence of a nuclear capability. Indeed, a considerable build up effort preceded this war. Egypt's increased activity in the field of CW was, to a large extent, centered on technological and scientific aspects relating to the elaboration and upgrading of chemical

warfare agents. Both sulphur and nitrogen mustard, as well as potent organophosphorus compounds were dealt with in the Central Military Chemical Laboratories of the Egyptian Army.¹² Yet, Egypt gradually accumulated further important data on organophosphorus compounds similar to nerve gases and on hallucinogenic substances that are militarily usable. Egyptian researchers studying nerve-agents resembling organophosphorus substances concentrated mainly on sarin and VX-related compounds.¹³ The Egyptian laboratories involved in these studies have been affiliated with Military Plant No. 801, the National Research Center and Ain-Shams University. At that stage, the Technical University of Budapest gave assistance. At about the same period of time, psychotropic agents were studied as well by Egyptian chemists. These agents included the hallucinogenic glycolates BZ and EA-3443, the laboratories involved being located in Egypt (the National Research Center), the USA and West Germany.¹⁴

It appears that during the 1970s, and on the basis of this accumulating techno-scientific knowledge, Military Plant No. 801 was manufacturing these two varieties of chemical warfare agents. The aim was to increase Egypt's CW arsenal and improve it¹⁵ (until 1967, when the Yemen war was concluded, Egypt did not use these types of chemical agents, apparently because it did not as yet have them in its inventory). Considering the nature of the data gathered by Egypt, it can be assumed that the nerve agent first developed was sarin (which Egypt indeed supplied to the Syrians in 1972 – see below). This agent is typically non persistent, whereas at a later stage Egypt began manufacturing the persistent nerve gas VX. Deductively, the hallucinogenic agent developed by the Egyptians was of the glycolates group of agents (as corroborated below). These new additions to Egypt's arsenal of chemical warfare agents supplemented the already existing ones (mustard gas and phosgene) and were installed, as were the first, in aerial bombs, artillery shells, rockets and mortar bombs; some of these agents were also installed in mines.¹⁶

With regard to Egypt's manufacturing capability, mention should be made of relevant Egyptian military industries. These facilities include the following:

- A. The Abu-Za'abal Plant No. 18 for special chemicals (near Plant No. 801 for CW). The facility manufactures propellants and explosive charges for all forms of munitions.
- B. The Hakstep Plant No. 81 for Chemical Industries. The facility manufactures all types of munitions. The plant has subsidiary facilities that specialize in recycling munitions cases, the preparation of Napalm, flame throwers, the production of fuses, explosives, essential chemicals and a variety of plastic and rubber items.
- C. The Heliopolis Plant No. 333 for Developed Industries. The facility manufactures artillery rockets and guided missiles.
- D. The Helwan Plant No. 99. The facility manufactures artillery rockets.
- E. The Helwan Plant No. 72. The facility manufactures aerial bombs.¹⁷

Prior to the Yom Kippur War, the strategic cooperation between Egypt and Syria expanded into the chemical arena. Syria did not, at that point in time, have a CW capability, and at first Egypt passed on to its ally its technical knowhow, supplying Syria with small quantities of CW for research purposes.¹⁸ At a later stage, it was agreed that CW would be supplied by Egypt to Syria for a sum of 6 million dollars.¹⁹ This was to provide the Syrians with a strategic offensive weapon of the first order, should they require it. Such an agreement between two Arab states was unprecedented. The inventory with which Egypt supplied Syria in 1972 most probably came as an essential part of the two countries' joint reorganization plan that was carried out by both prior to mounting the surprise attack on Israel. The CW that Egypt shipped to Syria included a lethal non-persistent agent (sarin)²⁰ and a persistent blistering agent (mustard)²¹, installed in tactical (artillery)²² and strategic (aerial)²³ ammunition. It is therefore clear that by that period (1972) Egypt had already accumulated an operational arsenal of these types of chemical agents and munitions.

During the Yom Kippur War at least one unit of the Egyptian Air Force was on alert in the event that a decision would be taken to use nerve gas,²⁴ although no use was made of CW during that war. Following the Yom Kippur War, however, Egypt's President Anwar Sadat and War Minister Gamasi made the point of

clearly hinting that should Egypt suspect that Israel might undertake an offensive initiative in the hope of reversing Egypt's achievements in the war, this option would seriously be considered. Thus, for example, in January 1974, when faced with what it regarded as a particularly threatening situation, President Sadat thought Egypt should make use of every weapon at its disposal.²⁵ Three months later, he announced that if Israel acted thoughtlessly Egypt would use any type of weapon, including those it had not used in the Yom Kippur War.²⁶ Gamasi used more explicit language on two occasions. In July 1975 he declared that Egypt would employ weapons of mass destruction, should Israel use its nuclear option,²⁷ and, in October 1976, he indicated that Egypt had a large enough arsenal of biological and chemical weapons to achieve the total destruction of its enemy.²⁸ The Egyptian leadership threatened to use its chemical and biological options as a deterrent. Apparently, during 1976, the Egyptian army deployed some of its nerve gas arsenal, believing that the most appropriate use of nerve gas would be against Israeli towns.²⁹ In any event, following the Yom Kippur War, Egypt persistently continued to develop chemical warfare agents and to manufacture launching systems for them.³⁰

The signing of the 1978 peace agreement between Egypt and Israel left Syria, Egypt's ally and partner in the 1967 defeat and the Yom Kippur War, feeling abandoned and bitter. However, gradually, from the late 1970s onwards, Egypt began to cooperate with Iraq. Iraq offered Egypt considerable financial support for increasing Egypt's output of chemical warfare agents and for the production of chemical munitions. Iraq hoped to reap some of the rewards.³¹ Thus, the strategic-technological cooperation between Egypt and Iraq in the development of a ballistic missile designed to carry, among others, chemical and biological warheads, grew steadily, as is detailed below.³² The cooperation between Egypt and Iraq, which commenced shortly following Egypt's signing a peace agreement with Israel, was probably not coincidental, particularly since the nature of the cooperation was technological, strategic and very secretive.³³ It was designed to equalize, partially at least, what both Egypt and Iraq saw as the considerable imbalance in their strategic capability, particularly in opposing Israel. This was, of course, in the event that peace between Egypt and Israel should unravel. In addition, Iraq undoubtedly had the Iranian threat in mind. Despite signing a peace agreement with Israel, Egypt had a keen interest in its ongoing strategic-technological cooperation with Iraq.

The 1980s: Ostensibly a Transfiguration

Modifications in the System and Conjunctive Conceptual Trends

After the cooperation with Iraq had been established and commenced, mainly in Iraq, Egypt deemed that some organizational alterations were needed concerning the ongoing activities which were taking place in Egypt itself. Thus, in 1983 and 1984 news items appeared in the Egyptian press regarding the comprehensive reorganization of Military Plant No. 801 in Abu Za'abal, otherwise known as The Company for Chemicals and Pesticides. The first report appeared in April 1983 in the *Al Garida Al Rasmia* newspaper. This national paper reported that, in accordance with a presidential decree, both the above mentioned chemical and pesticide company and the El-Nasr company for pharmaceutical chemicals would no longer be regarded as part of the pharmaceutical sector.³⁴ Four months later, in a letter written to the *El-Ahali* newspaper, employees of the Company for Chemicals and Pesticides claimed the facility had belonged to the Ministry of Defense since its establishment in 1963. In addition, given that, the company's employees had been surprised to learn that the authorities had decided to dismantle the company and thus harm their pension plans.³⁵ This was the first public indication that the company had belonged to the Ministry of Defense for the past twenty years but had, for some reason, recently been subject to large-scale reorganization. Several weeks later an item appeared in the *A-Sha'ab* newspaper in which it was reported that The Company for Chemicals and Pesticides was in fact Military Plant No. 801, and that the facility had been shut down, thus giving rise to the employees' concerns.³⁶

At the same time, in August 1983, Egypt first submitted a working paper at the UN Conference on Disarmament, in which it included the Egyptian proposal for the advancement of an international convention to end the proliferation of CW.³⁷ A year later, in July 1984, the Egyptian representative to Pugwash

presented a working paper on the subject of “Verification of No-Production of CW”.³⁸ Several months later, at the weapons fair held in Cairo in November 1984, the Abu-Za’abal Chemical Company was presented as a manufacturer of products for the mass decontamination of persons and equipment contaminated by chemical agents.³⁹ The Egyptian authorities also addressed the issue of the El-Nasr Pharmaceutical Chemicals Company, whose facility was also located in Abu-Za’abal. Presidential decree no. 380 of November 8, 1984 authorized the establishment of the Adwia Egyptian Chemicals and Pharmaceuticals Company as a public company whose facility would be built in the Egyptian town of the Sixth of October.⁴⁰ Moreover, presidential decree no. 191 of May 21, 1985 states that the government of Egypt authorized the establishment of the “New Company for Chemicals and Pesticides” as a closed public company. The location of this company’s facility would also be the Sixth of October.⁴¹

