CHEMICAL AND BIOLOGICAL WEAPONS IN THE ARAB COUNTRIES AND IRAN – AN EXISTENTIAL THREAT TO ISRAEL?

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Executive Summary

The progress in the chemical and biological (CB) weapons programs in the Arab countries and Iran marks the high point in strategic development achieved in the last two decades in these countries. This parallels their improvement also in ballistic missile capabilities. The military inferiority to Israel, best seen regarding the air combat aspect, is propelling the Arab countries and Iran towards mainly ballistic-borne CB armament, whether as a means of deterrence, defense or attack. It has to be added that Arab and Iranian augmentation of CB weapons is taking place also for reasons unrelated to Israel.

In the next few years, it is expected that the missile component of the arsenals in the Arab countries and Iran will be completed with the aid of Russia, China, North Korea, Pakistan, the CIS and additional countries, which will enable the launching of advanced, lethal CB weapons towards Israel. Arab and Iranian ground-to-ground missiles, armed with CB weapons, could pose a direct threat to Israel's rear, causing many casualties. The existing wide range of potential CB warfare agents satisfies different tactical, operational and strategic needs. The Arab states are aware of the maximal ratio between afflicted area size and amount of active (chemical, and in particular biological) agent and the low production cost, compared to conventional weapons. In addition, they are aware of the wide range of capabilities of various CB agents, be it tactical disabling or deadly, epidemic-causing agents with vast strategic impact, and the lack of means for discovery and inability of speedy treatment of some of them, at present.

The far-reaching technological cooperation on CB weapons between Iraq and Egypt (at least in the past), and between Iran and Syria, for instance, points to the potential for inter-Arab and Iranian coordination in the area of non-conventional weapons, including operational aspects.

A CB weapon could be employed in retaliation for the use of non-conventional weapons of any kind, and as an escalatory move both in terms of the weapon type and in terms of target and destination. The premise for taking such a step could take into account an Israeli retaliation with CB weapons. This is because it is more than likely that Israel would avoid the use of nuclear weapons (especially after the attainment of an Arab or Iranian nuclear umbrella), which makes the use of CB weapons more probable as an Arab first strike?

Foreword

Other than the nuclear weapons which already exist in Pakistan, are predicted in Iran and are once again being developed in Iraq, it is difficult to delineate clear circumstances pointing to the acquisition of nuclear weapons by any other Muslim country; therefore, and as a direct result of the present Arab chemical and biological armament processes, one can assume that in the present state of affairs and for the foreseeable future, their most significant strategic weapons will be long-range ballistic missiles carrying warheads containing biological warfare agents.

This survey is designed to present a comprehensive picture of the strategic approach and the acquisition process in the Arab countries and Iran in the areas of chemical and biological weapons, which are the two major forms of weapons of mass destruction with which these countries are equipping themselves at present and, on that basis, the severity of the resulting threat and whether it poses an existential threat to the State of Israel will be examined.

This paper begins with a characterization of the nature of strategic-military threats per se, deals with the development of the Arab-Iranian perception regarding the indispensability of chemical and biological weapons, analyzes the strategic essence of chemical and biological weapons, examines what has been accomplished to this point in the areas of chemical and biological weapons in the relevant countries and concludes with a multi-faceted discussion and a comprehensive prognosis regarding the existing processes and their ramifications. The essence of the chemical and biological weapons threat to Israel in the context of the strategic alignment of the Middle East in general, and in relation to the introduction of Arab/Iranian nuclear weapons to the Middle East in particular, will be considered as well. Chemical and biological terrorism which is an essentially separate issue, of increasing significance in its own right, whether state-sponsored or not, will be discussed in this survey, in a separate chapter.

CHEMICAL AND BIOLOGICAL WEAPONS IN THE ARAB COUNTRIES AND IRAN – AN EXISTENTIAL THREAT TO ISRAEL?

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Part A – The Strategic Rationale and its Ramifications

The Essence of Strategic Military Threats

An existing or developing strategic military threat (actual as opposed to a psychological intelligence warfare) as such consists of three components, and their configuration determines both its theoretical and practical nature:

A. The presence/deployment of troops and/or operational weapons systems (which serve a designated purpose) and in our case – chemical and biological weapons.

B. The probability of the implementation of the weapons – in other words, a single or confluence of circumstances which leads to a decision to implement the weapons.

C. The impact of the implementation of the weapons, that is, the practical damage inflicted by the utilization of the weapons (this component includes, among other things, the prospect of interception/neutralization of the weapon once employed).

This is a hierarchical continuum in that component A constitutes a necessary though insufficient precondition for components B and C, component B constitutes a necessary though insufficient precondition for component C, and condition C, in and of itself, is the result of the actualization of the threat. This characterization enables one, using an appropriate multi-variable formula, to evaluate threatening situations. Quantification of each of the above threat components individually is also required, accordingly. If, therefore, we define the configuration of the three threat components described above as the level of the threat, then the probability of the actualization of the threat, or more simply, the probability

of the threat, will reflect the configuration of the aforementioned components A and B (without component C) – while the feasibility of the threat will reflect component A alone. The assessment of the feasibility, probability and level of the threat can be made as a lenient or harsh realistic assessment, and the adoption of an approach of greater or lesser probability can be influenced, in a defined and reasoned manner by non-quantifiable background factors, such as the personality make-up of the one deciding to employ chemical/biological weapons, objective intelligence gaps and the like.

The calculation of the threat in general (the level of the threat) leads, first and foremost, to the vital distinction between a significant threat (requiring some sort of alignment against it), and an insignificant threat (a threat which does not require any alignment against it). The partial defensive deployment against the Iraqi biological threat executed by Israel in the February 1998 crisis is a typical example of arraying against a calculated threat deemed significant despite the negligible probability of its realization (component B), in that case, due to the validity of component A and component C. Furthermore, the calculation of the threat in general (the level of the threat) can facilitate an additional, no less vital, distinction between an existential threat and a non-existential threat.

The determination of a quantitative scale between the three levels of the configured threat, insignificant, significant but not existential, and significant and existential, is, admittedly arbitrary and technical, however, it can be anchored in substantial criteria and parameters which reflect a defined security doctrine. Furthermore, it is clear that any existential threat is a strategic threat, but not every strategic threat is an existential threat.

The parameters taken into consideration in assessing the strategic grievousness of the threat to use of chemical/biological weapons (or its practical accomplishment) include, among others:

The location of the attacked territory – within the territorial border of the nation state utilizing the weapons (whose territory was invaded and the invader is the potential target), or within the territorial borders of the nation state against whom the weapons are being utilized. In other words, if the nation employing the weapons is defender or aggressor.

Classification of the Attacked Locations – Military or Civilian Targets

The nature of the attacked locations – military sites which constitute a tangible direct threat or distress on other military or civilian targets.

To the extent that the calculated level of the chemical and biological weapons threat is more significant, so, too, is the value of the chemical and biological weapons as strategic tools for the purposes of deterrence, aggression, defense and intimidation. Today, and as long as no hostile Arab or Muslim nation possesses nuclear weapons, chemical and, especially, biological weapons constitute the most strategically valuable weapons systems, particularly when they are dispatched in ballistic missile warheads. At the same time, the introduction of nuclear weapons to the arsenal of a country or bloc of countries protected under a nuclear umbrella, will raise the level of the calculated threat of the chemical and biological weapons due to the augmentation of component B, as will be elucidated below.

In an antipathetic geopolitical environment, the specific strategic value of any given weapons system constitutes a potential threat against at least some of the countries within the same geopolitical environment.

In the geopolitical circumstances extant in the Israeli-Arab conflict, the threshold between a potential and actual threat is, at best, low as it does not involve any complex or extended logistical activity. Therefore, the Arab armies strive, beyond the basic acquisition of chemical or biological weapons, to minimize the dimensions of time and space associated with the logistical activity involved in the implementation of chemical and biological weapons in order to functionally facilitate the threat at any time that they deem it necessary from the strategically-political or military perspective.

The scenarios and prospects for the realization of this threat are complex, as will be explicated below, however, it is clear that there are very weighty strategic consequences even to the significant potential threat, on the one hand, and the low threshold to implementation on the other, which typify this cardinal issue. The dimension of time must also be considered regarding the anticipated arming processes, their tendencies, tempo and consequences. The rate of proliferation of chemical and biological weapons in the Middle East is, therefore, an extremely pivotal parameter. The dimension of the future can be fundamentally incorporated into the quantitative calculation of the threat on the basis of appropriate primary assumptions and the necessary

caveats regarding any such prediction; in any case, as the present point in time is incidental, future points in time which denote the juncture at which concrete proliferation processes reach fruition in general and fruition of critical mass in particular are extremely important.

The critical strategic turning point anticipated in the Middle East in the coming years is the Arab or the Muslim acquisition of nuclear weapons. In a situation of that sort, it is reasonable that a negative symbiotic relationship between chemical, biological and nuclear weapons will be formed in a way that nuclear weapons will constitute the deterrent and retaliation against nuclear weapons and total collapse, while the chemical and biological weapons will, at least potentially, gain a whole range of operational freedom on the strategic, operational and tactical levels. The reason for this is that it is highly doubtful if even nuclear weapons characterized as "tactical" would serve as deterrence or retaliation against chemical and biological weapons because of the tendency to shun first strike nuclear attacks, since that is an escalation which would lead to nuclear retaliation. This cardinal element will be elaborated upon below.

Predisposition of a Country to the Acquisition of Chemical/ Biological Weapons

The degree of a nation's predisposition to equip itself with chemical/ biological weapons can be assessed even prior to the assessment of the calculated threat posed by that country, since the predisposition under discussion is, for all intents and purposes, an initial evaluation of the characteristics, components or elements of the possibility/prospect that a country, as such, will take/has taken a decision to acquire chemical/ biological weapons; or, more precisely, will establish/has established for itself the goal of creating a chemical/biological offensive option. This evaluative stage precedes the assessment of the threat itself, as the latter relies on intelligence information and relates to the practical acquisition efforts, while the assessment of predisposition relies on fundamental characteristics and analysis of probability as follows:

- Basic orientation (of the country under discussion) regarding the geo-strategic status, the geo-political tendency and the balance of armaments;

- A concrete motive – a non-conventional arms race, sustained by offensive, defensive, deterrent or prestige considerations;
- The technical-scientific expertise to produce chemical/biological weapons (chemical and biological weapons substances plus means of launch and dispersal) in the context of a completely inadequate infrastructure;
- An inadequate though barely absorptive (to synthesize incorporate and assimilate outside technological assistance) infrastructure; an inadequate though easily absorptive infrastructure; and a completely adequate infrastructure;
- Vulnerability and reversibility to actualizing the chemical/biological weapons program;
- Ability to manage the program;
- Prospects for successfully concealing the program;
- Military capability in general and regarding long-range delivery systems in particular;
- Defensive capabilities (chemical/biological);
- Predictable future trends regarding the above characteristics.

The calculated factor resulting from the sum of these parameters – the level of feasibility – is extremely valuable at a time when the processes of non-conventional development and the escalation/deterioration potential is internationally or regionally monitored as it relates to a specific country as well. It can be useful in designing a model through which it will be possible to arrive at an estimate – both academic and practical – regarding any country in terms of the feasibility and traceable development of its chemical/biological weapons capability. In this way, a parametric estimate of a comprehensive assessment of potentially supporting components in the acquisition of chemical/biological weapons by any country can be attained.

The Perception of the Threat Against Israel

Since 1991, when Saddam Hussein launched dozens of missiles with explosive warheads at Israel but refrained from launching missiles carrying chemical or biological warheads, which were then in his possession, a

change, ascribing greater significance to the chemical/biological threat against Israel, has taken place. Saddam Hussein's continued and even daring persistence in, at least partially, maintaining his chemical and biological weapons like the resolute diligence of Syria and Iran to amass and perfect those weapons and their ballistic carriers, have vigorously exacerbated the attitude towards the threat. It is reasonable to assume that the anticipated addition of Iranian and perhaps Iraqi nuclear weapons will create a nuclear balance of deterrence which will raise the level of the chemical/biological threat. These matters reached their climax, thus far, when in the winter of 1998, conspicuous efforts were expended in Israel in strengthening the defensive alignment against the Iraqi biological threat which, after a delay, was publicly exposed.

Viewing the situation realistically, there is no doubt that the likelihood that surface-to-surface missiles will again be launched towards the Israeli coastal plain in case of war is greater than fifty percent. However, what are the chances that they will carry biological or chemical warheads and will that constitute an existential threat to the State of Israel? In recent years, we have witnessed in this context more weighty and serious treatment than in the past regarding the nature of the chemical/biological threat:

General (res.) Uri Simhoni held that conventional warfare of troops battling troops has lost its central significance in the Middle East and has been replaced by war of total destruction and terrorism.[1]

General (res.) Avraham Rotem held that there is an apparently inevitable necessity to face the very complex challenge of nuclear together with further forms of weapons of mass destruction. The necessity to prepare for all those challenges and confront them in due time is not liable to change, in spite of the partial peace. Moreover, the option for Israel to choose the desirable mode of conflict no longer exists.[2]

The commander of the Home Front Command, General Shmuel Arad, postulated that today, for the first time, we face a real strategic threat which did not exist in any of the previous wars, in the form of chemical and biological weapons in the hands of Arab countries and Iran; the danger is so great that the lack of preparation to face the threat or an error in its assessment, will exact an extremely high price. Thousand of fatalities constitute an almost existential price.[3]

The head of the Mossad, Shabtai Shavit, theorized that the possibility exists that the next confrontation will escalate to surface-to-surface missiles and the use of chemical weapons against a civilian population; that Iran constitutes an irrational threat combining Islamic fundamentalism with all forms of non-conventional weapons and delivery devices like surface-to-surface missiles; that Iraq constitutes a dormant threat, which could realize its potential as a result of Saddam Hussein running amok, which will lead to a barrage of Scuds which will upset stability, or through the removal of international sanctions which will bring about a countdown towards the rehabilitation of his capabilities; that a threat of non-conventional terrorism whose threshold has already been crossed – exists; that there exists the possibility that a crisis between Pakistan and India involving the use of non-conventional weapons will eventuate; that Russia is noteworthy as a contributor to the construction of non-conventional capabilities and constitutes a future threat; and that China is conspicuous as an enigma and as a contributor to the building of non-conventional capabilities.[4]

Deputy Chief of Staff, General Matan Vilnai, held that Israel must look beyond the horizon to distant confrontation states – Libya and Iran – since they possess weapons of mass destruction and must be capable of dealing with them.[5]

Defense Minister Yitzhak Mordechai, believed that the threat of non-conventional weapons is the most dangerous of all and that it also poses an existential threat to the State of Israel; some of the hostile countries have chemical weapons in their possession with the ability to launch them from planes or missiles, and there are countries industriously pursuing chemical weapons; but most grave is the fact that there are countries expending great efforts to attain the ability to produce and operate biological and nuclear weapons.[6]

Prime Minister Binyamin Netanyahu held that Iran constitutes the most concrete existential threat to Israel since the War of Independence. In his opinion, with the disintegration of the Soviet Union, the leak of ballistic missile and nuclear, biological and chemical weapon technology has become a great and torrential stream, in addition to the fact that the country which reined in Iran, Iraq, North Korea and additional countries no longer exists. The missile and non-conventional weapons threat is the primary and most significant threat facing Israel – an existential threat in every sense. As soon as a radical state like Iran acquires a nuclear and missile umbrella, then its

ability to implement other means (primarily biological and chemical) in order to topple regimes or to threaten them is much greater.[7]

The director of The Combat Means Development Authority, Dr. Ze'ev Bonen, held that Israel cannot rely on nuclear deterrence against chemical weapons and no technology in the world can reconstitute the situation in which the Israeli home front was invulnerable.[8]

The head of the General Security Service, Ami Ayalon, held that Israel is going to confront continuing non-conventional weapon (and terrorist) threats, which directly expose the population to a long-term crisis situation, and the divisiveness of Israeli society will make that confrontation more difficult.[9]

Different sources held that Iraq, Iran or Syria are liable to implement biological weapons against Israeli population centers employing terrorist methods and thereby cause hundreds of thousands of casualties.[10]

Can we conclude from all this that the chemical/biological threat has, indeed, been transformed into an existential threat? We will attempt to analyze this issue below.