Egypt took these steps as part of a general reorganization which appeared to be entirely civilian in character and, therefore, in accord with Egypt’s activities in various international forums that hoped to reach a ban on CW. These steps could be construed either as an attempt on Egypt’s part to cease production of chemical weapons or an effort to conceal the existence of activities that directly contradicted Egypt’s activities in the international arena. In reality, this reorganization resulted in Egypt’s being able to improve its production of CW agents, as indeed happened (see below). Evidence of this can be found in the doctoral dissertation submitted by the man then standing at the head of Egypt’s Chemical Warfare Directorate, General Mamduh Hamed Attiya. The dissertation, submitted in 1985, dealt with the future of nuclear weapons in the Middle East. One of its central conclusions related to CW, in terms of their being a factor that could constitute an important deterrent for the 1980s and beyond them.⁴²

Coping with the Media

How did Egypt cope with press reports referring to its own offensive chemical capabilities? After a ten year interlude, it was reported in 1986 that Egypt was attempting to acquire equipment designed to increase its production of CW.⁴³ In a 1987 report, Egypt was described as possessing a large inventory of CW, including mustard gas, nerve gas and additional chemical agents that had already been installed in both land and air-systems.⁴⁴ In October 1987, the US media, relying on US government and intelligence sources, reported that Egypt had an arsenal of CW.⁴⁵ Six months later, Senator John Macquein released considerable information on the potential chemical and biological capability of Arab states, including Egypt.⁴⁶ The report indicated that Egypt might possibly have tried to obtain an inventory of precursor materials for the production of nerve gas, and had, to that end, cooperated with Iraq on the development of both the Badr-2000 long-range ballistic missile and the Sakr-80 rocket. Also mentioned in the report were the chemical warfare agents launching systems included in Egypt’s arsenal – rockets, artillery shells and aerial bombs. In response, Egypt’s ambassador to the UN claimed that his country was not developing, manufacturing or building an arsenal of CW; yet, no less significant were the statements of senior Egyptian officials. In a newspaper interview given in July 1988, the former head of Egypt’s Military Chemical Warfare Directorate, argued that it was necessary for the Arab states to develop chemical and biological warfare agents.⁴⁷

Retired General Hassan Sweilam, who had once stood at the head of Egypt’s Institute of Strategic Studies, supported the argument that Arab states needed to equip themselves with missiles capable of carrying chemical warheads.⁴⁸ Egypt’s former Defense Minister, also stated in a newspaper interview given in October 1988 that chemical and biological weapons were important to Egypt and other Arab states.⁴⁹ An Egyptian semi-official report published in 1988 supported the existence of CW in Arab states.⁵⁰ In December 1988, the Washington Institute for Near East Policy published its review on “Chemical Weapons in the Middle East”, which stated that Egypt was in fact “continuing to develop its chemical program and was manufacturing CW, most probably mustard gas”. The review offered information supporting the claim that Egypt was assisting Iraq to develop the Badr-2000 ballistic missile as a weapon designed to carry chemical warheads.⁵¹ By way of contrast, Egypt announced to the Conference on Disarmament that it did not hold CW; further, the Egyptian Defense Minister, insisted that “we maintain that we do not have any CW in our

possession, and that it is not our intention to manufacture CW".⁵² Remarkably, as of 1989, an Egyptian Major General published an article entitled "Biochemical War", in which he included Egypt as one of the 16 states which, according to the CIA, maintained an inventory of CW. In this article no attempt was made to disprove this claim. Moreover, from a professional standpoint, this was the most comprehensive article on the subject of CW and BW to be published in an Egyptian military periodical.⁵³ The article, which reviewed the various events in which use had been made of bio-chemical agents, ignored both the Egyptian-Yemenite conflict and the Iraq-Iran war.

Also in 1989, a report published by the Egyptian Center for Military Studies, which was then quoted in a Kuwaiti newspaper, argued that for Arab states an arsenal of CW agents was a necessity.⁵⁴ This report accurately continues to reflect Egyptian opinion, despite the fact that its Defense Minister had, that very month, (August) stated that Egypt did not have an arsenal of CW, nor did it intend to produce any.⁵⁵ Yet, concurrently, an article published in the UN journal UNIDIR Newsletter by a senior Egyptian writer listed the principal factors that propelled developing nations to obtain CW: their considerable military value, as reflected in the fact that even nations with a nuclear capability continually improved their chemical inventories, and the need to obtain unconventional weapons to counter the threat of nuclear weapons.⁵⁶ Justifying the existence of CW in Egypt and in other Arab states, the writer was suggesting that they were in answer to the nuclear weapons capability attributed to Israel in light of Egypt's inability to attain a nuclear capability of its own. All in all, the dual language used by Egyptian strategists in addressing the issues of legitimacy and existence of CW in Egypt indeed reflects the reality, that is: formally – non-existence, and practically – justified possession.

Egypt's Postures Towards the Gulf War and the Conclusion of the CW Convention – The 1990s

Predictably, the Egyptian position concerning CW-related issues was sharpened by the beginning of the 1990s, under the outstanding circumstances of the Gulf crisis and the forthcoming CW Convention. To begin with, Saddam Hussein's statements regarding the missiles that constituted Iraq's chemical and biological option were well received in Egypt. In March 1990, the Egyptian Defense Minister, in an interview given to a foreign military periodical, noted that the deployment of chemical and biological weapons was not a new occurrence and that future political and military circumstances would necessitate the development of surface-to-surface missiles as the principal means of using warheads with unconventional agents. These would then affect the balance of power in the region.⁵⁷ It is reasonable to assume that the Egyptian Defense Minister chose to make these statements, being keenly aware of Iraq's vigorous efforts in this respect. This was also true of Egypt, although its efforts, in part in cooperation with the Iraqis, were concealed from public consciousness to a far greater degree than Iraq's.

On April 8th, 1990, upon returning from a visit to Baghdad, President Mubarak declared that Egypt was making every possible effort to demilitarize the Middle East from chemical, biological and nuclear arms. He called upon all the nations in the region to cooperate with it to this end, based on total equality and compliance.⁵⁸ The Egyptian ambassador to the UN submitted President Mubarak's initiative to the Security Council, emphasizing that, in an attempt to ensure the security of the world and the region, the attempt to achieve a CW ban should be regarded as a world-wide effort and should include every type of weapon of mass destruction.⁵⁹ The former Egyptian Defense Minister and Minister of Military Industries, was interviewed by a Lebanese newspaper two months prior to the Iraqi invasion of Kuwait. He had just returned from the Arab States Convention held in Baghdad with the aim of assisting Iraq to withstand the increasing pressure put upon it by the West. In the interview, he argued that "the Arabs should continue acquiring chemical, biological and nuclear weapons intended for mass destruction".⁶⁰ He was, it can be assumed, referring in particular to Egypt and Iraq.

Also, a retired Egyptian General suggested that the countries of the Middle East consider maintaining a fixed number of weapons for mass destruction, to be agreed upon jointly.⁶¹ In September 1990, an item appeared

in the Egyptian press claiming that some of the toxic gases in Iraq's arsenal had been manufactured in Egypt. These had been used in experiments carried out by Iraq on Iranian prisoners of war and had been found to be lethal.⁶² The report also mentioned "a high-ranking Egyptian military official" who maintained that "Egypt had in its possession large numbers of CW". In an interview given to an Egyptian newspaper, it was once again argued that Egypt opposed disarming the Middle East of CW without any discussion being held on the subject of nuclear weapons. It was compared to a situation in which two people, one carrying a gun the other a knife, were called upon to put down their knives.⁶³ Egypt was, in all probability, fully aware, during that time, of the efforts being taken by Iraq to progress in the nuclear field, alongside the Egyptian-Iraqi tight collaboration in the chemical and biological fields.

Similarly, in a seminar on "Disarmament and Security in Africa" held in Cairo in May 1990, Egypt's representative called for the demilitarization of Africa from all weapons of mass destruction.⁶⁴ He argued that this was called for due to the nuclear threat that African nations faced from Israel to the north and South Africa to the south. He added that:

In a situation in which a country cannot obtain nuclear weapons of its own and is under threat of a nuclear attack and has nothing with which to respond to this threat, such a nation would be foolish not to turn to the chemical option either as a deterrent or in reprisal to a nuclear attack.

This was a clear attempt on the part of the speaker to justify his country's offensive chemical capability.

Egypt's position was summarized in a letter written by the Egyptian Foreign Minister to the UN Secretary-General on July 21, 1991, a letter that was then forwarded to the Security Council⁶⁵ and to the Conference on Disarmament.⁶⁶ It is reasonable to suggest that Egypt's position, even if we do not assume that it stems from the fact that Egypt considers itself threatened by the nuclear weapons attributed to Israel, was due to its unwillingness to tolerate what it regarded as a vast strategic imbalance. This, for Egypt, was seemingly a matter of principle and an attempt to prevent other states, ostensibly Arab states as well, from acquiring nuclear weapons. A month later, however, in August 1991, two Egyptian officials presented different perspectives.⁶⁷ A General of the Egyptian Nasr Military Academy argued that equipping themselves with chemical and biological weapons would provide the Arab states with an advantage over the Israelis and the nuclear arms attributed to them. Another figure, previously the Chairman of the Egyptian Energy Authority, claimed that Egypt was not lagging behind the international community in developing chemical and biological weapons and in determining an appropriate policy, as was the case with many other countries in the Third World. Rather, this provided Egypt with a certain guarantee against the possibility of a nuclear attack. It was declared both with regard to Egypt itself and in the context of the Arab world in general.

Further, Egypt perceives that it is legitimate on the part of developing nations to hesitate and to regard the notion of forgoing a chemical capability with some apprehension, and this to avoid placing themselves in an inferior position to their foes. However, Egypt foresees a gradual destruction of CW over a ten-year period, including the destruction of all weapons of mass destruction.⁶⁸ This two-faceted Egyptian formula is reflected in its unofficial political position. At the CW discussions held in Geneva, for example, Egypt supported the French interim proposal more than any other state. The French proposed that while pursuing the long-term goal of destroying all CW arsenals, certain countries may have a real need to produce CW that would act as a deterrent during the interim period.⁶⁹ In 1991, an international UN CW trial challenge inspection was conducted for the first time, in this case in a West German military air base. The multi-national inspecting team included professionals from Egypt, Iran, Pakistan, Argentina, Great Britain and Germany.⁷⁰ Indeed, among the Arab states, Egypt was particularly active and supportive in the discussions held at the conference on disarmament that pertained to the CW convention.

Beginning in 1983, Egypt steadily increased its involvement in crystallizing the CW convention drafts, especially in the final stages (November 1992). This could be viewed as a continuous process of development, devoid of contradictions or waverings, one that was first manifested in the early drafting stages, continued with Egypt's efforts to secure practical parameters in the hope of including an all-encompassing formula relating to weapons of mass destruction, and culminating in the detailed wording on

issues relating to the essence of the convention. Egypt's views, therefore, indicate a pragmatic approach to the convention, one that was aimed at reaching a complete and final draft, though not necessarily signing it – as was in fact the case. This seemingly pragmatic attitude coincides with Egypt's declarations that it did not have an arsenal of chemical weapons, from which one might construe that its decision to join the convention was designed to avoid having to undertake the development of CW at some point in the future. In reality, however, Egypt wants to avoid having to destroy its existing inventory of CW or dismantle the related production plants and storage facilities, certainly as long as no link has been made on an international level between the regional destruction of CW and the disarmament of nuclear weapons, as publicly demanded by Egypt since 1987.

Thus, towards the conclusion of the CW convention, Egypt's central arguments were that it denied manufacturing CW, but insisted on a linkage between CW and finding a solution for other forms of weapons of mass destruction. These views continued to be expressed by high-ranking Egyptian officials. In May 1992, Egyptian Foreign Minister Amru Moussa made it clear that despite the fact that Egypt supported the discussions aimed at drafting a CW convention, and participated in them, it would not join the convention because the issue of nuclear arms had not been addressed.⁷¹ That same month, at a conference convened to debate weapons regulation in the Middle East, Egypt tried to convince other Arab states to draft a joint position paper on this issue.⁷² Shortly before the CW Convention was due to be signed, Foreign Affairs Minister Amru Moussa stressed the point that weapons of mass destruction constitute a central theme concerning the issue of re-establishing the regional system of the Middle East. He further explained:

We now have a treaty addressing the issue of CW. We are convinced of its necessity and want to sign our name to it. However, if we do so we will have joined both the convention on nuclear weapons and the convention on CW, unlike Israel. Therefore, we will not join the chemical convention, despite our having participated in drafting it. I hope that the Arab position will remain united in order to maintain a balance in the Middle East with regard to defense.⁷³

This statement clearly reflects the Egyptian-Arab reliance on CW in order to maintain a sort of military strategic balance in the region. When the Chemical Convention was signed in January 1993, Mubarak was in Damascus with Assad, and both called on Arab states to refrain from joining the Convention.

The position of the Egyptian military on this matter was discussed in the "Arab Strategic Report" published by the Al-Aharam Center for Political and Strategic Studies in Cairo.⁷⁴ This position also calls for a link between chemical, biological and nuclear weapons. It does, however, emphasize two main points that do not correspond with Egypt's position: embarking on the destruction of unconventional weapons following the implementation of the peace process, and comprehensively reducing the arsenals of such weapons by all nations to such an extent as to allow each nation to maintain only those weapons that will enable it to defend itself.

Moreover, in June 1993, at a Pugwash workshop conducted in Sweden, the Egyptian representative took a seemingly surprising step, one that appeared to indicate an official Egyptian initiative, perhaps coordinated with other Arab states. Formally, on his own behalf, the Egyptian representative submitted a background document entitled "The Arabs and the Chemical Weapons Convention". In this document he explained that Arab states should not be expected to join the CW convention so long as there was no concurrent reduction – though not necessarily elimination – of the nuclear weapons in Israel's possession.⁷⁵ In order to appear more pragmatic than had similar declarations previously made by Arab states, the Egyptian representative suggested this time a series of practical stages whose implementation would gradually bring about the eradication of weapons of mass destruction in the Middle East. He was thus recognizing that Israel required a strategic nuclear weapon as a final deterrent, and that it would be allowed to maintain its nuclear option for some time to come. In exchange, Arab states would undertake not to obtain – though not necessarily to destroy – weapons of mass destruction of any kind. (The Pugwash CW Study Group indeed been frequently attended by Egyptian strategists, the prominent ones being Esmat Abdel Hamid Ezz, Esam El-Din Galal, Mohamed Zarka, Hussain Ades and Hassan Zaky Youssef.)

Nevertheless, Egypt's Foreign Minister persisted in his "all-or-none" approach concerning weapons of mass destruction on various occasions, referring to Egypt by itself or to the Arab camp. Recently, he even applied this approach to Africa, where an African treaty against CW was thus outlined.⁷⁶ This approach is basically fed by the very existence of CW in Egypt's arsenal, an actuality belatedly acknowledged, finally, by "an Egyptian diplomatic source in Cairo",⁷⁷ as well as by a knowledgeable senior Egyptian strategist.⁷⁸ In a report prepared by NATO, it is stated, however, that "Egypt has claimed that while in the past it had a large arsenal of CW, it is currently limiting its production of CW to what it requires for deterrent and defensive purposes".⁷⁹ That is to say, Egypt acknowledged both the existence of a CW arsenal and that CW is still being produced, albeit in moderation.

Also, it was pointed out that Egypt's primary incentive with regard to the manufacturing of CW is to prepare itself for whatever political changes might occur in the region, taking into account the possibility of deteriorating relations and uncertainty.⁸⁰

The De Facto Activity

Without there being any connection to Egypt's other different and varied activities that have so far been discussed, Egypt's activities from the early 1980s that relate to its developing and accumulating an arsenal of CW agents are worthy of being noted. This includes the ballistic aspect, assistance received from external sources and the changes that occurred with respect to Egypt's chemical capability. Egypt's efforts to advance its military and strategic capability in general, and its chemical one in particular, were naturally conducted in secret, in order to maintain an image that corresponded with its public activities. The increasing cooperation with Iraq resulted in a secret agreement on the renewed activity of the Egyptian CW facility for a sum of 12 million dollars that Iraq granted Egypt for this purpose in 1981.⁸¹ The crowning glory of the cooperation between Egypt and Iraq was the "Badr-2000" project. In the late 1970s, as relations between Egypt and Iraq grew closer, the two decided to develop a long-range surface-to-surface ballistic missile (approximate range of 950 kilometers; warheads weighing 450 kilograms) capable of carrying explosives, as well as chemical and biological material of various sorts.⁸² Argentina was selected as a country that could provide the necessary technologies, far from the leering eyes of intelligence services that focused their attention on the Middle East. The project was named "Condor-2". A tri-lateral agreement was signed in 1984. The purpose was to equip Egypt and Iraq with 200 missiles and to construct the facilities to produce them, both in Egypt and in Iraq.⁸³ With this in mind, Egypt built a facility near the Egyptian chemical weapons plant in Abu-Za'abal.⁸⁴ "Condor-2" laid the ground for Egyptian-Iraqi cooperation on additional missile-manufacturing projects, which were carried out mainly in Iraq and were, like "Condor-2", designed to develop, among others, chemical and biological warheads.