Background Processes and Their Consequences

While discussing weighty strategic processes such as acquisition of non-conventional weapons in an unstable geopolitical environment, it is worth stepping back from involvement in this discussion and to assume an external vantage point. In doing so, it is clear that in the background, various strategically significant processes are underway, apparently independent of each other, and nevertheless, over time, a sense of familiarity sets in, a naturally human phenomenon, which belies their genuine acuteness and constitutes, at times, a source of trouble both in the intelligence and academic sense. There is an intrinsic gap, unobserved though substantial, between any given, essentially accidental and non-descript point in time – despite the fact that an attempt was made which pretends to analyze continuous and long-term strategic processes – and between the extended periods of time over which these processes – which are basically noteworthy in their inherent pace – that occurs. This pretense relies on the assumption that the processes discussed have a greater chance to continue than to cease.

Therefore, a specific point-of-time-related strategic description, concrete and comprehensive though it may be, is nothing more than a fleeting reflection of processes, whose essential characterization as processes, is immeasurably more significant. So, for example, the pace of the process of the development of nuclear and biological weapons in Iran is immeasurably more significant than the temporary status of present stages of development, as long as the development processes have not yet been completed. Cardinal significance in this context is attached only to the identification and, even more so, to the observation of the following, particular points in time:

1. The point of transformation from a reversible process to an irreversible one (the definition of this point, in each case, is complex though vital);
2. The point of transformation from the end of development to the beginning of the deployment;
3. The point of crossing from the point of reversible deployment (production) to the point of irreversible deployment;
4. The point at which the accumulated power constitutes critical mass (whose quantitative definition is an issue in and of itself) of the weapons system under discussion.

The processes of development and deployment are continually sustained by the occurrence and maturation of various background processes, each possessing its own dynamic which, directly and indirectly, actually dictate and shape the processes of development and acquisition and their tempo.

These are the background processes under discussion as they relate to Arab countries and Iran:

- General military strengthening whose conventional components do not replace and in fact even reinforce its non-conventional components;
- Inability to achieve military superiority (versus Israel) through conventional means of combat – the accumulated experience of previous wars proved that within the parameters of conventional warfare, decisive successes were not achieved, neither in defensive nor offensive operations;

- Massive increase in missile capability, compensating for air inferiority, and enabling – and perhaps originally designed for this purpose – the acquisition of long-range chemical and biological warheads;
- The widespread acceptance of the speculation attributing chemical, biological and nuclear capability to Israel;
- The continued technological inability of most Arab countries to develop nuclear weapons;
- The anticipated Iranian acquisition of nuclear weapons (as an impetus to the deployment of chemical and biological weapons under the auspices of a nuclear umbrella);
- The apparent Iraqi acquisition of nuclear weapons (see above);
- The consolidation and advancement of the theory concerning the strategic need to acquire non-conventional weapons, first and foremost, chemical and biological weapons;
- The unwillingness of the central Arab confrontation states to sign the chemical and biological conventions, especially as long as no valid agreement has been reached in the matter of nuclear disarmament of the entire Middle East (Iran, for primarily political reasons, signed the accords, but at the same time, continues with its programs to acquire extensive chemical and biological weapons);
- The increasing Arab-Islamic solidarity and unity in general and in strategic contexts in particular, and especially in the areas of non-conventional armaments; resulting in the goal to abate all intra-Arab or Islamic hostility or rivalry, even among nations which were just recently on different sides of the barricade, like Iran-Iraq, Iraq-Syria, Egypt-Libya and the institution of cooperation and basic strategic understandings;
- The freeing of personnel, information, equipment and weapon resources in countries outside the Middle East which conform, at least partially, like Russia, to the chemical and biological treaties;
- Accelerated scientific progress in the fields of biotechnology and chemical engineering, and especially, the breakthroughs in the field

of genetic engineering, enabling a great leap forward in the sophistication of chemical and biological weapons.

These processes are synergetic, therefore, their integration is very significant, and lead, thus far inevitably, to efforts to develop and deploy chemical and biological weapons.

In summary, therefore, it is possible to characterize in this context three phases, which result from one another:

- A "theoretical" phase which includes all the background processes described above;
- A "practical" phase which includes the development and deployment processes resulting from the background processes;
- A "pragmatic" phase, which includes the four cardinal points in time (as seen above) which result from the processes of development and deployment.

The Value of Intelligence

Intelligence has overriding value in the alignment against strategic threats, like offensive capabilities in the implementation of chemical and biological weapons. The areas for which intelligence is responsible in this context are the identification of deployment efforts and the pace of their progress, monitoring technological resources, exposing organizations, facilities and personalities involved, identifying the weapons substances and the launch and delivery systems, their numbers and characteristics, the strategic, systematic and tactical operational perception of the enemy, military and diplomatic preparations for implementation, distinguishing between a potential threat, a practical threat and genuine operational intent, and the distinction between a threat for deterrence or intimidation purposes, etc. These intelligence aspects make vital contributions regarding subsequent counter-measures like the strengthening of the intelligence alignment itself, defensive alignment, preventive alignment, construction of a response, articulating a political, strategic, military and technological counter-perception and taking practical steps both in times of tranquility and times of emergency. It is clear that the value of intelligence is liable to be critical in the face of chemical and biological weapon threats.

The act of intelligence is, therefore, like infinite moves on a chessboard. Even if we assume that potential intelligence resources are endless, and can always be improved, as time passes the advantage of the conductor of surveillance over the object of surveillance will gradually diminish as will the superiority gap of the conductor of surveillance regarding the rate of improvement of the intelligence techniques at his disposal.

So it has transpired that, over the last few years, the activities of the Arab countries and Iran have concentrated on underground facilities which make visual surveillance and planning an attack that much more difficult; so, too, the Arab countries and Iran have learned that the more they help each other and minimize their reliance on external supplies of technology, the more difficult it will be to monitor them through intelligence, and cooperation between them has increased accordingly.

And, indeed, the intelligence output, in general, can be categorized in the dimension of time into four value levels, which constitute, to a great extent, a direct result of the difficulty involved in its formation:

- Anticipatory intelligence – the most valuable intelligence, as a rule (whenever it is accurate, of course), as it provides a concrete prediction (as opposed to general forecasts which can also be produced by talented journalists or informed academics) significantly prior to their realization;
- Real-time intelligence – second in importance, as it provides reliable classified information regarding events and developments as they occur;
- Intelligence after the fact – relatively inferior intelligence which does provide classified information regarding events and developments which have already taken place in their entirety and had they been known earlier, would have facilitated different influences or alignments;
- Declassified intelligence after the fact – actually inferior intelligence, supplied primarily by public information about events which already took place and are nothing more than journalism disguised as intelligence.

Furthermore, there are situations of total absence of intelligence in which even after the fact, it was not at all clear that anything significant occurred,

and in this context as well, a distinction must be made between a situation where the conductor of surveillance is aware of its ignorance and a situation where it is unaware. It is clear that the latter is much more dangerous.

Therefore, the party under surveillance will naturally attempt to direct the conductor of surveillance towards intelligence whose value is negligible or even towards the most desirable situation from the perspective of the party under surveillance – the surveillance conductor's lack of awareness – and in that way to facilitate at will processes of armament, planning an attack and orchestrating threats, practical deployment and the like. When dealing with the processes of acquiring non-conventional weapons, it is clear that an intelligence failure, in any aspect of those detailed above, is liable to be tantamount to an existential threat.

The main test of the Israeli intelligence community, to this point, which includes army intelligence and the Mossad in this case, regarding a non-conventional threat, was in the year 1990, when Saddam Hussein proclaimed that Iraq possesses nuclear, chemical and biological weapons, invaded Kuwait and threatened to use them. Actually, Iraq had chemical and biological warheads but not nuclear ones. There was no doubt that Iraq did not have nuclear weapons at that point. There was similarly no doubt that Iraq did have chemical weapons. Without getting into the issue of the effectiveness of the chemical and biological missile warheads, which is no doubt an important though essentially separate issue, army intelligence contended that it was highly probable that Iraq possessed chemical missile warheads while the Mossad suggested that it was unlikely. Army intelligence believed that it was highly probable that Iraq had biological weapons in its possession and that its biological missile warheads were at an advanced stage of development, while the Mossad contended that it was highly unlikely that Iraq had biological weapons in their possession and that Iraq had not yet begun developing biological missile warheads.

This disparity in the intelligence picture resulted from, the fundamentally, totally justified, intelligence community's pluralistic research approach. However, it accentuated a grave Achilles' heel, in this case, one with clear strategic ramifications, especially as the then Prime Minister Yitzhak Shamir (formerly holder of a senior position in the Mossad) admitted after the fact that he adopted the Mossad's assessments because they were more convenient at the time.[11]

The Mossad toiled during the 1980s, which preceded the climactic challenge of 1990, to produce intelligence from those sectors which were already illuminated by the spotlights disseminated by the massive Iraqi chemical weapons armament program, an effort whose existence was exceedingly apparent due to the implementation of chemical weapons by the Iraqi army in its extended war against Iran. Even so, Israel was unsuccessful in taking appropriate action to prevent the comprehensive aid, which Iraq received from dozens of supplier companies, especially West German companies. At most, Israel succeeded in slowing down the pace of Iraqi chemical armament, a delay whose significance in the long run is highly dubious. In contrast, in the biological area, which was somewhat unclear and raised difficulties in the gathering of intelligence, the Mossad did not comprehend the extreme strategic importance of biological weapons, and did not expend efforts to produce intelligence and, as a result, to attempt to foil the Iraqi program, as the situation warranted. Army intelligence toiled maximally in both areas – chemical and biological – simultaneously, both in terms of intelligence gathering and research. Therefore, it was also successful in formulating intelligence assessments very close to reality, despite the severe information gaps. Under the somewhat optimistic assumption that that which needed to be corrected, especially in the Mossad, was in fact corrected, the Israeli intelligence community still faces extremely difficult challenges in the areas of chemical and biological weapons, their stockpiling by Arab countries and Iran, their storage, and implementation methods and scenarios.

The Fundamental Arab-Iranian Perception

Over the years, a fundamental Arab-Iranian perception has consolidated and intensified, one, which supports, or even mandates, the acquisition of chemical and biological weapons. The basic assumption that Israel possesses weapons of mass destruction, including chemical, biological and nuclear weapons in its possession, is undoubtedly a sufficient though not necessary condition for the existence, validity and realization of the perception which calls for the acquisition of chemical and biological weapons. The absence of nuclear weapons from most Arab countries in the present and foreseeable future constitutes a factor, which completes the equation at the basis of this perception. This awareness is shared by the entire Arab world and specifically by a number of Arab countries and Iran, and it serves them,

either as a reason or as an excuse for the continuing effort to acquire biological and chemical weapons.

And, indeed, there is pan-Arab and Iranian unanimity regarding the legitimacy, if not the necessity, of chemical/biological armament. This frequently manifests itself publicly in situations in which Arab leaders or their spokesmen see fit to provide media resonance, justification and approval for these armament efforts. However, beyond the media dimension, a conceptual line of thinking emerges which certainly reflects a viewpoint common to most Arab countries, in their joint, internal deliberations; it presumably constitutes a direct result of conceptual, strategic coordination among them and is apparently reinforced in this way.

In the public and political dimension, this perception serves as a polemical tool against those capabilities attributed to Israel in the realm of chemical, biological and especially nuclear weapons, in other words, if the existence of a chemical/biological option in Arab hands is perceived (by Israel, the United States, the United Nations, or any other factor) as illegitimate, then, by the same token, it is no more legitimate in Israeli hands. Likewise, the concept serves as a bargaining chip, designed according to the Arab perception, to lead to a comprehensive disarmament, which will include chemical, biological and nuclear weapons. This notion is also sustained by the internal Arab and Arab-Iranian balance of power, both actual and prestige-wise, due to the fact that Israel, for all intents and purposes, emerged victorious in all of the conventional battles in all of the wars, as well as from the significant effect resulting from Iraqi use of chemical weapons, which it employed during the war with Iran, and from the relative ease in which those weapons can be produced and from its terrifying notoriety.

However, even in real terms, chemical and biological weapons have tremendous import in Arab countries and Iran. They constitute a tool of intimidation of the first order. The great difference between the intimidation level embodied in a conventional warhead and that embodied in a warhead containing anthrax illustrates this distinction. Chemical and biological weapons are perceived as means of deterrence, reprisal and attack. The value of the chemical and biological weapons is actually measured, like all other weapons, in the ratio between production, storage and operating costs on the one hand and the level of intimidation which it provides its possessor, the degree of damage which it is capable of causing, that is, the number of

casualties, the territory and facilities neutralized (though not necessarily physically attacked) and logistical and psychological effects on the other (these criteria will be detailed below).