Egypt's strategic-technological cooperation with Iraq also included Egypt's increased assistance to Iraq in the production of chemical warfare agents and their storage,⁸⁵ including the supply of entire Egyptian CW systems.⁸⁶ Egyptian assistance to Iraq also included the establishment of chemical manufacturing facilities in Iraq via the Egyptian branch of the German company WTB,⁸⁷ and the purchase of raw materials for the production of chemical warfare agents.⁸⁸ In a similar manner, for example, 26 tons of hydrogen fluoride were shipped to Egypt from the UK in 1986. Their final destination was an Iraqi production plant, where they were used to produce nerve gas. Egypt was merely the way station. The shipment was authorized by the British cabinet, despite its fear that the true destination was indeed Iraq. At the recommendation of the British Foreign Minister, the UK satisfied itself by communicating this fear to the Egyptian government. Later, an additional 34 tons of this essential raw material were shipped along the same route. It was at this time that the Iraqis employed CW against Iranian forces. Plausibly, the experience gained by the Iraqis both from their own use of CW and through defending themselves from Iranian use of some chemical agents on Iraqi troops was shared with Egypt. Thus, Egypt probably gained considerably in both the theory and practice of CW from its joint venture with Iraq.

Concurrently, Egypt cultivated what was to it extremely important: cooperation with North Korea, a country well versed in the technology of surface-to-surface missiles and CW, of which it has an impressive arsenal, including the Scud-B and other missiles – that carry chemical warheads. In 1986, North Korea completed the development of both a missile with a somewhat longer range (320-340 kilometers) and of a series of warheads (standard, cluster, chemical and biological). Egypt hoped to emulate the North Koreans.⁸⁹ Thus, in January 1989 a report was published in Lebanon regarding the existence of surface-to-surface missiles carrying chemical warheads in Egypt, Syria and Iraq.⁹⁰ This item most probably relates to Egypt's efforts to equip itself with such missiles, following Syria's evident 1986 acquisition of Scud-B missiles carrying chemical warheads, and Iraq's producing chemical warheads for its Scud-B extended-range missile. Further reports on the existence in Egypt of surface-to-surface missiles carrying chemical warheads also appeared later.⁹¹ With regard to the existence of bomblets systems (1000 in number, at least in the Sakr-80 rocket warhead, which has a range of 80 kilometers and is manufactured in Egypt), note should also be taken of the fact that the Egyptian Military Industries took control of this sort of technology.⁹² A chemical or biological warhead in such a design is quite an advanced technology, particularly in light of the fact that Egypt supplied Iraq with these rockets.⁹³

Mention should also be made of the involvement of the British company, British Aerospace Dynamics, in joint Egyptian-North Korean projects designed to increase the range of the Scud-B missile and in additional Egyptian projects regarding guided missiles.⁹⁴ Besides, there was the assistance provided by Russian scientists in the development of a 450 kilometer and a 1600 kilometer range missile.⁹⁵ It is likely that this increased activity in Egypt was intended to compensate for diminishing technological cooperation with Iraq and the Argentine, with regard to strategic missiles and for the difficulties Egypt faced in its attempts to advance the Condor project which, as far as Egypt was concerned, was to carry conventional plus chemical and biological warheads. However, the Condor technologies were utilized by Egypt for the development of another ballistic missile – Vector (whose range exceeds 1000 km.), while simultaneously acquiring from North Korea the components needed for Scud-C production.⁹⁶ Egypt has already probably attained the technological know-how for fitting ballistic missiles with chemical warheads, and has virtually put it into practice, that is to say – it has indeed fitted ballistic missiles with chemical warheads, and attained such an arsenal.

Throughout the 1980s, Egypt continued to advance CW research.⁹⁷ The research was conducted in Egypt (including cooperation between chemists of Cairo's National Research Center and the Egypt Institute of Atomic Energy), as well as in Denmark and West Germany, with the participation of Egyptian chemists. Also, a high ranking officer (Major General Hussein Ades) left for the United States, where he received training at the University of Columbus, Ohio in organophosphorus compounds similar to nerve gases.⁹⁸ At the National Research Center, the effect of seawater on organophosphorus substances was examined,⁹⁹ thus allowing the possibility of exploring seawater as a suitable burial site for old nerve gases. At Cairo's Military Technical College, the effect of nerve gas-like pesticides on the enzymes they inhibit was studied.¹⁰⁰ In addition, at an Egyptian facility for formulating pesticides the delayed effect of nerve gas-like pesticides on the neurological function of 230 employees in the facility was examined. This research was carried out in cooperation with the Research Triangle Park Center of North Carolina.¹⁰¹

Throughout the 1980s and the 1990s, the nucleus of Egypt's technological know-how (on the pre-industrial level) in most aspects related to organophosphorus substances, including nerve gas-like pesticides, further developed at the National Research Center in Cairo.¹⁰² It was at the National Research Center, that much of the know-how on these substances in Egypt, perhaps in the Arab World, was accumulated. Even the manufacturing process of the substance in which Egypt chose to conduct its domestic trial challenge inspection, (para-toluen-sulphonate) was carried out at an unidentified Egyptian facility.¹⁰³ It was developed, at least to a pre-industrial level, at the National Research Center for the Egyptian Company for Dye Stuffs and Chemical Products (which manufactures this substance at a rate of 600-3000 tons per year).¹⁰⁴ Despite the fact that Egypt did not see fit to name the facility in which it carried out the trial inspection (only defining it as a facility "capable of manufacturing chemical weapons of any kind" in its above mentioned report to the

Conference on Disarmament), it transpires that there is a definite link between the Egyptian National Research Center and the Egyptian Company for Dye Stuffs and Chemical Products. A close link between the National Research Center and the Egyptian principal CW production facility, Military Plant No. 801, has indeed been previously indicated.¹⁰⁵ All this while Egypt participated in drafting items for discussion at the CW Convention.

The reorganization of Military Plant No. 801, in its civilian and military divisions, as a facility manufacturing CW, was planned during the mid 1980s. In 1986 the El-Nasr Chemical Company was set up in Giza, Cairo, to establish new production lines for spray refills. The company was managed by the Egyptian military who appointed an army General, Faruk A-Sadik, to manage it. The Egyptians emphasized the multi-purposive profile of the spray production lines, which were constructed by the British company Cartridge Pack and the Swiss company Druck Pack. The Canadian company, Central Convey supplied the conveyance system.¹⁰⁶ That these refill production lines were designed to fill CW/BW as well in a form of a spraying device should not be ruled out. In the same period, another facility, a CW plant located near the Egyptian Air Force base in Bani-Sueff, some 60 kilometers south of Cairo, placed an order for toxic substances with some Canadian suppliers.¹⁰⁷ Egypt's request that Canadian suppliers provide it with raw materials for the production of nerve gas was met with a refusal.¹⁰⁸

It was roughly then that the division manufacturing CW at Military Plant No. 801 in Abu-Za'abal was reorganized, with the aim of doing away with the dated manufacturing facilities and updating the production of Egypt's offensive chemical capability with the aid of Western European companies.¹⁰⁹ Egypt seems to have gone to great lengths to carry out this two-stage plan. First the establishment of renewed production lines for some of the raw materials, particularly phosphorus tri-chloride, followed by the establishment of an enlarged manufacturing facility for nerve gas. This plan, whose official permanent "customer" was the El-Nasr Pharmaceutical Company in Abu-Za'abal,¹¹⁰ appears to have been aimed at blurring the natural division between the establishment of raw material production lines through the pharmaceutical plant itself (requiring some similar raw materials) and the establishment of the renewed manufacturing facility at the neighboring Military Plant No. 801.