Conceptually, three basic situations are possible:

- A concept which designates chemical /biological weapons primarily for deterrence purposes;
- A concept which designates chemical/biological weapons primarily for reprisal purposes (not necessarily in response to a bio-chemical strike);
- A concept, which designates chemical/biological weapons for offensive purposes.

Fundamentally, it is clear that the Arab-Iranian concept does not believe that acquiring chemical and biological weapons necessarily leads to their implementation, however, the gravity of the situation stems from the very deployment of these weapons and their availability for operational use. Furthermore, this availability itself can create a change in concept, under certain, difficult to anticipate, circumstances, in a manner which will substantially lower the threshold of implementation. The probability of a prospect of this sort increases as a result of the addition of nuclear weapons to the non-conventional weapon balance of power equation (see below), and also as a result of changes of leadership, for example, in an Arab country possessing these weapons.

Furthermore, the concept which views deployment of chemical/biological weapons, and even more so, its implementation and practical manifestation on the battlefield positively (Egypt versus Yemen, Iraq versus Iran) creates a domino effect to a degree, which over the last 20 years has affected Iraq, Syria, Libya and Iran after Egypt was alone in that sense, during the years 1962-1981.

Certain differences exist regarding the intra-Arab-Iranian relationship in this matter, ranging from an Arab/Islamic nation aware (and nothing more) of the chemical/biological efforts of its Arab/Islamic brethren, by way of those which side with, support or benefit from it, all the way through strategic partners. This final level is liable to manifest itself in an extreme though not insignificant instance, in intra-Arab-Iranian cooperation in implementing chemical/biological weapons.

A second conceptual alignment which in certain respects is no less significant than the one described above, is one which deals with the Arab/Iranian public attitude to the issue of chemical and biological weapons in general, and to the specific development programs of one or another of the Arab states in particular. In this context, there exists a diverse range of public pronouncements, ranging from maximal obscurity, concealing the acquisition efforts with a smoke screen, through very clear and explicit declarations regarding the need, the legitimacy and the acquisition effort underway. Thus, for example, Egypt repeatedly claims that it no longer possesses chemical weapons, Syria admits (indirectly) that it does possess chemical weapons and Iraq, in the winter of 1991, declared at its own initiative that it possessed chemical weapons. Iran also admitted that in the past it possessed chemical weapons (though, in fact, that is the case today as well).

This great disparity stems from the existence of two contradictory motives which serve two vital purposes at odds with each other, namely the desire to engender the enemy's awareness as to the existence of a first-rate strategic deterrence and offensive capability on the one hand, and the desire to avoid the spotlight of international public opinion, and the attention of counter-intelligence and other assorted troubles, including monitoring and supervision by international bodies responsible for the disposal of weapons of mass destruction on the other hand. Furthermore, there is the goal of cultivating an international image compatible with the worldwide tendency to condemn weapons of mass destruction, even if it entails deceit and fraud. The combination of these two purposes manifests itself in different formulas and manners in the Arab countries and Iran, as will be described below, and in any case, it deserves special attention.

The Biochemical-Nuclear Trap

All six Islamic, Middle Eastern countries conducting chemical and biological armament programs (Egypt, Syria, Libya, Iraq, Sudan and Iran) would have undoubtedly preferred to equip themselves with nuclear weapons as well. However, in actuality, only two – Iraq and Iran – cultivated for themselves an applied, concrete framework of nuclear armament programs, whose commencement was immediate and systematically organized. The remaining four are not yet capable of doing so. The Iraqi

effort to accomplish this was interrupted (twice, though certainly did not cease) while the Iranian effort continues full speed ahead. In any case, the Iraqi and Iranian concept, which stems from this effort, requires it to simultaneously deploy chemical and biological weapons together with nuclear weapons, not as an alternative armament, and therein lies its extreme gravity. On the other hand, Syria, Egypt, and Libya are forced to adhere at this point, to a concept sufficing with chemical and biological weapons (to the exclusion, of course, of the possibility that nuclear weapons or useful fissionable material will be acquired in a clandestine manner) as the military, strategic cutting edge – a necessity resulting from technological and/or monetary limitations. (In the late 1970s, Egypt abandoned a nuclear option of its own, after long years during which it tried to construct a nuclear military infrastructure, at the same time that it was formulating extremely close strategic-technological cooperation agreements with Iraq, which included the element of non-conventional weapons, and relied on the understanding that nuclear weapons will be developed, in practice, only in Iraq, which is how it turned out.)

These two conceptual approaches together – each on the basis of a different rationale – encourage chemical and biological armament; the first enables to significantly lower the operational threshold of chemical and biological weapons, by virtue of the fact that the fear of nuclear reprisal is marginal when the nation deploying the bio-chemical weapons possesses nuclear weapons or even if it is protected by a nuclear umbrella. The second approach holds that armament with chemical and biological weapons is the vital minimum in the balance of non-conventional armaments, which shapes the strategic interface between Israel and the Arabs, especially when the acquiring state has no pretensions to acquire nuclear weapons. Nevertheless, additional Arab/Islamic countries, like Saudi Arabia and Algeria, are liable to embrace similar concepts.

As a result, the existence or lack of a nuclear weapons armament process has important ramifications, at least potentially, for the status of the biological/chemical threat, and therefore, in that sense, it is advantageous to evaluate the issues together. In this context, among the non-Arab, Muslim countries one must, in addition to Iran, mention Pakistan as a country which has adopted, like Iraq and Iran, a concept mandating the comprehensive deployment of nuclear, biological and chemical weapons, while at the same time, maintaining close ties with other Muslim countries, especially Iran,

Iraq and Libya; in addition, though more distant and outside of the Muslim world – there is North Korea, an extremely radical country, which manifests an identical conceptual approach and generously aids Syria, Iran and other countries. The recent successful nuclear experiments conducted by Pakistan will certainly provide a substantial impetus to the nuclear efforts in Iran, Iraq and perhaps Libya as well.

In summary, and in terms of the Middle East, it seems, therefore, that the development of nuclear weapons will always be accompanied by the development of biological and chemical weapons, while the development of chemical weapons will be accompanied by the development of biological weapons. It appears that the Middle East Muslim bloc's deployment of nuclear weapons is occurring on a minimal scale which, in the view of the Muslim bloc, will constitute a sufficient and vital component in attaining a balance of nuclear power versus Israel (including the creation of a nuclear umbrella); in other words, sufficing with Iran's and/or Iraq's nuclear weapons on the one hand, and on the other hand, maximally deploying chemical and biological weapons which constitute the optimal strategic weapons in the eyes of most Arab countries which deploy them (especially as they assume that sooner or later they will enjoy the protection of a nuclear umbrella) – Egypt, Syria, Libya, Sudan and perhaps even Algeria and Saudi Arabia. Evidence of this approach can be seen in the close strategic-technological cooperation which existed during the 1980s between Egypt and Iraq, in which the "Condor" (and other) missiles were designed for carrying chemical, biological and nuclear warheads which were to be developed and produced in Iraq, while Egypt was to continue to develop and produce only chemical and biological weapons.

Nevertheless, there is a conspicuous difference among the Arab countries and Iran regarding the approaches and the character of their development efforts as will be elaborated upon below.

The Strategic Essence of Chemical and Biological Weapons

At the foundation of the issues lies analyzing the ratio of the necessary outlays in purchasing conventional weapons relative to its strategic benefits, a ratio which is significantly inferior to the ratio between necessary outlays in acquiring chemical and biological weapons (as a rule) and the strategic advantages resulting from it.

Recent breakthroughs in the fields of biotechnology and chemical engineering have sharpened the definitions of biological and chemical warfare agents. Biological warfare agents include live causes of illness (bacteria, viruses, single-celled organisms and fungi), or lifeless substances whose authentic mass was created in an intact living cell (lifeless warfare agents of this sort are called toxins). Chemical warfare agents include any poisonous warfare agents which are not biological. It appears that these are the most substantive definitions, despite the fact that the possibility certainly exists that within this framework, a warfare agent that is both chemical and biological could be produced, resulting in biochemical warfare agents – any substance which can be produced either as biological or chemical warfare agents. The chemical and biological weapons delivery systems include artillery, air, sea and ballistic instrumentality, which are capable of launching the weapons for purposes of operational implementation.

Chemical weapons are the simplest to produce of the three types of weapons of mass destruction (chemical, biological and nuclear), however their strategic value is inferior to the other two as well. Their military utilization is mostly for tactical or combat purposes, though it clearly constitutes a strategic threat to Israeli cities and especially to vital installations. Its drawback lies in the fact that even under optimal operational conditions it is an evanescent mass, in other words, it is a mass which beginning with implementation gradually dissipates in the course of time.

The production cost of one kilogram of sarin or tabun nerve gas is approximately $15, and the cost of the contents of a SCUD warhead (300 kilograms of active matter) is $4,500. The cost of a comparable amount of conventional explosives is approximately three times that. The economical production cost is many times more beneficial if the effectiveness of chemical weapons is compared to that of standard explosives. If a SCUD missile carrying 300 kilograms of chemical weapons substances was to fall on a city with a population density similar to Tel Aviv (7 people per acre), it would cause between 300 and 2,000 fatalities and a similar number of severe casualties. In contrast, a missile carrying a comparable amount of explosives would cause approximately 5 fatalities, leaving thirteen wounded. The negligible number of casualties in the Dan region resulting from the missile attacks in the winter of 1991 is a tangible illustration thereof. Therefore, chemical weapons are not only the most inexpensive, but their effectiveness is between 40 and 700 times that of a comparable amount of conventional

explosives. In other words, the cost of killing a person with explosives would be $5,000 as opposed to between $7 and $125 with chemical weapons.

Biological weapons are more difficult to manufacture, especially at the stage of loading the biological substances onto the weapons system and effectively maintaining them therein. However, their advantage is that under optimal operational circumstances, they constitute a multiplying mass (except for toxins which are like chemical substances in this sense). In other words, they have the capacity to reproduce within the human body (or any other host or benevolent environment). The ratio of the number of casualties per measure of biological substance is, therefore, maximal. The variety of types of biological warfare agents is extensive, which poses problems for one defending against them in identifying the type of biological warfare agents and in taking appropriate, timely countermeasures.

Among the three types of weapons of mass destruction, biological weapons manifest the optimal cost effectiveness ratio, in other words, the investment involved in its production is minuscule relative to its strategic value. The manufacture of biological warfare agents is a simple, familiar process, though the accompanying processes – preventing biological leaks, processing the biological substances for storage and dispersal and effectively loading them onto warheads – require rather sophisticated technological expertise. Even so, the cost-benefit gap between biological weapons and both chemical and nuclear weapons is substantial.

In terms of a clinical-pragmatic feasibility study, successful implementation of biological weapons is the most effective, at least potentially, especially if it is executed in a manner in which it is impossible to distinguish it from a natural occurrence. Under optimal meteorological conditions, 10 grams of anthrax spores are sufficient to generate a fifty-percent fatality rate in an area of one square mile (2.5 square kilometers). Additional data indicates that 30 kilograms of biological substances are liable to cause between 20,000 and 80,000 casualties, as opposed to 400-6,000 casualties from 300 kilograms of sarin nerve gas, and 80,000 casualties from a 20-kiloton nuclear bomb. An airplane flying into the wind above a city, which unleashes a cloud of anthrax spores, is liable to cause 100,000 to 3 million fatalities. The reference is to unprotected residents. A missile armed with 100 kilograms of anthrax bacteria will cause death in an area between 20 and 260 square kilometers, depending on weather

conditions. Even if civil defense measures are affected, the area of fatality will range between two and 20 square kilometers. These are, obviously, theoretical estimates, but in favorable operating circumstances this is the anticipated effect, and in any case display, in a tangible fashion, the relative damage capability of biological substances – in this case anthrax, which is not a communicable disease. It is noteworthy, that most biological warfare agents are not contagious, but they are liable to cause widespread outbreaks of disease, because they are prone to pass from person to person in different ways. It is also possible to disseminate infected insects or animals, like rats. The strategic effect is many times greater when speaking of biological weapons, which generate epidemics (like smallpox). In the annals of the human race, there have been three terrifying epidemics – the Black Plague and smallpox in the Middle Ages and the Swine Flu in the twentieth century.

If the subject is strategic weapons which do not cause the physical destruction of installations (as opposed to conventional and most types of nuclear weapons), and are then made capable by the operator of the weapons to be adapted for such purposes, chemical and biological weapons possess that advantage. An additional strategic advantage is that if need be non-lethal forms of chemical and biological weapons can be implemented in order to place a burden upon the victim's hospital and logistical alignments.

On the other hand, it is clear that the means of defense against chemical/biological weapons, both technical (sealing, filtering and dress), chemical and medical (antidotes, vaccines and medicines) are much more effective than protection against nuclear weapons, and if they are in good operational condition, they can even, as a rule, provide total protection against chemical/biological weapons.

If we assume that nuclear weapons represent the maximum technological level and demand the maximum monetary outlay relative to the acquisition of other non-conventional weapons and the maximal damage achieved relative to other non-conventional weapons, on a scale of 100, we will reach a rough estimate of:

	Required Technological Level	Required Outlay	Damage
Chemical Weapons	15	20	5
Biological Weapons	35	30	75

Three factors relating to the unmasking of weapons in a country's possession, should be added, and once again we will assume in this context, schematically, that nuclear weapons constitute the maximum of exposure:

	Chance of Exposure Through Technological Monitoring Intelligence by a State Conducting Surveillance	Chance of Official Revelation by the Developer/ Possessor of the Weapons	Chance of Unofficial Revelation by the Developer/ Possessor of the Weapons
Chemical Weapons	60	50	70
Biological Weapons	25	30	40

It must be emphasized that the estimates cited in these two tables are extremely imprecise, and their purpose is to illustrate the quantitative and qualitative complexity of the issue.