The Swiss chemical company Krebs came to Egypt's aid. Both the planning and the establishment of the all important phosphorus tri-chloride raw material production line was made possible by shipping the required equipment from the Pennsylvania-based company Stauffer Chemicals. Krebs received authorization for the blueprint of the production line, which was sold in 1986 to the company in accordance with the needs of the client.¹¹¹ In actual fact, the Egyptian project was designed to produce, among others, the nerve gas sarin, but, despite a warning to Krebs from the Swiss authorities,¹¹² Egypt was supplied in 1987 with a complete facility for producing phosphorus tri-chloride. In 1988 it was also supplied with the main components for the CW manufacturing facility.¹¹³ It should be noted that a short time earlier, the Iraqis concluded a basically similar process with the aid of several German companies.

In March 1989 the Egyptian-Krebs connection was brought to public attention. Following US pressure on the Swiss government and an Egyptian refusal to supply details of what chemicals would be manufactured in the facility, Krebs abandoned those few stages of the project that had yet to be completed.¹¹⁴ Egypt failed in its attempt to prevent the cat getting out of the bag. The President of Krebs noted that though he believed the Egyptian facility to be a "manufacturing plant for pharmaceutical chemicals", his company was severing all ties with the Egyptian company.¹¹⁵ On the same day, President Mubarak claimed that the facility in question was a pesticide manufacturing plant.¹¹⁶ Again, the "slight" difference between pharmaceuticals and pesticides reflects the transparent interchangeability of the two above mentioned Abu-Za'abal-based outstanding plants. The US administration did, however, take the trouble to try to justify Egypt, peculiarly stating that the Egyptian CW were designed to deter Libya.¹¹⁷ A distraction from the brewing commotion was supplied in the form of US Senator Daniel Inouye who arrived in Egypt for talks with President Mubarak. To persuade Senator Inouye that Egypt was not at fault, a tour of Abu-Za'abal was arranged for him. The tour focused on a plant which manufactured tanks, providing an eyewitness with a misleading account, thus disproving, ostensibly, the previous disturbing information.¹¹⁸ Nevertheless, two additional

pesticides plants, located in Kafr El-Dawar and Kafr El-Zayat, have been suspected of chemical warfare agents production.¹¹⁹ The involvement of at least the Kafr El-Zayat factory in handling organophosphorus compounds has been subject to evidence.¹²⁰ Another pesticide plant, located in the area of Manuf-Abu-Rawash and affiliated with the public sector, has been accused by some Egyptians of illegally producing and holding poisonous materials and being erected improperly.¹²¹

Egypt, however, began searching for partial replacements and further technological backing. It developed the Egyptian Company for Dye Stuffs and Chemical Products which manufactures a pesticide called malathion, aiming at the production of phosphorus penta-sulphite¹²² – which is also used, not casually, as main precursor for the production of the VX nerve gas. It also began to procure additional raw materials from India (which had meanwhile become a supplier to Iran and Syria)¹²³ and to cooperate with the Hungarian company Lampart in order to acquire further necessary technologies for the production of CW.¹²⁴ In those same years Egypt appears to have expanded, however, its industrial infrastructure for the production of nerve gases in such a way as would diminish its dependency on controlled imported raw materials.¹²⁵ Egypt has been assessed to possess the “majority of critical elements of CW systems”.¹²⁶ Indeed, in 1992, Western intelligence agencies identified renewed activity in Egypt with regard to the production of CW.¹²⁷ India had now become an important source for raw materials, supplied to Egypt in industrial quantities until at least 1993 (totaling a quantity of at least 340 tons). It can therefore be assumed that both the and domestically manufactured raw materials are currently being used to produce CW, with the emphasis being put on advanced VX nerve gas. It should also be noted that in 1993 a Russian intelligence report pointed out the existence of information indicating that Egypt intended to acquire warheads that it would fill with liquid chemical warfare agents.¹²⁸ Further, this report states that while Egypt’s CW arsenal could not sustain large-scale operations, its industrial capacity would enable it to produce an additional quantity within a short period of time. Needless to say, Russian ideas of what constitutes large-scale chemical offensive operations, are, considering the outstandingly enormous Russian CW arsenal, by no means out of kilter with Egypt’s concept, doctrine or seeming needs.

PART TWO – Biological Weapons

Background

The identification of the Egyptian biological weapons program is much more complicated than the chemical one, due to shortage of information, complexity of the subject and, inevitably, its consequent considerable overlapping with seemingly civilian activities. Hence, the following chapter is worked out through a different methodology and a thorough analysis.

The most detailed published reference dealing with Egypt’s activities in the area of BW is that of the Russian Foreign Intelligence Service. As of 1993, it says:

Egypt has a program of military-applied research in the sphere of BW, but no data has been obtained on the creation of biological agents in the interests of military offensive programs. The start of realization of research programs in the sphere of BW pertains to the 1960s. Toxins of varying nature are being studied and techniques for their production and refinement are being developed at the present time in a national research center. There is information on cooperation between Egypt’s research centers in areas of biological research related to BW and certain civilian and military laboratories of the United States, particularly in the sphere of highly pathogenic microorganisms and dangerous disease-bearing agents. A US naval military-medical laboratory for the study and development of means of combating particularly dangerous infectious diseases is functioning in Egypt (named Namru-3). The laboratory is a leading medical-biological center of the Near East region, equipped with the latest apparatus and staffed with highly qualified American specialists. Concern is evoked by the fact that the subject matter of the research of such a facility is strictly classified.¹²⁹

In addition to Russia, only the US has referred publicly to the Egyptian biological capability. As of 1996, the US Arms Control and Disarmament Agency reported that:

The US believes that Egypt had developed biological warfare agents by 1972. There is no evidence to indicate that Egypt has eliminated this capability and it remains likely that the Egyptian capability to conduct biological warfare continues to exist.¹³⁰

Evidently, the Soviets, more than any others, could closely follow Egypt's activities in the biological domain until 1973, whereas from that time onwards the Americans were indeed able to trace those activities, thanks to their gradually deepening cooperation with Egypt. Hence, the two above mentioned references are plausibly acceptable, and may basically be regarded as credible.

The substantiation and corroboration of those references can rely on four elements, at the fundamental level: framework, concept, facilities and actuality.

Framework – an Egyptian military program, code-name “Izlis”, which indeed included BW in addition to CW, commenced by the early 1960s and was scaled up, whereas a concomitant nuclear program failed.¹³¹ Also, German scientists staying in Egypt during the 1960s supported an Egyptian BW-CW program.¹³² Indirectly and covertly, this program had apparently been supported at that stage by the Soviets as well. As already shown, the Egyptian BW-CW program yielded a fully operational chemical ordnance, and this considerably facilitates the reconstruction of the contemporary BW program and its outcome, in terms of time, place, mode and so forth.

Concept – early Egyptian military documents (written mainly during the 1960s and captured in the Yom Kippur War; details are given below), as well as later statements made by various senior Egyptian strategists (detailed above – Part 1 – CW as well as below), evidently indicate the necessity and importance attributed to BW as a strategic factor.

Facilities – the 1960s were indeed marked by the creation, upgrading and increased utilization of a purposive biological infrastructure, mainly in Abu-Za'abal, near Cairo (details are given below).

Actuality – the concrete outcome of the early effort that took place throughout the 1960s and the beginning of the 1970s – namely the existence of BW in the possession of Egypt, was repeatedly and clearly stated and implied by President Sadat and Egypt's Ministry of Defense during the 1970s, while this effort was intensifying in itself (details are given above and below).

The elements of concept and facilities may further be corroborated, as follows.

Concept

Documents issued within the Egyptian army throughout the 1960s and captured in the Yom Kippur War indicate that a considerable momentum had been generated during the 1960s, in relation to the Egyptian military concept concerning BW. It is reflected in the variety of documents pertaining to the strategic, as well as operational and tactical usability of BW.¹³³

The majority of the data and features included in these documents is apparently of a general sort, rather than of a specific kind; yet, they probably reflect the outline of an Egyptian concept that emerged and evolved in conjunction with the formation of those documents. The fundamentals included in this doctrine are the following.

Chief Candidate Biological Agents:

Toxins – botulinum; bacteria causing plague, cholera, tularemia, glanders, brucellosis, anthrax, melioidosis, ornithosis, Q fever; viruses causing Japanese B encephalitis, Eastern equine encephalitis, influenza, smallpox.

Chief Candidate Munitions:

Mechanical aerial bombs; explosive aerial bombs; aerial cluster bombs; aerial spraying tanks; converted aerial bombs for delivering infected insects; flying balloons; cluster warheads for rockets and missiles.