From both conceptual and practical perspectives it is possible to outline a hierarchy according to which chemical weapons constitute a threat supporting the implementation of conventional weapons, biological weapons provide a threat in support of the implementation of chemical weapons and nuclear weapons furnish a threat in support of the implementation of biological weapons. As a result, it is to be expected that the acquisition of chemical weapons will be accompanied by the acquisition of biological weapons and that the acquisition of nuclear weapons will be accompanied by the acquisition of chemical and biological weapons. Chemical weapons constitute both a conceptual and practical response to chemical weapons, but only a conceptual response to biological and nuclear weapons; biological weapons, including toxins, biological warfare agents which do not generate epidemics and biological warfare agents which do, provide a conceptual and practical response to all three types (chemical, biological and nuclear) and nuclear weapons provide a conceptual and practical response to nuclear and biological weapons and in a minuscule manner – perhaps even to chemical weapons. In the strategic constellation of the Middle East, the possibility that a country will develop nuclear weapons without, at the same time, developing chemical and biological weapons is negligible, both in terms of

the conceptual approach and in terms of the technological capability (a country whose technological capability enables it to develop nuclear weapons, will certainly have the capacity to develop chemical and biological weapons). In the last decade, with the sharp increase in the strategic value of biological weapons, the possibility of developing chemical weapons without the concomitant development of biological weapons is similarly negligible, despite the fact that the development of biological weapons requires a higher technological level than do chemical weapons.

Therefore, biological weapons constitute a central axis and crucial component in this framework, especially for developing nations lacking nuclear capability and are, according to their perception, subject to a nuclear threat.

Biological Weapons – The Silent Strategic Weapons Component

In 1972, a year before Egypt implemented its plan of strategic deception in the Yom Kippur War, President Sadat took the trouble to point out that Egypt possesses biological weapons in storage that he believes would be especially effective against Israel, given the density of its population. The Egyptian defense minister emphasized in 1974, in an attempt to deter Israel from staging a military operation to erase Egypt's accomplishments in the Yom Kippur War, that Egypt would not hesitate to implement the additional weapons of mass destruction in its possession, above and beyond its chemical weapons (at a time when it was clear to all that it did not have nuclear weapons). Syria claimed that in light of Israel's arsenal, it is wholly within its rights to equip itself with a variety of weapons of mass destruction. Kaddafi vigorously opposed all those negating Libya's right to develop chemical weapons and, at times he added, biological weapons.

Iraq, accused in 1988 that it produces and stockpiles biological weapons, vigorously denied it publicly, however, a few years later Saddam Hussein, in order to produce a deterrent effect, made a point of declaring that Iraq possesses biological weapons. Iraq also expended much energy to avoid the revelation of the existence of its biological weapons, and even after they were exposed claimed, and continues to claim, that they were destroyed and exist no longer.

Iran, on the other hand, noted at the time, in the face of the Iraqi non-conventional threat against it, that it is forced to consider equipping itself with chemical and biological weapons.

We can assume that there is a significant difference in the status and the specific value which the Arab countries and Iran attribute to chemical as opposed to biological weapons, since the chemical weapons capabilities of the Arab countries and Iran were exposed, to a great extent, in the media in recent years, in very realistic scope and detail, while, on the other hand, the Arab biological capability has been only minimally revealed. This substantive difference denotes different roles for the chemical and biological weapons for the Arab countries. Chemical weapons constitute, under these circumstances, an overt, distinct strategic deterrent weapon, more or less, while biological weapons play a covert deterrent role, and must be kept that way long-term, as a last strategic bargaining chip (ignoring, at least for the moment, the nuclear realm), because of its very broad strategic potential and the fact that the element of surprise is crucial to its implementation. Indeed, biological activity in the Arab countries is subject to much more extensive and elaborate camouflage than are chemical weapons, both in terms of the essential activity and most certainly in terms of the types of biological weapons warfare agents and launch delivery systems. The nuclear weapons attributed to Israel underwent a conspicuous period of intentional nebulousness.

We will now turn to surveying the situation in each of the threatening countries.

Part B – The Situation in the Arab Countries and Iran

Syria

Syria has been active for some time in a consistent, systematic and determined effort to acquire chemical/biological weapons, an effort, which is constantly intensifying.[12] Its public references to this effort, which it has never denied, are gradually receiving greater expression. More than any other country, the concept of "strategic balance" with Israel whose primary practical manifestation, beyond balance in conventional forces, involves acquisition of chemical/biological weapons, is attributed especially to Syria and in fact to Hafez Assad himself. Regarding "the other types of weapons" – as Assad was wont to refer to Syria's chemical/biological weapons, in distinguishing them from the nuclear weapons attributed to Israel – "Syria and the Arabs are willing to dispose of them, but only after Israel undergoes nuclear disarmament", in his words. Syria's acquisition of chemical weapons from Egypt, in the framework of their joint preparations for the Yom Kippur War, is, to a great extent, indicative of Assad's extreme insistence upon strategic balance. Up until the time of his death, Assad and Mubarak coordinated positions regarding leadership of the Arab camp, which negated signing the chemical and biological conventions.

Syria apparently cooperates with Egypt in the present as well, regarding the acquisition processes of chemical/biological weapons, that is certainly the case with Iran and most probably with Libya. Its reliance on Russia and North Korea is enormous and should be treated with great concern, as it seems to cover, or will cover in the near future, all of the elements whose deficiency still delays the completion of the deployment process to Syria's satisfaction; China contributes significantly to this as well. Syria aspires, it is unanimously believed, to complete its arsenal of enhanced-range surface-to-surface missiles – including SCUD-C, M-9 and Nodung – armed with operational chemical and biological warheads, and beyond that, cruise missiles carrying chemical/biological cluster bombs. The portion of the budget and the comprehensive effort commanded by the Syrian armament in the chemical/biological field, especially when it is integrated with ballistic armament, is enormous relative to other strength components and other portions of the Syrian military budget. From this perspective, the situation of the recorded conventional inventory of the Syrian army is deceptive. The transfer of chemical and biological weapons from production and storage

facilities to underground facilities should also be mentioned, as it obstructs both intelligence surveillance and attempts to destroy the weapons.

Chemical Weapons

In 1972, Syria received aerial bombs and artillery shells containing sarin nerve gas (non-persistent) and mustard gas (persistent). After ten years, when the sarin began to age, Syria started producing its own sarin, and loading it onto aerial bombs and later onto SCUD-B missiles. It has been reported that the configuration of Syrian chemical weapons is binary, and in that sense, it is the most advanced among Arab countries. The possibility cannot be ruled out that the mustard gas which Syria received from Egypt is still functional due to its remarkable stability, and furthermore, it has stockpiled cyanide in amounts necessary for the purpose of limited warfare at least (about 18,000 of the Sunni residents of the city Hama were killed by the Syrian regime in 1982 with cyanide, certainly with Assad's knowledge).

In recent years, Syria began producing the extremely toxic stable nerve gas – VX, and to arm aerial bombs and missile warheads with it. This chemical warfare agent is more valuable than sarin or at least constitutes a complementary weapon, in terms of its operational qualities. It is worth emphasizing that Syria received unofficial assistance from Russian scientists who apparently specialized in VX chemical substances (the Russian version of this matter is more potent than the original American version). The Syrian chemical effort, which began in the early 1980s and gradually intensified, expanded significantly in 1996 with the establishment of a large underground installation for the production of chemical weapons in the Aleppo region (in partnership with Libya).

Quite recently, Syria also armed their SCUD-C missiles with chemical warheads, adding them to their stockpile of thousands of aerial bombs loaded on Suhoi-22, Suhoi-24 and Mig 23 warplanes and 100-200 SCUD-B chemical warheads. The assistance from Russian experts effected the successful development of cluster chemical missile warheads. Lately, chemical warhead carrying SCUD-D missiles were successfully field tested by Syria.

The warning given by the Syrian ambassador in Egypt, that Syria will threaten the use of chemical weapons against an Israeli threat of nuclear weapons is, for all intents and purposes, the climax of expressions in this context rather than a new direction or breakthrough.

Already in January 1987, in an interview in the Kuwaiti newspaper **El-Qabs**, Assad noted that Syria is seeking a technical response, which will constitute a direct reaction to Israel's nuclear weapons. A few months later, Damascus radio emphasized that Syria has an answer to Israel's nuclear threat. Shihabi, Syria's Chief of the General Staff, asserted in 1988 that there is a sense of satisfaction in Syria from its accomplishments in the area of strategic balance, and that Syria possesses weapons whose deterrence effect can counter Israel's extremely lethal weapons.

In his conversation with Senator McLain in Damascus in January 1989, Assad confirmed that Syria possesses chemical weapons. In 1993, Assad stressed that a Syrian solution to the problem of repatriating the Golan Heights exists, regardless of the cost and despite Israel's nuclear superiority. Syria's Minister of Information held in 1995 that Syria possesses "trump cards" which it had not yet "played" but would, if need be, in case of the conflagration of a war against Israel. Furthermore, different reports indicate that Syria possesses biological weapons as well – in addition to its chemical weapons – whose strategic value is significantly greater than chemical weapons. Assad proclaimed that Syria has the ability to cause Israel significant damage by means of "the special weapon" in its arsenal and that the Syrian army has attained strategic balance with the IDF. And, indeed, beyond these declarations, the Syrian army conducted a series of SCUD missile launch tests with different models of the missile, for use with chemical warheads, along with increasingly closer chemical cooperation with Russia. Meanwhile, that cooperation has effected the successful development of chemical cluster warheads. Furthermore, the exposure of the Syrian operational deployment of SCUD-C missiles by satellite photographs indicates that a chemical armament has been integrated with the missile program in a manner enabling a surprise chemical attack option, and that the missiles are pointed at the reactor in Dimona, airports and Israel's big cities. At the same time, the revelation of the operational nuclear deployment attributed to Israel by **Jane's**, by means of satellite photographs, apparently enables Syria to launch a chemical strike against that deployment. Conceivably, this is a first-rate Syrian strategic option.

One of the central consequences of this situation is Syria's intention to achieve prior (at least methodical) neutralization of Israel's nuclear threat, which is liable to frustrate Syrian military accomplishments in the Golan

Heights, if and when Syria sees fit to stage an attack in that sector, especially if it includes Syrian utilization of chemical weapons.

Biological Weapons

Syrian spokesmen have remarked that Syria is equipping itself with an even more powerful, technical response to Israel's nuclear weapons, and that it is legitimate for Syria to equip itself with a variety of weapons of mass destruction. In response to the ever-growing pressure effected by the UN against Iraq's attempts to conceal its biological weapons, the Syrian Foreign Minister emphasized (in December 1997) that the pressure is totally unjustified as Israel is given free reign to develop all types of weapons of mass destruction and, therefore, Syria and other Arab countries have the right to develop countermeasures against belligerent Israel. It seems that despite Syrian remarks regarding biological weapons and due to their limited number, the weapons represent a conceptual approach whose purpose includes indirect leaks regarding the intention to equip themselves with biological weapons while simultaneously maintaining maximal obscurity. This is necessary because despite the fact that it is common knowledge that Syria possesses chemical weapons, it is questionable whether or not chemical weapons, in and of themselves, can erode the nuclear deterrence capability attributed to Israel. A background document was circulated in the Syrian army itself regarding the biological weapons, which illustrated their significant strategic value as perceived by the army.

The public reference to Syria as a country developing biological weapons, in addition to chemical weapons, began in 1988 and has continued since. Today, at least 13 years after the start of development, Syria is, at times, described as a producer of biological weapons: two toxins (botulinum and ricin) and two bacteria (anthrax and cholera). Russian experts hired by Syria are hard at work to produce the anthrax bacteria and load it onto warheads. In the Scientific Studies and Research Center in Damascus, in which development activity of chemical weapons has been proven, a Department of Biology is active as well. Studies published under its auspices indicate, indeed, activity involving germs and proteins.

Botulinum, ricin, anthrax and cholera constitute four especially powerful types of biological warfare agents: botulinum – a lethal toxic protein (produced from a bacterium) is more poisonous than any other substance, natural or synthetic; ricin – a lethal toxic protein (produced from castor

beans, easily grown in Syria) that optimally fulfills the criteria in terms of the relation between (production) costs and (respiratory) toxicity; anthrax – a lethal bacterium easily cultivated with optimal durability under unfavorable conditions (during storage, launch, plus environmental stability upon implementation); and cholera – a typical epidemic incapacitating germ for guerrilla warfare. In addition to the aforementioned development center functioning in Damascus, another biological weapon facility in Cerin has been mentioned. One can assume that the new chemical weapons factory in the Aleppo region includes a biological weapons section as well.

Syria apparently intends to attain the capability to biologically arm all types of its long-range surface-to-surface missile warheads, and it is reasonable to assume that this goal can be realized in the course of a few years, if it has not yet been attained.

Syria's official position regarding biological weapons maintained that Syria "supports closer international cooperation in the field of biology for peaceful purposes which will certainly increase the influential power and the realism of the biological convention". Despite its positive tone, there is, of course, nothing in this vague formulation of the Syrian position to indicate anything about Syrian inactivity in the field of biological weapons. In fact, since 1983, if not earlier, Syria has expended a considerable effort in the realm of biological weapons and, it is reasonable to assume that it has already had biological weapons in its possession since the early 1990s.

Egypt

Egypt was the first Arab country to equip itself with chemical and biological weapons. It was also the first to utilize them (in Yemen in the 1960s). It supplied Syria with chemical weapons (during their joint preparations for the Yom Kippur War), and also supplied Iraq with chemical weapons and assisted it in producing chemical and biological weapons in the 1980s. Egypt itself continues to maintain chemical and biological weapons even today, despite the fact that it denies that truth and for years has taken pains to cultivate an image of a country clearly striving to eliminate them. However, simultaneously, Egyptian spokesmen take the trouble to emphasize that the acquisition of chemical and biological weapons are extremely necessary and completely justified.[13]

In preparation for the international accord to liquidate chemical weapons (January 1993), and especially in its wake, the clear consolidation of a pan-Arabic approach is obvious – with Egypt in the lead – calling for withholding signatures from the chemical convention – and implicitly supporting the maintenance of an offensive chemical and biological capability, as is the practice in Egypt itself – as long as a comprehensive ban on chemical, biological and nuclear weapons in the Middle East is not implemented. Egypt's Foreign Minister Amru Moussa, even stressed that this issue constitutes a main topic in the reorganization of the regional alignment in the Middle East. In January 1993, when the chemical convention was signed, Mubarak was in Damascus, and together with Assad, called upon the Arabs to refrain from joining the convention.

Egypt is naturally well aware and familiar with the biochemical armament efforts of Syria, Iraq, Libya and even Iran. One can assume that, according to its perception of the present-day strategic balance in the Middle East, it even prefers, or at least views, this armament effort as legitimate, if not imperative, something much more difficult and complicated to say about nuclear armament.

In 1990, the ballistic and biochemical cooperation between Egypt and Iraq flourished; shortly before the latter's invasion of Kuwait, Egypt's foreign and defense ministers rallied to the defense of Iraq's acquisition of chemical and biological weapons, apparently in anticipation of joint Iraqi-Egyptian benefit.

The tip of the iceberg of Egypt's deep involvement in the Iraqi ballistic and biochemical armament effort was noteworthy in the Gulf War, when Egyptian insiders publicly assessed it; however, it was only four years later, in June 1995, that a UN contingent arrived clandestinely in Egypt in order to attempt to expose the scope of the Egyptian-Iraqi cooperation – with extremely limited success. At the same time, tens of thousands of Egyptians, who worked in Iraq and left in the wake of the invasion of Kuwait, began returning to Iraq, apparently without pan-Arabic agreement. Some evidently returned to Iraqi military industrial plants. The reasons justifying the strategic partnership between Egypt and Iraq in the 1980s exist today as well, and the hostility, which was foisted upon them during the Kuwait War, was temporary.

Today, Egypt sees the need for chemical/biological cooperation with Libya and Syria as well, both conceptually and technologically. On the basis of Egypt's enormous expenditures as far as its unprecedented military build-up is concerned, in addition to its decision not to join the accords preventing the proliferation of chemical weapons, it would be very unreasonable to conclude that this build-up does not include chemical and biological weapons, as the Egyptian leadership claims.[14]

Chemical Weapons

The Egyptian acquisition of chemical weapons began in the early 1960s, and only barely preceded its frequent implementation by the Egyptian Air Force in the Yemen war from 1963-1967.

The primary facility is located in Abu-Za'abal (supported by local insecticide and pharmaceutical plants) and secondary facilities are located in Abu-Rawash (the assembly point for filling aerosol cans) and adjacent to Beni-Suaf (an air force base). A primary research and development plant is located in the National Research Center in Doki, and a central production adjunct point functions within the framework of the chief Egyptian company which produces dyestuffs and chemicals.

Egypt first produced mustard and phosgen (asphyxiation gas), which were also employed in Yemen. Subsequently, they moved to producing psychomimetic incapacitating agents, sarin nerve gas and later VX nerve gas. All these were produced in industrial quantities and were loaded onto land mines, artillery shells, aerial bombs, rockets (including cluster rockets) and finally onto missile warheads. After the Egyptian-Iraqi-Argentinian "Condor" missile program was frozen, which was designed for chemical and biological armament from the Egyptian and Iraqi perspectives, Egypt turned to arming alternative missiles, and that armament effort has already certainly been realized.

Many Egyptian experts have been integrated over the years in various international forums, and have acquired knowledge and access in the field of chemical weapons. Egypt participated in a trial challenge inspection exercise for the tracing of chemical weapons under United Nations auspices, conducted for the first time by a multi-national staff, at a West German operational Air Force base, together with experts from Iran, Pakistan, Argentina, England and Germany. Egypt even conducted a national trial challenge inspection exercise on a chemical plant in its own country and

reported on it to the Conference of Disarmament, without exposing the plant. The Egyptian representative noted in his report that "Egypt does not possess or produce chemical weapons" even though "the inspected plant is definitely capable of producing chemical weapons of all types" – a purposeful claim designed to create uncertainty and obfuscate the distinction between production ability and actual production. In contrast, and at about the same time (1991), Egypt claimed that "in the past it possessed a large supply of chemical weapons, but at present its chemical weapons production is limited to that which is necessary to ensure defensive and deterrence capabilities"; in other words, indirect Egyptian admission of the existence of chemical weapons in its possession and its production.

Biological Weapons

Anwar Sadat and Saddam Hussein were the only two Arab leaders to this point who unambiguously declared (20 years apart) that Egypt and Iraq, respectively, possess operational biological weapons.

In the early 1960s, Egypt embarked on an integrated chemical and biological weapons project which was code-named "Izlis". It was implemented (and apparently continues to be) in a military-civilian consortium located in Abu-Za'abal which includes a military installation called Military Industry 801, a civilian installation called "The Abu-Za'abal Company for Chemicals and Insecticides", and an additional civilian installation called "The El-Nasser Company for Pharmaceutical Chemicals and Antibiotics". The last plant constitutes a cover for military activity in the field of biological weapons.

Sadat first announced the existence of biological weapons in Egyptian possession in 1970, when he was still vice-president, and once again in 1972 when he was already president: "Egypt has biological weapons, stored in refrigerators, which can be used against Israel's dense population." It seems that in the early 1970s, a decade after the project's inception, and after the massive stockpiling of operational chemical weapons and their implementation in Yemen, Egypt stockpiled biological warfare agents in operational quantities and also the means to deliver them. However, it seems that Sadat's declaration was not incidental, but was timed to coincide with the decision to launch a surprise attack against Israel and was designed to greatly enhance Egypt's non-conventional strategic deterrence capability, in order to neutralize to whatever extent possible the plausibility of a nuclear

counterstrike by Israel. The existence of chemical weapons in Egypt's possession was already public knowledge, while the strategic deterrence (and offensive) potential of biological weapons is much greater.

After the Yom Kippur War, Sadat and his Chief of Staff even declared that Egypt would employ all types of weapons which it did not utilize in the Yom Kippur War, should Israel act unreasonably, and that it possesses a genuine mass destruction capability which includes sufficient biological and chemical weapons, though not nuclear weapons. Indeed, in the 1970s, Egypt significantly intensified its activity in the field of biological weapons, and in the 1980s, worked in close cooperation with Iraq in the development of biological weapons.

"The Egyptian plagues" which included pestilence and swarms of wild beast, have been preserved there in the present day as well, and have enabled its scientists to closely investigate these two classic agents of plague and to adopt them as biological warfare agents. Furthermore, Egypt's advanced biotechnological ability enabled it to deal in these two instances with a bacterium (the agent of pestilence) whose development and storage are not simple, and a virus (the agent of the Rift Valley Fever) – whose treatment is even more complicated than that required by bacteria. Add to these the development of biological warfare agents like the botulinum toxin and the encephalitis virus, at least.[15]

Egyptian strategists, who have dealt with the issues relating to the Israeli-Arab balance of power, have repeatedly emphasized the importance of both biological and chemical weapons as a vital component of Arab and Egyptian armament efforts. One can assume, therefore, that the goal is to equip themselves with long-range missile warheads carrying biological warfare agents, as an optimal strategic power component, and that Egypt's technological capability enables that.

Iraq

Iraq represents an unusual case in which, to this day and despite all the restrictive sanctions taken against it, the worrisome aspects are more numerous than the encouraging ones. The severity of the Iraqi instance stems, first and foremost, from the fact that Iraq is acting according to a comprehensive approach which calls for the extensive acquisition of

chemical, biological and nuclear weapons, ordained by a very determined totalitarian dictator, and as far as can be determined, is not subject to change as long as he remains in power.[16]

The extremity of the Iraqi case is exemplified by the enormous – according to any criteria – scope of its chemical/biological acquisition effort; in its extremely close cooperation throughout the 1980s with an additional Arab country, its ally – Egypt; in the great success – technologically at least – of this effort and in its implementation despite the many difficulties posed by the repeated efforts to limit external technological suppliers. Circumstances reached a point where in the Gulf War (1991), many dozens of missiles were readied for immediate launch, armed with chemical and biological warheads, and all that was lacking was Saddam's decision to proceed.

Furthermore, the Iraqi case illustrates the impotence of the international community in halting the incessant use of chemical weapons produced by Iraq and implemented over the course of seven years against the Iranians, including Iranian villages, and against the Kurdish citizens of Iraq itself.

The litany of subterfuge employed by Iraq to counter UN efforts to induce its chemical and biological disarmament over the years, points to a number of cardinal issues:

- Blatant lack of Iraqi willingness to cooperate with supervisory steps, including those which were decided upon with Iraqi agreement;
- Inability to rely upon Iraqi cooperation even in cases where they, seemingly, agreed to cooperate;
- Inherent limitations – in different contexts – of UN resolutions, which *de jure* allowed optimal freedom of movement for inspectors, but *de facto* did not provide solutions for variable or unpredictable situations contrived by the Iraqis.

Given these circumstances, it is impossible not to raise doubts regarding the value of international treaties forbidding chemical, and even worse, biological weapons, as far as Arab countries plus Iran are concerned, and especially, when the conditions of those treaties are less accommodating, in terms of the inspectors, than the draconian rules instituted specifically against Iraq.

In the Iraqi context, in any case, it turns out that:

- Their approach is to continue to conceal, trick and maneuver in order to maintain, to whatever extent possible, its present capabilities and to rehabilitate and restore those capabilities;
- It will apparently continue with this approach as long as a radical change in its relationship with the UN and its inspectors does not take place;
- Its remaining chemical weapons capability (after most of it was destroyed) is marginal in quantitative terms, relative to the original stockpile which was in its possession; valuable in qualitative terms relative to the original arsenal; and not insignificant (at least) in absolute terms of non-conventional strategic strength (quantitative and qualitative combined) relevant to the Middle East;
- Its rehabilitative ability in the area of chemical weapons is certainly significant both in terms of the (partial) restoration of the stockpile and in terms of the clandestine operational reproduction alignment. Fundamentally, the suspicion exists that it will soon be able to produce chemical weapons again if it has not already done so;
- Its remaining capability in the area of biological weapons is extensive (perhaps even complete) in both quantitative and qualitative terms, relative to its original biological arsenal. This capability is great, if not also especially grave, in absolute terms of non-conventional strategic might;
- Its rehabilitative capability in terms of biological weapons is significant and clear. The suspicion exists that it could be once again capable of producing biological weapons within a period of a few weeks to a few months.

However, UN inspector activity in Iraq has expired, and is seemingly unrecoverable. Fundamentally, estimates maintain that in the absence of supervision, Iraq will be capable of rehabilitating its chemical/biological offensive capability within 6-9 months. The fact that many of its civilian chemical and biological production plants capable of "double utilization" were not bombed by the United States and Britain during the Gulf War must be taken into consideration.[17] Furthermore, despite the utmost efforts of the West, or more specifically the United States and Britain in particular, to block Iraq's non-conventional rehabilitation, it has recently been the

beneficiary of increased non-conventional aid from Russia, South Africa and even Serbia and perhaps from Pakistan, China and North Korea as well.

The extreme gravity of the Iraqi situation manifests itself beyond all else, in the fact that Iraq possesses an extremely comprehensive and profound web of technological and commercial know-how necessary for the development, storage, concealment and implementation of chemical and biological weapons. This expertise is significantly greater than that possessed by other Arab countries (with the possible exception of Egypt, which at least partially, was a partner in Iraqi activity until the Kuwait War, and has noteworthy expertise of its own) and, therefore, its cardinal significance lies in the fact that it embodies valid critical mass which has already been attained.

If and when Iraq decides to share its accumulated knowledge with other Arab countries without limitations, then this critical mass will become the property of additional countries in the circles of menace facing Israel. This situation will constitute an escalation with grave ramifications as it will minimize the dependency on non-Arab resources, will reduce the ability to employ intelligence surveillance and is liable to maximize the level of intra-Arab strategic cooperation. Indeed, in recent months, after a respite of many years – the ties between Iraq and Iran and those between Iraq and Syria have been renewed. The possibility that cooperation in the area of chemical/biological weapons is developing between Iraq and Syria which could potentially bolster the existing chemical/biological cooperation between Syria and Iran cannot be discounted. Furthermore, Iraq has initiated intimate cooperation with Sudan, which produces chemical weapons for the Iraqis in order to circumvent the severe restrictions enforced by the UN in Iraqi territory. Practically, significant Iraqi assistance is already being afforded by Iraqi experts in the field of both chemical and biological weapons to Sudan, Libya and Algeria.

Beyond the characteristics described above, three noteworthy events were recorded:

- The murderous, criminal attack by the Iraqi air force, using chemical weapons on the Kurdish village Halbaga, in which 4,300 Kurdish citizens were slaughtered;

- Saddam Hussein's declaration (in 1991) that Iraq possesses functional, operational chemical and biological weapons, which he is ready to use;
- Saddam's avoidance of launching missiles with chemical or biological warheads at Israel, Kuwait or Saudi Arabia, despite his use of conventional missiles.

Chemical Weapons

Assuming that most of the chemical weapons produced by Iraq were destroyed, one can assume that the (very great, by all accounts) quantity which was destroyed was, to a large extent, "sacrificed", unwillingly, by the Iraqis, in a manner which obscured the concealment of much smaller quantities of considerably higher quality chemical weapons, which they either did not disclose, or which they acknowledged was in their possession and claimed that they themselves or the allies destroyed them before the initiation of UN inspection. If that is the case, they retained relatively high quality chemical warfare agents along with delivery and dispersal systems, which until today include long-range missile warheads. One can surmise that the chemical weapons which were acknowledged by the Iraqis include relatively outdated chemical weapons (possessing inferior military value) or leaky weapons and/or chemical weapons which do not fit into the above categories but which the Iraqis decided to "sacrifice" in order to satisfy the UN inspectors.

The variety of chemical warfare agents and delivery systems developed and produced by the Iraqis was extensive; primary among them were:

- Blistering gases – sulfuric and possibly nitric mustard gas;
- Hallucinogenic (psychochemical) gases – glycolates;
- Blood gases – cyanide;
- Nerve gases – tabon, sarin, GF, VX and possibly soman;
- Delivery systems – shells (many types), aerial bombs (many types), rockets (various types), aerial spray systems (various types), mobile spray systems (various types) and surface-to-surface missile warheads (various types). Surface-to-surface missiles adopted to carry chemical warheads included long-range missiles whose scope even exceeded that of regular and enhanced SCUDs.

In fact, the Iraqis were involved in the development of an intricate network of sophisticated delivery devices, including binary and cluster systems, and of sophisticated combat gases, including thickened chemical warfare agents, and powdery chemical warfare agents which penetrate filters. In doing so, they accumulated expertise unprecedented in the Arab world in terms of quantity and quality, expertise that is at their disposal today, even after the destruction of most of their chemical weapons. The Iraqi army is also the most experienced in the world in implementing chemical weapons against a wide range of targets in various topographical and environmental conditions. This too is the case as far as employing suppliers of forbidden technology and circuitous ways to acquire them are concerned and also in terms of concealment, development, production and storage alignments. There is no doubt that the Egyptian army and the Egyptian military industry absorbed a significant portion of this extensive inventory of expertise as well.