Chief Principles of Employment:

Surprise advantage is supreme and should be attained by secrecy in preparing the weapons; applying new pathogens and modes of dissemination; and employment when the enemy does not expect it and of quantities beyond the enemy's defensive capacity.

Strategic Impacts Attained by the Affliction of Military and Civilian Centers on a Large Scale:

Disordering of the political and military administration; weakening of the economic, military, political and morale potential, particularly in industrialized areas; disrupting the mobility of the army.

Military Objectives –

Highly lethal or debilitating agents;

National Logistic Objectives –

Mainly epidemic debilitating agents;

Operational and Tactical Objectives -

Second line troops and reserve troops; air bases; artillery concentrations; logistic and communication centers; water supplies.

Choosing the BW Agent Should Meet the Following Demands -

Large objectives and vast territories – stable dispersible agents that can be disseminated as aerosol clouds and cause heavy losses of manpower (it is calculated that a cloud with a diameter of 200 meters dispersed as droplets of about 5 micron diameter each at a height of 100 meters would contaminate an area of 600 square kms., each square km being afflicted on average by an amount of 1.33 kg of active biological agent).

In terms of concrete concept, it has been postulated that:

The development (by Egypt) of defensive means against BW does not prohibit the study of offensive means of biological warfare, so as to be prepared for employing them in the case that battle conditions impose such employment, and be able to bring about the same impact that the enemy may afflict manpower, economy and morale with.

This postulation implies the necessity of BW for retaliation as well as for first strike.

In addition to the military concept and doctrine presented above, the emergence of a strategic concept emphasizing the need to possess CW and BW should be pointed out, according to statements made by various prominent Egyptian personalities throughout the 1970s and the 1980s (as described in the above CW part). Politically, Egypt signed the 1972 BW Convention, but, not surprisingly, has not yet ratified it.

Facilities

In 1956, (possibly following the abrupt conquering of Sinai by the Israeli Defense Forces) the idea of constructing an exceptionally large pharmaceutical complex in Abu-Za'abal arose as a joint Egyptian-Soviet venture. It was intended to include two main industrial wings – a fermentative one and a chemical one – and named “El-Nasr Company for Pharmaceutical Chemicals and Antibiotics”. By that time the Soviets had already completed an ordnance of the first generation of their biological weapons. The soviet mode of camouflaging BW-related activities has largely been followed in that case. The site chosen for the Egyptian complex was at Abu-Za'abal, an industrial zone located some 10 kms. northeast of the city of Cairo, bordering the desert. It has been explained that

Consequent to rigorous surveys, the Egyptian and Soviet experts reached the conclusion that this location is preferable since there are general facilities there, it is easy to get rid of the industrial wastes, and the wide area enables further expansion.¹³⁴

Indeed, it was thus constructed. Shortly afterwards, an additional large adjacent facility was erected, which was called the “Abu-Za'abal Company for Chemicals and Insecticides”; the latter, known to be military plant number 801 for CW production, as already mentioned, was intentionally interchangeable with its “twin”, the pharmaceuticals and antibiotics plant (sometimes, yet not consistently, also called “El-Nasr Company for Chemical Pharmaceuticals”, instead of Pharmaceutical Chemicals), thus facilitating the backing up of its BW wing by the fermentative-antibiotic wing (FAW) of the pharmaceutical plant.¹³⁵ The FAW actually has a fairly considerable biotechnological infrastructure. It manufactures a broad range of culture media in industrial quantities for cultivating bacteria and fungi. It has been equipped with and operates various fermentors, from 10 liters (Kovo, Czechoslovakia) up to 10,000 liters, for industrial production of a variety of substances by bacteria and fungi. (Larger, possibly the largest fermentors found in Egypt, are operated by the Egyptian Society for Sugars and Distilleries and reach a volume of 250 cubic meters each). During the 1960s and 1970s, the senior fermentologist of the FAW was trained in Czechoslovakia, a leading country of the former Warsaw Pact in biotechnology as well as in military-oriented medical microbiology. During the same period of time, local devising, manufacturing and operation of fermentors at an unspecified site in Cairo (in that case an 80 liters fermentor for the production of a bacterial toxin) were carried out and later described. The FAW also specialized in the aspect of bacterial sensitivity to antibiotics, which comprise its principal pharmaceutical products. The adjacent military pesticides factory (801) includes component elements dealing with insect and pest sensitivity to pesticides, aerosols and spraying, and plant nutrients.

Nearby facilities include a regional hospital for contagious diseases, a sanatorium which has been involved in human experiments (see below), and a military chicken hatching farm, which can feasibly sustain viral and rickettsial propagation in embryonated eggs.

Chief peripheral industrial facilities include mainly (in addition to academic foci of know-how and involved experts as detailed below):

- A. The Egyptian Organization for Biological and Vaccine Production, Agouza, Cairo – which has the full capacity and know-how for industrial production of pathogenic bacteria, viruses and toxins.
- B. Abbasiya Laboratories for veterinary research and vaccine production – same as above.
- C. Ahmadiya Distilleries – large industrial fermentation capacity of basically non-pathogenic microorganisms and by-products
- D. Alexandria Starch and Yeast – same as above.
- E. Military fermentation facilities for large scale production of biogas – industrial capacity for crude fermentation processes.
- F. Abu-Rawash aerosols and insecticides – industrial capacity for aerosols technology.

Pathogens and Toxins

The exploration of Egyptian practical activities concerned with BW-related pathogens and toxins is based in this review on the following criteria:

Pathogens and toxins compatible with the Egyptian conceptual doctrine (as described above); pathogens and toxins included within Egyptian-Iraqi collaborative activities and the Iraqi BW program which has materialized; further pathogens and toxins conspicuously dealt with in Egypt.

1. Activities Compatible with Conceptual Doctrine:

Botulinum toxin

Various strains of the toxigenic bacterium (*Clostridium botulinum* type B) have been successfully cultivated (for instance in infusion broth medium) and used for toxin production.¹³⁶ This research took place even though there was no recorded incidence of botulism in Egypt until 1991, when a major outbreak sickened 91 residents of Cairo, 20 percent of them fatally. Industrial production of very closely related toxins – tetanus, as well as various veterinary clostridial toxins – have been operational for many years, and has been modernized by the Netherlands based Public Health Institute of Bilthoven.¹³⁷

Plague

The causative bacterium has been industrially cultivated for vaccine production.¹³⁸ Outbreaks of the disease occurred in Egypt, but have not been reported,¹³⁹ although the causative strains have most probably been isolated and studied. Egyptian scientists participated in research studies on the magnitude of bubonic plague threat in Egypt, conducted by NAMRU-3, and on the virulence of the pathogen in the Walter Reed Army Medical Research Institute, USA.¹⁴⁰ Domestic Egyptian studies included experimentation of a closely related pathogen – *Pasteurella multocida* – in terms of environmental survivability and intra-nasal infection,¹⁴¹ presumably as a model pathogen for plague and tularemia (see next paragraph).

Tularemia

The pathogen is not found naturally in Egypt and its surroundings, yet a study conducted in NAMRU-3 with the participation of an Egyptian scientist dealt with a wide range of animal diseases in humans, tularemia being the only exotic disease included.¹⁴²

Cholera

The causative bacterium has been propagated in extremely massive quantities for vaccine production during epidemics.¹⁴³ The dreadful epidemic potential of the disease has been profoundly experienced and studied. The efficacy of the vaccine has been investigated with support given by the US Office of Naval Research.¹⁴⁴ DNA relatedness of environmental and clinical *Vibrio* species isolated in Indonesia, including *V. cholerae*, has been studied in collaboration with the Washington based Walter Reed Army Institute of Research.¹⁴⁵

Brucellosis

The causative bacterium is cultivated on an industrial scale for veterinary vaccine production in Egypt, whereas human vaccine has been developed in France with the participation of an Egyptian scientist.¹⁴⁶ The survivability of the pathogen has been explored in particular, including the species *B. suis*, which has been weaponized by the US Army and is actually not native to Egypt.¹⁴⁷ Experimental infection has been conducted in an Egyptian research station located at Ras El Hekma.¹⁴⁸

Anthrax

No scientific work has been published in Egypt about this classical BW pathogen, although it is naturally found there. The closely related species *Bacillus subtilis* has been industrially cultivated in El-Nasr Pharmaceuticals factory for the production of an enzyme.¹⁴⁹ Another closely related species, *Bacillus brevis*, has been used as a model bacterium for an advanced multi-stage continuous culture production system; a study conducted by an Egyptian scientist affiliated with the Egyptian Military Technical College, in Kent University.¹⁵⁰

Glanders and Melioidosis

No scientific work has published in Egypt about glanders, although the disease is found there, whereas melioidosis is exotic. The closely related germ *Pseudomonas Aureogenoza* has been overtly studied, presumably as a model strain.

Ornithosis

The causative germ has been studied in Egypt, including experimental infection.¹⁵¹

Q Fever

The causative pathogen has been experimentally propagated and tested intra-dermally in the form of an antigen in more than 200 volunteers.¹⁵² Further studies have been conducted.

Japanese B Encephalitis

The causative virus is an exotic one. This pathogen has been extensively researched into by an Egyptian scientist, while temporarily residing in Pennsylvania, supported by the US Armed Forces Epidemiological Board.¹⁵³ Propagating the virus in suckling rat brains was later investigated in Egypt.¹⁵⁴

Eastern Equine Encephalitis

Although being a totally exotic virus, a human vaccine has been developed and produced against this virus in Egypt and experimented with on volunteers.¹⁵⁵ Virus propagation in suckling rat brains was studied as well.¹⁵⁶

Influenza

The causative virus has been propagated on an industrial scale for veterinary vaccine production.¹⁵⁷ Human vaccines of foreign and of local origins have been experimented with on volunteers from “a special hospital” through a specific intra-nasal spraying device.¹⁵⁸ Laboratory animals have been artificially infected intranasally.¹⁵⁹ The pathogen has been extensively explored by the medical laboratories of the Egyptian Air Force.¹⁶⁰ Egyptian virologists approached a leading influenza expert specializing in influenza experimental infections of humans.¹⁶¹

Smallpox

Closely related pathogens of humans and animals have been industrially produced for the manufacturing of vaccines. Animal strains have been extensively studied. A strain isolated from buffaloes was identical to variola in various aspects examined.¹⁶²

2. Collaboration with Iraq:**Smallpox**

Closely related animal pox viruses (including Camel pox, which has been declared by Iraq to be part of their inventory) have been extensively studied. Notable aspects were intra-tracheal experimental infection, monkeys' sensitivity and heat selected mutants.¹⁶³

Cholera

Closely related bacteria were tested for antibiotic resistance.¹⁶⁴

Brucellosis

Causative strains isolated in Iraq have been investigated for survivability and infectivity.¹⁶⁵

Eastern (and Western) Equine Encephalitis

The causative virus has been studied jointly by an Iraqi and an Egyptian scientist in the CDC, USA.¹⁶⁶

Histoplasmosis

The causative fungus (*H. capsulatum*) has been studied in conjunction with a related animal pathogenic fungus, the latter being the declared object of the study.¹⁶⁷

Congo-Crimean Hemorrhagic Fever

An epidemic lethal strain of the causative virus isolated in Iraq has been thoroughly studied in a biohazard facility with the participation of an Egyptian scientist.¹⁶⁸

3. Pathogens and Toxins Included in Egyptian Research Activities and in the Iraqi Declared BW Program:**Congo-Crimean Hemorrhagic fever**

The pathogen has been explored in Egypt as well.¹⁶⁹

Mycotoxins

Tricothecenes (T-2 toxin and Fusariotoxin have been extensively studied, partially supported by the US Army Research Office.¹⁷⁰

Formerly, since the 1960s, a closely related *Fusarium* fungus (*Gibberella fujikuroi*) has been routinely used in El-Nasr Pharmaceuticals factory for industrial fermentation,¹⁷¹ while in the Yemen War, Fusariotoxin Tricothecenes has allegedly been employed concurrently as a biochemical weapon by the Egyptian Air

Force.¹⁷² Some 15 years later, Major-General Dr. Esmat Ezz, who headed the Egyptian Chemical Weapons Corp., accumulated significant experience during a profound investigation which he led into the alleged aerial employment of Fusariotoxin Trichothecenes as a biochemical weapon in Laos and Afghanistan (known as “Yellow Rain”).

Aflatoxins have been studied for their increased production, economical separation and specific toxicity.¹⁷³

Gas-Gangrene Toxin

The causative toxin, another member of the Clostridial toxins (*Cl. perfringens*) has been industrially produced for the manufacturing of veterinary vaccines. Its toxicity has been specifically studied.¹⁷⁴ Concomitantly, the producing bacterium has been experimented with through artificial infection as well.¹⁷⁵

4. Outstanding Egyptian Researches and Activities:

Aconitine Toxin

This powerful plant toxin was used by the Egyptian regime for the assassination of Field Marshal Amer, the chief commander of the Egyptian Army.¹⁷⁶ An unidentified toxicant, possibly the same plant toxin, was used to replace the antidote with which Egyptian auto-injectors were filled for personal assassinations.¹⁷⁷

Snake toxins

Alternatively, snake toxins could readily be used for the same purpose, considering that notably extensive research has been conducted into various snakes' venom in Egypt, for about the same period of time.¹⁷⁸

Histoplasmosis

The prevalence of *H. capsulatum* has been studied in conjunction with the Cairo based air-force hospital.¹⁷⁹

Typhus

The causative pathogen has been thoroughly studied by an Egyptian scientist in the USA, under the aegis of the US Armed Forces Epidemiological Board.¹⁸⁰ In Egypt it has experimentally been propagated and tested in the form of live vaccine in some 1350 persons (pseudo-volunteers) living in the mental hospital of El-Khanka, near Abu-Za'abal.¹⁸¹ An Egyptian trainee in West Germany has tested a closely related pathogen in animals through intra-nasal experimental infection.¹⁸²

Rift Valley Fever

The causative virus was isolated for the first time in Egypt in October 1977, during an explosive fatal epidemic that inflicted a very wide population.¹⁸³ The primary geographical axis of this epidemic was Belbeis-El-Khanka-Cairo. However, the Egyptian viral strain Eg-ZF-41 was isolated and identified before August 1977 at Yale University.¹⁸⁴ Still in 1977, three additional strains were isolated in Egypt – ZH-501, ZH-548 and ZABOR – but essential, yet incomplete, information about the two latter ones became available only years later, through the US Army Medical Research Institute of Infectious Diseases.¹⁸⁵ Very extensive studies have been conducted in Egypt on this virulent virus, including the aspects of increased production capacity, as well as natural and experimental air-borne infection.¹⁸⁶ Also, mosquito-borne infection has been experimentally studied in collaboration with the US Army Medical Research Institute of Infectious Diseases.¹⁸⁷

Insects

Colonization, infection and vectorial potency of RVF virus harboring mosquitoes (which are the transmitters of other arbo-viruses as well, including the above mentioned Eastern Equine and Japanese B Encephalitis viruses) have been experimented with in collaboration with the US Army Medical Research Institute of Infectious Diseases.¹⁸⁸ Previously, mass rearing of the Mediterranean fruit fly has been carried out.¹⁸⁹

Specific Overt References

Several references have been made by Egypt specifically concerning BW, in addition to various statements referring to BW together with CW, as already mentioned in the first part of this review). In 1970¹⁹⁰ and 1972,¹⁹¹ President Sadat stated that Egypt possessed BW. He never retracted this statement. After his death, the Egyptian representatives made two other statements to the review conferences on the BW convention. In 1980 the Egyptian representative stated that Egypt had never developed, produced, stockpiled or otherwise acquired or retained BW. Also, he noted that considerable development took place in the scientific and technological field, resulting in expanded potentials for producing BW, which led to favor a periodic review of the convention to ensure its adaptation and the effective realization of its objective.¹⁹² In 1996, the Egyptian representative stated that Egypt supports the framework and content of the BW convention, conditioned that the BW convention is incorporated within (necessarily, as an integral part of) a comprehensive agreement for the eradication of all weapons of mass destruction.¹⁹³

Between those two review conferences, in 1989, Egypt vigorously denied that it was cooperating with Iraq on the production of BW and CW. The Egyptian Military Industries Minister declared that Egypt and Iraq were in no shape or form cooperating to produce either BW, CW or surface-to-surface missiles,¹⁹⁴ – an unquestionably misleading declaration. A month earlier, however, the military correspondent of the Egyptian newspaper Al Gomhuriya noted that Egypt and Iraq had agreed to conduct joint projects, the first of which would be to assist Iraq in producing defensive measures against BW and CW.¹⁹⁵

In 1991, the former head of the Egyptian Chemical Weapons Corps, Major General Dr. Esmat Ezz, published some curious and thoughtful views concerning BW, biological warfare agents and their handling, seemingly based upon a degree of practical experience, an updated, peculiarly positive evaluation of BW, and, still, an ostensibly increasing defense-oriented trend.¹⁹⁶ The tiny distance between defensive and offensive technologies, especially those related to biological warfare, is well known. Moreover, the evident cooperation between Egypt and Iraq in producing CW most probably represents the same regarding BW.