Furthermore, if Iraq's rivalry with Iran and Syria prevented it, at least to this point, from sharing this valuable strategic information with them, evidently, Libya – in addition to Egypt, Iraq's ally in the 1980s – is benefiting from the technological fruits of this period.

As a result, despite the diminishing differences between Iraq and the Iranian-Syrian bloc, Libya – and perhaps Egypt, – serves as a conduit for the flow of information of this sort to its long-time good friends, Syria and Iran. This depiction, for all intents and purposes, cancels the positive value of Islamic divisiveness as a barrier, as far as the transfer of strategic-technological information is concerned, and increases the possibility of pan-Arab and Iranian reliance on a joint database, which, at least apparently, has the ability to facilitate vital upgrading/leaps and breakthroughs.

It is noteworthy that the Iraqis have also experimented with the implementation of toxic chemical substances clandestinely – first they assisted in the mercury contamination of Israeli citrus fruits marketed in Europe; afterwards, they shortened the lives of many dissidents by poisoning their food or drinks with thallium; and finally, they killed the fugitive Kurds by covertly poisoning them with nerve gas.

Biological Weapons

The Iraqi biological weapons program, like its chemical counterpart, was second in its scope and pretensions to just one other country in the world –

the Soviet Union. However, amazingly, just as Iraq and Russia both agreed to destroy their chemical weapons, and even took steps, ostensibly, to implement that agreement, so, too, they are aligned in their consistent and resolute evasiveness in terms of admitting that they presently possess biological weapons – and as a result, from destroying them. It is possible that this is a well thought out strategic approach – conceding chemical weapons (partially or totally) whose loss will be offset by biological weapons.

Even if we assume that the Soviet Union refrained from or limited the passing of biochemical military information to Iraq in the past, the latter has been well supplied with this information through East Germany. However, unfortunately, Iraq's close ties with East Germany in the 1980s led to close ties with West Germany, which has proven to be money-hungry and filled with greedy suppliers. Indeed, democratic, commercially unobstructed, Germany stood at the head of a large camp of technology suppliers from Western Europe, and to a certain degree, Americans as well, who were joined by Yugoslavians and Egyptians. Furthermore, recently, and as a result of the dismissal of thousands of scientists from the Russian biological-chemical alignment, some of them are employed in Iraq, along with covert, semi-institutionalized dual assistance extended by Russia.

In contrast to the frequent implementation of chemical weapons, Iraq has implemented biological weapons in only a few instances – the difficulty in confirming or denying said implementation attests to the great potential advantage of biological weapons substances – fungal toxins against the Iranians, malaria carrying mosquitoes and typhoid bacteria against the Kurds, and unidentified biological warfare agents (and unidentified chemical warfare agents) against the Allies. (The last case raised a contentious issue in the United States in that they did not find a satisfactory explanation for the medical complaints of many of the participants in the Gulf War, even though it can be simply accounted for as the result of leaks which took place in the wake of the bombing of ammunition storage facilities.)

However, there is no doubt concerning the vast Iraqi experience in development, production, storage and concealment of biological weapons. Throughout the 1980s, Iraq's efforts to amass an extensive operational stockpile of biological weapons were maximal, and for the most part, successful. This effort was identified in its early stages but did not lead to attempts to gather intelligence or genuine efforts to halt its progress, like those unsuccessfully taken against Iraq's chemical efforts (until the war in

Kuwait). In retrospect, it turns out that assessments regarding the Iraqi biological missile capabilities in Kuwait were, for all intents and purposes, accurate, though they were the subject of much skepticism.

The Iraqi success in concealing its arsenal of biological weapons, including, apparently, biological warfare agents and delivery systems beyond those which they declared is many times more serious; in that context, it is worth noting the following Iraqi development activity:

Biological warfare agents– anthrax, botulinum, plague, gas-gangrene, smallpox, conjunctivitis, encephalitis, Crimean-Congo fever, malaria, typhoid, fungal toxins and more. It is important to stress that the Iraqi development of biological warfare agents was based significantly on cooperation with senior Egyptian scientists, and was aided both by types of biological warfare agents which were isolated in Iraq itself (and probably in Egypt and Mauritania as well), and on pathogens and toxins purchased from the United States, from quasi-governmental suppliers of biological strains, who acted carelessly.

Delivery systems – aerial bombs (of various types), aerial spray systems, pilotless drones (of various types), super guns and super gun shells (almost certainly for the purpose of launching anthrax spores), rockets and long-range surface-to-surface missile warheads. Similarly, there is great importance attached to cluster armaments developed by the Iraqis in order to attain an extremely effective launch of biological elements, and also to the processing of powdery biological elements, which they acquired.

The main drawback which resulted then and still exists in this context, with especially severe strategic ramifications, is that today as well, one must assume that Iraq possesses an operational biological stockpile, and each of the above components is liable to be part of it. Furthermore, in the course of UN inspection in Iraq, and despite the inspection, Iraq managed to conduct new and more advanced field experiments with biological weapons, and to retool and improve a pilotless drone to carry and disseminate those weapons. There is no doubt that Saddam ascribes supreme importance to biological weapons. As a result, the production of biological warfare agents, and especially anthrax bacteria, in hidden facilities in Iraq has been renewed. Iraq's present concealment effort is astounding and it includes, among other elements, components, which will facilitate the launch of biological warheads within days.

This conclusion is unavoidable in light of the fact that it is clear beyond a shadow of a doubt that Iraq has amassed an extensive biological stockpile, on the one hand, while there is no proof (other than theories and specious proofs) that it was even partially destroyed, on the other hand.

Furthermore, in 1997, in the midst of UN efforts to reveal and destroy Iraqi biological weapons stockpiles, the "Samsam Project" began in Iraq, designed to harness scientists and biotechnological resources from South Africa (due to the termination of the South African efforts to acquire biological weapons) in partnership with the Iraqi general intelligence apparatus. For this purpose, South African branches of German companies and key merchants were recruited to purchase centrifuges for the separation of bacteria, stainless steel for the production of fermenters and accessory equipment in the guise of milk and pharmaceutical industries.

Libya

It is specifically Libya, the leader in recent years of the chemical/ biological armament effort whose scope is extensive and unprecedented in the Third World (with the exception of Iraq), while at the same time, the persistent suspicion exists that Libya could, with relative ease, implement chemical and biological terrorism. It is almost certain that the ratio between Libya's ballistic plus chemical/biological development budget and its conventional military budget is one of the highest in the world. The Libyan biological and chemical effort benefits, unfortunately, from significant aid from South Africa in addition to assistance from a wide variety of companies from around the world. Nevertheless, it seems that Libya, which maintains close relations with all of the Islamic nations developing chemical/biological weapons (Iran, Iraq, Egypt, Syria and Pakistan) is the beneficiary of very significant aid from at least some of them. In that sense, Libya, which is the most scientifically and technologically backward of them all, would be able to catch up with the help of that assistance. Similarly, Libya's participation in the planning and funding of the Pakistani nuclear effort was apparently rewarded with the transfer of chemical/biological weapons or at least vital biochemical and ballistic technologies from Pakistan to Libya.

In summary, it seems that Libya is closer than ever to the inauguration of a massive acquisition effort in the field of chemical weapons and in its wake, biological weapons which will include among other things, long range

missiles which will constitute an especially grave threat to Israel and to Europe. The extreme gravity of this threat stems from the inability to halt the process and from the fact that this terrifying arsenal is destined to be in the possession of an unpredictable dictator like Kadaffi, who has emphasized many times that Libya has every right to equip itself with non-conventional weapons.[18]

Chemical Weapons

Already in 1983, the CIA reckoned that Libya has chemical weapons in its possession, however, it has since traveled a long adventurous path.

Immediately after concluding the Chemical Convention, Kadaffi met with Mubarak in order to coordinate with him subsequent Arab strategy in the wake of the conclusion of the treaty. Ironically, not many years later, Mubarak himself announced that in contrast to the lies told by Libya, which at that time tried unsuccessfully to deny the establishment of an enormous chemical weapons plant, Egypt neither possesses chemical weapons nor is it striving to attain them. Syria, on the other hand, was the only one to defend Libya's efforts to portray its chemical weapons plant as a pharmaceutical plant, hinting at the hidden cooperation which had developed between them in the framework of the four-way reciprocal relationship between Libya-Syria-Iran-North Korea in the field of missiles and chemical/biological weapons. From then on, this cooperation has progressed to the point of mutual assistance in the process of acquiring chemical and biological weapons.

Libya contributes to the funding of North Korean efforts to develop missiles with warheads intended to carry chemical and biological warfare agents, which Libya (along with Iran and Syria) itself will acquire and in doing so, the Libyan threat against both Israel and Europe will significantly escalate. These missiles include the "El-Fatah" (with a range of 350 kilometers), the "Nodong 1" (1,000-1,300 kilometers) and also the TD-1 and TD-2 (2,000-3,000 kilometers). At the same time, the Libyan effort to acquire the Otrag missile, whose range is 2,000 kilometers, and SCUD-B enhanced range missiles (El-Fajr and El-Jedid) continues.

Libyan efforts to acquire chemical and biological weapons are noteworthy in their extraordinary dimensions, its resoluteness and its sophistication. At first, it established a huge above-ground consortium called "The Technology Center", in an isolated desert location close to the village,

Rabta, which included a plant for the production of chemical warfare agents – mustard and nerve gases. The latter was concealed as a pharmaceutical plant called "Pharma-150 Hong Kong", with a symbolic pharmaceutical plant with that name, established at the same time in Hong Kong, for purposes of subterfuge. Recruitment of personnel and the acquisitions in order to establish the plant were conducted in many European countries and in the Far East.

Once the ruse was revealed, Kaddafi denied the true purpose of the pharmaceutical plant, evacuated its equipment, invited all comers to come and witness its pharmaceutical nature, and even staged a fire and attributed it to American, German and Israeli intelligence services. At the same time, he announced his willingness to pay "a billion" to anyone who would agree to establish a chemical plant in Libya, since it is not forbidden.

In the uproar which ensued, the plant was transformed into a pharmaceutical plant, though it did manage to produced between 30 and 100 tons of chemical weapons – aerial bombs and artillery shells containing primarily mustard and tabun gases which provided Libya with a genuine offensive chemical capability, though it lacked, at this point, missile launching capability.

The Rabta installations were intentionally preserved in a state where they could be transformed to their original purpose – production of chemical weapons (a transformation which could transpire at any point), and in September 1995, were even rededicated in a well-attended ceremony, attended by the Egyptian Health Minister, among others. The ostensibly converted plant is supposed to supply pharmaceuticals to Arab countries as well, after an Egyptian pharmaceutical company – the "El-Nasser Pharmaceutical Company" – a company well known for many years as one which supports the Egyptian chemical warfare agents enterprise – assisted in its establishment. Indeed, even earlier, in December 1994, the CIA director noted that Egyptian-Libyan cooperation in producing chemical weapons exists, while in 1996, the clandestine production of Libyan chemical warfare agents was renewed. However, beyond that, it seems that Libyan cooperation exists with Iraq, Syria and Iran; it seems, therefore, that the Libyan case is unique in that it unites five countries posing threats around one of them. However, it is possible that the cooperation between Libya and its close neighbor, Egypt, the only one with which it has a common border, is the most significant in this respect, and Kadaffi's exuberant proclamation –

when Mubarak was appointed as a "mediator" on the issue of Libya's chemical weapons plant – that they constitute one uniform nation, will attest to the fact.

In any case, the Libyans decided to shift their facilities to huge underground installations, dozens of meters deep, which provide them with two substantive strategic advantages: preventing satellite surveillance and preventing bombing. Even the director of the CIA, who is following Kadaffi's extreme intensification augmentation efforts, noted this severe limitation, and emphasized that even a joint, coordinated preventive international effort could only delay the augmentation process, but in no way prevent it.

The two new installations are located in Sabha and Tarhonah, in extremely deep underground tunnels, which were excavated in mountains. These projects are also camouflaged as civilian, and are aided by job contractors and suppliers of technology and equipment from around the world, including Germany, Switzerland, Italy, China and many other places. The plans of the Sabha plant were given the virtual name "Pharma-200", and were designed to produce lewisite (a blistering chemical weapon) and sarin. The plans of the Tarhonah plant, which has been described as the largest installation in the world for the production and storage of chemical weapons, were attained by German intelligence from German and Austrian contractors, and the suspicion exists that they might have reached Syrian and even Iranian hands. The installation is in its final construction stages, is expected to be operational presently and is designed to produce mustard gas, nerve gases, sarin and soman. Raw materials are attained from those designed for production in a seemingly civilian plant, which was expanded and is located in Bengazi. In the first stage, China supplied 10,000 tons of raw materials. The Tarhonah plant was camouflaged as an irrigation project, however, its location was carefully chosen: excavated deep underground and especially sheltered in a narrow valley hidden between two mountains, making photography or bombing extremely difficult. Companies from Austria, Germany, China, Pakistan, Belgium, England, Thailand and Switzerland assisted in the establishment of the installation. Iraqi chemical weapons experts located in Libya provide significant and valuable assistance to the Libyan effort. Most of the activity takes place at night, making surveillance even more difficult.

Biological Weapons

In the area of biological weapons, secret cooperation has been established between Libya and Romania, on the basis of the close ties which once existed between Kadaffi and Ceaucescu, the Romanian tyrant. This partnership focused on biological warfare agents on the basis of the brucellosis bacterium, but one can assume that beyond that, the Libyans turned to the development of the two typical biological warfare agents – anthrax and botulinum. Later, activity began – also with the aid of foreign companies – in the establishment of the "Center for Microbiology Research" and the "General Health Laboratories", as frameworks serving the purpose of concealing the acquisition of biological weapons. It is reasonable to assume that Muslim countries, South African elements, China and North Korea are providing significant aid to Libya.

Very substantive assistance has been provided recently by Iraqi scientists who moved to Libya in the framework of a secret agreement between the two countries, and were integrated into the Libyan biological weapons project, code-named "Ibn Hayan". The project is under the auspices of the Libyan Defense Ministry and reports directly to Kadaffi. The project equipment was purchased primarily from China, India and Serbia by civilian Libyan research institutions.[19]

There is no doubt that the Libyan chemical weapons installations in Rabta, Sabha and Tarhonah are capable of containing, and almost certainly do contain, sections for the discreet development and production of biological weapons. There is a reasonable possibility that the Libyans have already begun to produce and stockpile biological weapons, and it is clear that they plan on reaching the point where they will be able to arm long range missiles with biological warheads.

Iran

Despite the fact that Iran is the only non-Arab country included in this survey, and despite its relative distance from Israel, it potentially constitutes the greatest chemical/biological threat in a number of senses[20]:

- Its present chemical and biological and future nuclear armament efforts result from its resolute perception of the three types of

weapons of mass destruction as vital (the gravity of this issue was discussed above);

- Its many scientific and technological resources which surpass, for all intents and purposes, those of any Arab country;
- Its signature on the chemical and biological conventions treaty, despite its chemical and biological armament efforts, which it denies;
- Its close ties with hostile Arab countries, especially Syria and Libya (along with its ties to radical North Korea) which include cooperation in the chemical/biological realm;
- Its gradual, though prioritized, acquisition of long range surface-to-surface missiles (with ranges reaching thousands of kilometers), designed to carry chemical-biological warheads, and its interest in cruise missiles; its development of a missile with a range long enough to reach Israel has been completed, and its adaptation to carry chemical/biological warheads has begun;
- The extensive quantity and dispersal of facilities included in the development, production and storage alignment of chemical and biological warfare agents and of the delivery systems designed for them. Noteworthy facilities are located in Teheran, Kharj, Karai, Ispahan, Marv-Dasht, Shiraz and Bandar Khomeini;
- The lack of a significant change in concept and strategic armament policy after the change in government. Iran was characterized as the most concrete existential threat to Israel since the War of Independence for good reason;
- The excessive cultivation of terrorist capability, including chemical and especially biological terrorism;
- Its enmity towards Israel and its Islamic fanaticism;
- The match between Iran and Syria, alongside North Korea, represents, therefore, an unusual and powerful strategic relationship in general, and in the non-conventional context in particular.

However, lately, the significance of the aid to its chemical/biological armament programs including in the ballistic realm, which Iran receives from China, Russia, Pakistan and South Africa, is gradually burgeoning. At the same time, it is the beneficiary of extremely advanced Russian

technological expertise which is accelerating the pace of Iranian development and deployment and is continuing despite the vigorous American and Israeli efforts to persuade Russian authorities to halt those transfers. Recently, it was reported that 10,000 Russian chemical, biological and nuclear experts were employed in Iran.[21] Even if we assume that the quantity is exaggerated, Russian aid remains extraordinarily massive. In fact, the American sanctions have not been at all successful in slowing the Iranian non-conventional armament efforts. At the same time, Iran is receiving extensive aid from German companies, a large number of which previously aided Iraq, and by doing so, were, ironically, bitterly condemned by Iran – a typically fraudulent Iranian approach – in fact, one of many which have constituted the Iranian strategic philosophy for a considerable period of time.

Chemical Weapons

Iran, more than any other country, has learned from bitter experience, one which absorbed seven years of frequent, mostly effective, Iraqi chemical attacks. This accumulated experience has ramifications for Iranian chemical armament efforts. In the course of its war with Iraq, Iran attempted to produce chemical weapons, but implemented them on a very limited scale, not at all comparable to the scope of the Iraqi use of chemical weapons. However, by the end of the bitter war, Iran had gained considerable momentum in its preparations for the extensive production of chemical weapons, and the practical implementation of those preparations. Today, it possesses chemical weapons, including artillery shells, aerial bombs, rockets and, it is reasonable to assume, missile warheads as well. The chemical weapons substances, which it produces, include cyanide, mustard gas, lewisite, phosgene, tabun and sarin. At this stage apparently, they do not possess operational missiles with chemical warheads capable of reaching Israel, though it is clear that it is striving to reach and they are quickly approaching that capability.

Biological Weapons

In the field of biological weapons, too, Iran is operating tirelessly. It possesses extensive and sophisticated biotechnological infrastructures in which trained personnel are concentrated. Therefore, it does not require much outside assistance and it is likely that its biological efforts will garner results, in terms of deployment. The biological warfare agents which it develops/produces coincide surprisingly or not so surprisingly with those

noted above regarding Syria – botulinum, ricin and anthrax. Foot and mouth disease (an anti-livestock agent) has been mentioned as well. Nevertheless, its ability to develop and produce biological warfare agents, including viral biological warfare agents, is much more extensive than Syria's, and there is no doubt regarding their aspiration to equip themselves with biological warheads carried by long range missiles. The development of warheads of that type was recently completed in Iran. The Iranian effort to equip themselves with biological weapons is a concentrated effort; in this area, it is assisted by Russia, among others, which contributes to the operational Iranian offensive biological capability whose effect, according to American intelligence sources, will be comparable to that of nuclear weapons. The Iranians are even expending an effort to recruit biological weapons experts from the CIS.[22] The significance of biological weapons in the context of terrorist activity has not escaped the attention of the Iranians, and it has equipped itself with guerilla warfare instrumentality designed to implement biological warfare agents by aerosol or by contaminating water systems.

Other Arab Countries

Sudan represents an outstanding example of a country attempting to develop chemical and biological weapons, a development process, which was primarily inspired and managed, by another friendly country – Iraq. The beginnings of the phenomenon were in the winter of 1991, when Iraq, under the threat of a powerful Arab coalition in the wake of its invasion of Kuwait found a solitary outpost in the desert in the guise of Sudan, transferred SCUD units to it, and in doing so, effected a threat to Egypt. Over the years since, and due to increasing UN pressure on Iraq to expose and destroy its non-conventional weapons arsenal, Iraq's remarkable outpost in Sudan has gradually been strengthened. Teams of experts, equipment, components and apparently whole weapons systems were transferred to Sudan for purposes of concealment and establishing local infrastructures which would both assist the rehabilitation of Iraq's depleted arsenals and Sudanese armament efforts.

This phenomenon developed to the point of the establishment and operation of several facilities functioning in research, development, production and storage of chemical and biological weapons in Sudan, with –

in addition to the Iraqis – Iranians, Libyans, Egyptians, Syrians and Arab terrorists of undetermined origins, all involved in this alignment.[23]

In other Arab countries, it is difficult to clearly identify efforts to develop a chemical/biological capability, and a significant distinction exists between them and the countries discussed above in technological-scientific and other characteristics. Saudi Arabia is noteworthy in that scientifically and technologically, generally speaking, it is no less advanced than the group of nations equipping themselves with these weapons.[24] Regarding countries like Saudi Arabia, as well as Algeria, for instance, the primary limiting factor (not to speak of financial ability) in the chemical/biological context is the decision as to the need to equip themselves. The fact that Saudi Arabia possesses long range Chinese surface-to-surface missiles capable of carrying chemical/biological weapons, and that it participated substantively in the planning and funding of the Pakistani nuclear effort (it is hard to imagine that its funding will not be repaid in chemical/biological weapons, which, by the way, the Pakistanis possess) and its experience with the Iraqi chemical/biological threat, are liable to accelerate a decision of that sort. Along with Saudi Arabia, Algeria should be mentioned, as in the past, France developed chemical weapons within its borders and Iraqi biological weapons arrived there recently. Its apparent attempts to establish a nuclear-military infrastructure point to an intensifying orientation in the area of non-conventional weapons.

Part C – Discussion

Characteristics of the Threat

The chemical and biological weapons belonging to the Arab countries and Iran can serve them in the attainment of a number of objectives, some through the actual implementation of the weapons and some by taking steps threatening its implementation.

The goals in the actual implementation scenarios are:

- Conquest
- Defense
- Neutralization/Paralysis
- Causing massive losses
- Severely lowering morale
- Prevention of existential danger to the regime
- Damaging vital strategic targets

The goals in the threat scenarios are:

- Spreading panic
- Deterrence of an initiated or retaliatory Israeli action
- Erosion of Israeli deterrence

A detailed description of various operational scenarios will be offered below. We will point out now that the two initiative scenarios at the two ends of the spectrum – tactical deployment for the purpose of conquering a given sector (the Golan Heights, for example) as opposed to strategic implementation against civilian population centers on the home front (the Dan region, for example), would serve completely different purposes of course, and between them, there are various intermediate scenarios such as striking military air fields, concentrations of reserve forces or command and control installations. However, the common denominator of them all is the assessment that by implementing chemical and biological weapons, the chances to attain vital goals or targets, which are virtually or completely unattainable in any other way, are enhanced. Given this guiding principle which contains within it – from the Syrian perspective for example – readiness to absorb equivalent Israeli retaliation in the same operational

arena (a chemical/biological counterstrike), it is reasonable to assume that it will serve the Syrians on the defensive as well, and its feasibility will increase as Syria's distress as defenders exacerbates, or even on the offensive were they to absorb unbearable blows.

At the same time, it is noteworthy that the reason that Saddam refrained from the escalation involved in the launch of missiles armed with chemical and biological warheads after already having crossed the threshold of launching conventional missiles at Israeli cities, would probably not discourage Iran, for example, especially if it was already equipped with nuclear weapons, on the one hand, and if it was to view a chemical/ biological strike against Israeli cities as a more vital target than did Saddam Hussein, on the other.

And, indeed, in the not too distant future, if and when Iran (and then Iraq or Libya) acquire nuclear weapons, it is reasonable to assume that it will serve as a nuclear umbrella protecting all Arab countries as such from a nuclear threat. Iran, Iraq and Libya themselves, at least, in that case, will feel free to implement chemical and biological weapons, if need be, without worrying about a nuclear counterstrike and would be subject, according to their assessment, to nothing more than a chemical/biological counterstrike, which could definitely be considered tolerable from their perspective.

A situation of this sort will engender a far-reaching change in the balance of power. Even if we assume that the day when this will eventuate is far off, even today, an additional, less extreme, though no less grave, change in the balance of power in terms of how the equation is liable to be perceived by the Arab countries must be considered: An Arab or Iranian assessment based on biological weapons as a neutralizer (conceptual or methodical) of the threat of an Israeli nuclear counterstrike to an operational chemical weapons initiative. Relatively less extreme, and at the same time definitely grave, is a change in the balance of power in which Syria, for example, will assess that its chemical missiles constitute a massive threat against Israel's citizens, which could neutralize (conceptually) Israeli nuclear retaliation for a Syrian chemical strike against the Golan Heights. It is extremely worthwhile to prevent the facilitation of those changes, even at the conceptual level. (In the background, Russia's exceedingly pragmatic approach should be noted, in that it, at least, apparently agreed to destroy its chemical weapons, while at the same time it totally denies the fact that it has stockpiled biological weapons, which it is trying very hard to conceal and preserve, due to the fact

that it ascribes especially great strategic value to biological weapons; it is possible that Iraq is adopting a similar operational approach, based on the same concept.)

Unfortunately, and after the long road which the Arab countries and Iran have traveled to this point in establishing chemical and biological weapons production alignment, and in the accumulation of production technology and stockpiles of these weapons, it is difficult to imagine a way which will effect a substantive reduction in the rate of deployment by impeding the arrival of external technology (expertise and components) to those equipping themselves. The actions taken by Israel can lower the rate of deployment, in other words, to have some sort of quantitative, but no substantive influence in the sense of affecting the essential existence and progress of the process; in almost every case, alternative technology suppliers and more sophisticated circuitous routes will emerge, especially in light of the fact that the technology transfers among the Arab countries and Iran themselves are steadily increasing.

Furthermore, the official North Korean aid to Syria, Iran, Libya and Egypt, and the unofficial, or semi-official transfer of valuable technology, especially from Russia and China, are liable to effect – and for all intents and purposes are effecting – an extreme escalation in their present rates of deployment.

The very grave conclusion arising from this is that the completion of chemical and biological weapons arsenals which will ultimately include missile warheads which will facilitate their dispatch from any point in enemy territory to any point in the State of Israel, is just a matter of time, and in terms of basic strategic time, there is no substantive difference, in this sense, between completion of the armament process within three, six or nine years. The time dimension does constitute a significant factor in terms of the accelerated construction of defensive means such as the “Arrow”, but even if we posit that the effectiveness of a single “Arrow” missile is perfect, the doubt still remains as to the effectiveness of a defensive alignment based on the “Arrow” against a concentrated or diffuse missile attack. Even the addition of further defensive anti-missiles envelopes is not prone to provide full shielding.

Only a dramatic about-face in the effectiveness of the enforcement of international trade limits, in the attitude of a radical country providing

assistance like North Korea, or in the intense Arab-Iranian motivation to reinforce a solid strategic front in the sense of non-conventional armaments equilibrium – will, perhaps, effect a substantive change in this matter. The situation today and in the foreseeable future does not portend any of the above changes.

The option of physically attacking the threatening element, that is the arsenals and/or the production alignment, whose effectiveness was well established in the surprise, surgical bombing of the Iraqi nuclear reactor, and was placed in doubt in the continued bombings, lacking in the element of surprise, during the Kuwait War, were and remain a stinging, surprise contingent operation with great potential. However, two changes have transpired in recent years which pose great difficulties in the attempt to maximize that potential – the change from surface to underground production and storage installations, whose monitoring and bombing are problematic; and in addition, the (substantial) doubt whether the Arab countries and Iran would act with restraint (as was the case following the destruction of the reactor in Iraq) were they to absorb a blow of this type in a period of calm. Indeed, the effectiveness of these new changes is increasing. Satellite surveillance of the establishment of new facilities has substantially reduced effectiveness when attempting to investigate construction of excavated installations conducted primarily at night, as Russia and North Korea, which are carefully tracked by the United States, succeeded in doing. The Arab countries and Iran are following in their footsteps. Even if the allusion was to a facility which could be bombed, it is safe to assume that an Israeli bombing attack would not pass without a military response. In this sense, one must relate to the bombing of the Iraqi reactor, which passed with no reaction (at least, immediate) as an isolated incident.

Preventing the confluence of circumstances which would lead the Arab leaders to decide to implement chemical and biological weapons or alternatively, to deputize lower echelons to decide to implement the weapons, is of the utmost importance; contributing to this is defensive readiness, in that it will significantly minimize the effect of the damage and the anticipated benefits for the attacker. Readiness for an immediate and unendurable Israeli retaliatory strike, which will include simultaneously the neutralization of the remaining chemical/biological capability of the attacker; identifying the location and mode of stockpiling weapons and production alignments, creating an immediate and effective ability to attack

them, and identifying the preliminary stages leading to Arab/Iranian chemical/biological weapons implementation for the purposes of neutralizing the process politically or militarily, is needed.