Estimate

A considerable number of the scientists involved in the described research and development have been associated with military-oriented activities. The works openly published by them probably reflect only certain fractions of their overall activity. Further, a thorough assessment, integrating the four above mentioned criteria (framework, concept, facilities, actuality) and the described ramifications, would lead to a conclusion that most of the pathogens and toxins detailed above have had fairly positive prospects for having been developed as biological warfare agents in Egypt. Yet, it is quite clear that only a minority of them have indeed been weaponized by Egypt. At any rate, Egypt evidently possesses the essentials of warfare applications regarding bacterial, viral and toxin agents altogether, in their native (non-modified) state. Nevertheless, Egypt is presently taking her first steps in the course of acquiring a capability for genetic manipulations. Also, it appears that Egypt's strong biological collaboration with Iraq has yielded BW, which have not necessarily failed to find their way into Egypt's arsenal. However, alongside Egypt's futile and uninformative contribution to UNSCOM concerning her cooperation with Iraq in the chemical field,¹⁹⁷ nothing has been revealed by Egypt regarding the biological field.

Among the delivery systems listed above, and in light of the delivery systems actually included in the Iraqi BW inventory, it is likely that Egypt has adopted aerial bombs and missile warheads for biological warfare agents' weaponization. Somewhat modified chemical warfare agents' delivery systems could plausibly serve

this purpose, and the improved dispersibility of BW agents has presumably been attained through cluster warheads and aerosolization techniques which are moderately available in Egypt.

Since 1980, Egypt has claimed that it has never been active in the sphere of BW. Yet, the fact that for many years Egypt baselessly denied the very existence of CW in its hands, and, moreover, its unquestionable employment of CW in Yemen, has a solid projection as to the parallel dimension of BW. It thus appears that Sadat's positive statements in the 1970s concerning an Egyptian BW arsenal were fairly sound – further evidence for this has been presented above.

PART THREE: Assessment and Implications

Aware of its lingering failure to acquire nuclear weapons, and estimating that Israel possesses chemical, biological and nuclear offensive capabilities, Egypt is primarily motivated to maintain non-conventional weaponry as a strategic counterbalance. Chemical and biological weapons represent the optimal armament for her in this context. This is clearly reflected in Egypt's policy and statements, as well as throughout her concealed activities, as shown. Besides, the increasing non-conventional arms race which marks other Arab countries, plus Iran, constitutes a typical regional drive, in terms of both strategic power balance and traditional continuing hegemony. This additional drive is no less significant in itself.

In a sense, CW and BW are conceived by Egypt to be a tool for putting pressure on Israel, so as to reach a comprehensive agreement banning all weapons of mass destruction. Also, the close timing of the initiation of the Egyptian CBW program relating to the employment of CW and possibly toxins by Egypt in Yemen, is, deductively, non-accidental; moreover, since the Soviets were somehow involved in these moves, this may imply that direct field-testing of CBW (in Yemen) is an Egyptian-Soviet incentive common to both. Hence, the option of first strike, in addition to retaliation capacity, is probably incorporated within the Egyptian concept.

Evidently, the strategic cooperation between Egypt and Syria approaching the 1973 War against Israel included cardinal coordination regarding issues of non-conventional warfare and, as a result, transfer of CW from Egypt to Syria.

It is fairly clear that during its wars against Israel in 1967 and 1973 Egypt was reluctant to resort to CBW against Israel because it feared an Israeli powerful non-conventional retaliation, and, secondly, no cardinal threat had been posed towards her. Yet, Egypt made use of its possession of a CBW arsenal for deterrence purposes prior to as well as during and after the 1973 war against Israel, seemingly attempting to undermine an Israeli non-conventional retaliation option that would deprive Egypt of instant achievements as a result of a strategic surprise attack (as in fact happened), and long-term achievements that stemmed from that war.

The value of BW as an essential fortifying factor in the context of non-conventional strategic strength is plain within the Egyptian concept. It pertains to each of the aspects mentioned in this concluding chapter, and, as a matter of fact, BW constitute the maximum strategic armament that is available to and sustained by Egypt.

Nevertheless, Egypt officially and persistently denies that it possesses CW or BW, apparently calculating that the desired critical mass of its non-conventional capabilities image already exists in practice. At the same time, Egypt refrains from providing information on the suppliers that furnished it with technological components procured for its CBW program, reasoning that such information would impair its national security.¹⁹⁸ Nonetheless, the purchase of precursor materials for nerve gas production on a full industrial scale by Egypt as late as 1993, for instance, provides in itself, the critical mass needed for collapsing the much earlier, ostensibly solid Egyptian attempt to establish a sound image of a CW condemning state.

The Egyptian-Iraqi chapter is of particular significance. It constitutes the most powerful cooperation ever formed within the Arab world, in terms of strategic-technological collaboration. During 1990, Egyptian-Iraqi cooperation in ballistic and bio-chemical armament reached its peak. Indeed, only a short while before Iraq's

invasion of Kuwait, Egypt's defense and foreign ministers defended Iraqi acquisition of chemical and biological weapons, hopeful of reaping fruits from the Egyptian-Iraqi cooperation.

The tip of the iceberg of Egyptian involvement in Iraqi bio-chemical and ballistic development was revealed during the Gulf War when Egyptian officials publicly estimated the progress of the Iraqi acquisition program. It was only four years later – in June 1995 – that a United Nations investigating team quietly arrived in Egypt looking for information about Egyptian-Iraqi cooperation, without great success. At the same time, tens of thousands of Egyptian workers who had worked in Iraq but left due to the Iraqi invasion of Kuwait, returned to Iraq (apparently without inter-Arab approval). Some of these workers returned apparently to work in Iraq's military factories and the original reasons for joint Egyptian-Iraqi strategic cooperation have probably continued to exist. But Egypt has not stopped there, and it seeks bio-chemical cooperation also with Libya and Syria, conceptually and technologically. Apparently, the common, long and desolate border Egypt has with Libya facilitates cooperation between them. Southwards, the border with Sudan has been recently crossed as well, since Egyptian experts and technicians (among others) have been mobilized by Iraqi Intelligence to assist the current joint Sudanese-Iraqi CBW build-up in Sudan.

Thus, the inter-Arab coordinated moves rigorously led by Egypt as to the position of mainly the four Arab CBW-oriented states, itself plus Syria, Libya and Iraq in particular, towards the CW convention, as well as towards the issue of non-conventional weapons in general, probably reflect more than merely diplomatic steps. Rather, they are the tip of the iceberg, representing profound strategic interests and trends that are shaped to a great extent by Egypt. Hence, it is not at all surprising that there are reports indicative of Egypt lately cooperating with those countries, particularly in terms of shielding, if not upgrading, the strategic profile of their CW and BW capabilities.¹⁹⁹

Hence, Egypt may provide a typical example of a mild developing country, while actually there is an acute gap between its image and its accumulating military capabilities, both conventional and non-conventional. As a matter of fact, all of the prevailing conditions, as described, encourage it to retain, to say the least, its CBW, and that is how Egypt acts. Moreover, deducing from the present trends of mass destruction weapons proliferation in the Middle East, one may scarcely estimate that Egypt would avoid this process. Paradoxically, the anticipated forming of an Islamic or Arabic nuclear umbrella, involving primarily Iran or Iraq, would probably accelerate the proliferation of CBW within Arab countries, including Egypt, while calculating that the risk of nuclear counter-strike as a retaliation consequent to the use of CBW is largely reduced; and willing to absorb a CBW counter-strike alone. Yet, even beyond that level of readiness, Egypt improves its preparedness for non-conventional warfare, as also reflected in its announcement about exercises dealing with its capacity to absorb nuclear attack.²⁰⁰ All in all, the threshold of CBW attainment and employment would thereby be lowered considerably. Thus, Egypt's current inclination to establish a Middle East totally free of all weapons of mass destruction, mainly nuclear weapons and particularly the nuclear weapons attributed to Israel, may be, at some stage, reevaluated by Egypt and take a new shape, formally or practically; namely Egypt may thereby reorient itself, overtly or covertly, with regard to the whole complex of non-conventional weaponry proliferation and utility in the Middle East. In that sense, the near future may provide a crossroads of paramount importance ■

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