In the political dimension, identifying an Arab approach based on brinkmanship – extended or acute – is in order to implement a counter-strategy based on a considered employment of brinkmanship and beyond.

International Intra-Arab and Iranian Cooperation

Intra-Arab and Iranian cooperation in the area of chemical and biological weapons has been going on for many years and includes: transfer of chemical weapons and technical expertise from Egypt to Syria in preparation for the Yom Kippur War; Egyptian-Iraqi cooperation in the development and production of chemical and biological weapons, including ballistic missiles with chemical and biological warheads (this is the case between Syria and Iran as well, who together purchase appropriate components and missiles from North Korea and China); Egyptian and Syrian concealment (and perhaps even genuine cooperation) of the Libyan effort to produce chemical and biological weapons; Iranian aid to Libya, including the provision of weapons; clandestine purchases of different components, transfer of information about preferred suppliers, indirect ways to attain and implement controlled technologies, ways of developing, producing, testing, storing and operating chemical and biological weapons, loopholes in chemical and biological treaties and more. It is clear that there is close intelligence cooperation between the Arab states concerning Israel in general and regarding its non-conventional capability in particular. Strategic understandings which are liable to lead to substantial strategic cooperation probably ensue, and it is possible that therein lies, more than anything else, the potential for the formation of existential strategic threats, including those of a chemical/biological nature with which we are discussing. The first indications of this, in any case, are already in place, as can be seen in this survey.

The intra-Arab/Iranian cooperation, therefore, manifests itself on the technical, commercial, intelligence, political, military and strategic planes. Mutual concealment and support are also, as stated above, one of its manifestations. Mubarak and Kadaffi recently constituted a fine example of this, when they convened a profound deliberation as to the degree of validity

of the American evidence (which was delivered to Mubarak by the American Secretary of Defense), incriminating Libya for establishing an enormous chemical weapons plant. Following this implication – a few years after the United States went out of its way to protect Egypt (when the latter was exposed establishing state-of-the-art chemical weapons production lines) as one which requires chemical weapons for use against Libya, and after Mubarak virulently attacked Kaddafi's lies (as Mubarak said about Kaddafi who denied Libya's efforts to prepare for the production of chemical weapons), Mubarak rushed to protect his colleague to the West, and their joint deliberations "led" to the conclusion that Libya was not establishing a chemical weapons plant. One can assume that this conclusion contradicted Egyptian intelligence's own assessment.

So, too, for example, the Syrian Defense Minister asked: "How can we justify granting Israel total freedom to develop every type of weapon of mass destruction, while at the same time, Iraq is embattled under the pretext that it has some sort of biological weapons?"

However, beyond all this, from the process perspective (which is, of course, much more important than the present, somewhat accidental, point in time or of one of the examples of past points in time), it seems that there is a clear trend towards an intensification of the intra-Arab (including Iraq) and Iranian strategic cooperation and it appears that it is liable to (again) reach the point of transfer of chemical and biological weapons from country to country, or even to strategic operational coordination within that context. This issue, therefore, embodies an extremely severe potential threat, which requires appropriate attention. A parallel manifestation exists in the nuclear field as well, in which Libyan and Saudi financial support, among others, enabled the successful development of nuclear weapons in Pakistan. It can be assumed that the quid pro quo which Pakistan supplied to those two countries includes, at least, aid in the development of chemical/biological weapons, or even the transfer of weapons of that sort to their possession, weapons, incidentally, which have been in Pakistan's possession for a number of years. As a rule, it can be assumed that whenever any type of nuclear cooperation exists, it is accompanied by chemical/biological cooperation as well.

A characteristically different threat, whose significance is clear and as a result, manifests itself in the intra-Arab and Iranian cooperation in the

context of international conventions relating to the liquidation of chemical and biological weapons.

The Arab countries, which have not signed the chemical convention (to this point), are countries which border Israel and/or possess chemical weapons, in other words, Syria, Egypt, Lebanon, Libya and Iraq. An Arab country – this is true regarding Iran as well – which has signed the treaty, is permitted to demand a challenged inspection of facilities in another country which signed the treaty, Israel included (if Israel joins the convention), and as a result, one can assume that the results of the inspection will be transmitted by the country posing the challenge to its Arab colleagues which are not signed on the treaty. It is difficult to imagine a way to prevent this consequence unless a draconian bylaw was legislated which would negate the right to examine the results of the inspection (in their entirety even if they are positive) from the challenging country. Furthermore, Arab countries and Iran will be able to coordinate among themselves, which facilities from their perspective are worth challenging.

Lack of coincidence accompanies the process of Arab countries and Iran joining the chemical and biological conventions treaty – Iran joined as it is a Muslim, non-Arab country which invests a major effort in the acquisition of chemical and biological weapons, but is "outside" the Arab-Israeli circle of conflict. Jordan joined as a country lacking any pretenses or any chance of being contested regarding chemical/biological weapons, so that in the best case, its participation will engender no harm or benefit, and in the worst case, it will challenge Israel (on the basis of its long common border with Israel) and will transfer the findings of the inspection to other Arab countries. Lebanon, which is fundamentally similar to Jordan in this sense, did not join the treaty, apparently in order not to expose the Syrian forces located within Lebanon to a chemical inspection. In any case, there is no doubt that Iran, in the wake of its signing of the chemical treaty, is certainly preoccupied in its quest for ways of evading compulsory inspections of its chemical and biological installations, will serve as an inexhaustible source for valuable information on this issue for Arab countries possessing chemical and biological weapons, if and when they sign the accords. This is also the case apropos locating new methods of evading trade restrictions dictated by the chemical and biological convention regarding the purchase of technology, equipment and materials by its members.

Technology Suppliers

After a long period during which the Arab-Iranian alignment relied primarily on Western chemical/biological technology suppliers, most of them private companies, due to the pressure to enforce the international trade restrictions in this area, the latter have, to a certain degree, been replaced by technology suppliers from four additional categories:

- Suppliers which function as private commercial companies in free countries in the Far East like India, Japan and Singapore;
- Suppliers which function commercially, ostensibly free, in totalitarian or semi-totalitarian countries in the Far East, like China;
- Suppliers which function on the basis of the availability of extremely valuable technological resources due to the disarmament processes and the inactivity of relevant infrastructure installations, like Russia, Kazakhstan and South Africa;
- Islamic suppliers which function on the basis of primarily official cooperation, which is developing and intensifying among Arab and Islamic countries like Pakistan, Iran and Syria, and for all intents and purposes, between all of the involved nations.

For these purposes, a supplier is any technological resource, whether an isolated person, a laboratory, institute, university, hospital, engineering firm, commercial company, military academy, aeronautical developer, raw material producer, chemical warehouse, weapon arsenal, experimental proving grounds and the like.

Recently, the center of gravity has tilted towards countries like Russia, Ukraine, Kazakhstan and the like, due to the massive availability of technological resources as a result of the (partial) inactivity of the multi-faceted research, development, production and storage systems of chemical and biological weapons in the former Soviet Union (but also in Russia as its continuation) with the consummation of disarmament agreements. In various facilities, which functioned in these countries, very advanced accomplishments were recorded in the development of sophisticated chemical and biological warfare agents, and of enhanced delivery and dispersal systems for them, which raised chemical and especially biological weapons to the strategic level of a super weapon. However, despite the great secrecy of these weapons, including their integration with ballistic systems, a

steady leak of the technologies on which they are based is underway, due to the loss of their totalitarian supervision, disarmament processes and increasing financial distress.

Even in a controlled country like China, which also possesses outstanding expertise in the fields of chemical and biological weapons and ballistic missiles, significant aid is proffered to Arab and Islamic consumers by local suppliers which formally function in a manner independent of the government. Despite the intensive efforts on the part of the United States and Israel to bring an end to that aid, it is perpetuated by suppliers in China, Russia and the countries of the Confederation of Independent States. Thus, for example, hundreds of Russian experts advise Syria, Iraq and Iran in the field of ballistic missiles and weapons of mass destruction (chemical, biological and nuclear weapons).[25] North Korea should be added to this illustrious list of course, as its technology transfers take place in a completely official, though extremely secretive manner, along with South Africa from which technology leaks in a non-state-sponsored fashion.

From a global perspective, it is perfectly clear that a serious, even critical, deterioration has taken place in the activities of the technology suppliers. Alongside limited restraint on the part of Western suppliers, alternative suppliers have emerged who in an accelerated mode, close various, sometimes cardinal, gaps in the Arab countries'/Iranian acquisition efforts. It appears that the geopolitical dynamic created in this context is irreversible.

The Ultimate Weapon System

The most important strategic military asset existing or emerging in the Arab countries and Iran, in terms of armaments, are the chemical and biological warheads of surface-to-surface missiles. As such, it is worth spending a few moments discussing the parameters, which ascribe their great strategic value to them.

Range – which enables the deploying nation the option of launching from any point in its territory to any point in Israel. This situation, as opposed to the situation when the range of the missile is limited – where effective launch to all of Israeli territory is possible only from territories adjacent to the border with Israel or close to Israel or alternatively launch from deep in its territory to only a portion of Israeli territory – is, of course, the most

desirable from the perspective of the nation equipping itself, as it provides it with the maximal flexibility regarding the choice of the hidden site for storage and launch of the missiles as well as the target to be hit.

Quantity of Active Substances (chemical/biological) – unlimited in any case, by the content and transport capability of the warhead, as the chemical or biological weapons matter is always required in smaller amounts (due to the great impact per unit of active matter) than the quantity of explosives which the warhead was originally designed to contain. Furthermore, at times, the reduction of the excessive weight of the effective payload of the warhead (when speaking of chemical warfare agents and especially biological warfare agents) enables the enhancement of the missiles range.

Type of Active Matter – neutralizing, wounding or killing; stable or volatile; long-lasting or evanescent; engendering epidemics or not engendering epidemics; identifiable or non-identifiable; treatable or difficult to treat. This categorization is not always clear, and at times there are warfare agents which represent intermediate circumstances. Biological warfare agents which are deadly, long-lasting, epidemic-inducing, are difficult to identify and to treat, have maximal strategic value, in general, though the combination of these characteristics is attainable only through artificial introduction of some of them (as successfully accomplished by the Russians which explains their resolute and continued avoidance of relinquishing their biological option).

Effectiveness of the Dispersal of the Active Matter – this factor is cardinal regarding stable chemical warfare agents and also regarding biological warfare agents as it dictates the size of the contaminated area (dependent also on weather conditions). It is determined by the loading method of the warfare agents – united (less effective) as opposed to clustered (more effective); its dispersibility which is determined by auxiliary materials and by auxiliary mechanical or explosive devices (in this area as well, the Russians attained very important accomplishments, which are liable to leak to Arab countries and Iran and it is doubtful whether it has not yet happened); this aspect has extreme importance regarding the preservation of the effectiveness of biological warfare agents during launch, flight and dispersal, and there is no doubt that the contribution of Russian expertise in this area can lead to enhancement.

Functionality – dictated primarily by the half-life of the active matter and the maintenance of the warhead, or its components if they are stored separately (in an extreme case, the active matter is produced immediately before and for the purpose of operational implementation of chemical/ biological warheads):

- Operational Accessibility – the amount of time necessary from receipt of the launch order until the completion of the installation of the operational warhead onto the missile (the operational accessibility is, of course, also determined by everything related to its operational handling and the launch of the missile itself);
- Vulnerability – the degree to which the warhead (and the missiles with their launchers) is exposed intelligence-wise or physically both during periods of calm and in operational situations;
- Missile Quality – in terms of duration of flight (the shorter the better), accuracy (not especially vital), multi-reentry, homing and cruise;
- Size of the Missile Arsenal and its Deployment – dictate the magnitude of the first strike launch and as a result, its geographic dispersal, its ability to deal with intercept missiles and the scope of the contaminated areas; this is also true of the magnitude of the second strike.

Nevertheless, it must be mentioned that in addition to missile alignments which, as we know, Israel is readying itself for deployment in a number of defensive layers, there are also important means of launch and dispersal, especially in light of Israel's population density along the coastal plain, which are operated from ships and pilotless drones (see below). Furthermore, there are those who hold that it is imperative to consider the possibility that effective defense against missiles is liable to induce the one who stubbornly aspires to attain weapons of mass destruction threat capability to develop an especially deadly biological vector, which could be launched clandestinely or with the help of terrorist organizations.[26]

In any case, fundamentally, any missile weapon system should be viewed as potential carriers of chemical and biological warheads. Therefore, it is worth surveying the existing and anticipated missile arsenals of the various Arab countries and Iran, in two sections divided according to range:

- Minimal range – the range which enables launch from the closest point from Israel's border to the closest target in Israeli territory.
- Maximal range – the range which enables launch from the farthest point from Israel's border to the point deepest within Israeli territory.

There is a substantive difference between these two distances (including the intermediate distances between them), in terms of anticipated detection, monitoring and disrupting the launch preparations.

Country	Minimum Range (in kilometers)	Maximum Range (in kilometers)	Existing Surface-to-Surface Missile Range (in kilometers)	Developmental Surface-to-Surface Missile Range (in kilometers)
Syria	60	1,100	65-550	600
Egypt	270	1,450	80-600	1,000-1,600
Libya	950	2,400	65-280	950-1,300
Iraq	330	1,200	100-600	1,000-3,000
Iran	900	2,800	150-550	1,000-4,000

According to CIA estimates, in the course of the coming years through 2005, the above countries and Algeria will possess ballistic missiles capable of carrying biological and chemical warheads weighing a ton and traveling a distance of over 1,000 kilometers.

The Evolving Threat to the West

The existing trend in most of the biochemical threat countries mentioned above, to equip themselves with extremely long-range missiles, capable of flying thousands of kilometers, covering territory much more extensive than its adjacent environs and relevant in strategic and geo-political terms, arouses astonishment and equivocation, especially while accompanied by a parallel trend of developing the capability to carry chemical and biological weapons substances. Today, there is no doubt that Iran, Iraq and Libya, at least, intend to attain a missile alignment covering parts of Europe and beyond.

The intensifying cooperation between Turkey, the Muslim country which serves as a barrier between Europe and the Middle East and is a member of NATO, and Israel necessitates the attainment of Arab-Iranian chemical/ biological strategic power multipliers, whose potential targets include both Israel and Turkey and, therefore, significant portions of Europe. Thus, two focal points of the ballistic-biochemical threat come into being: The first, the Iranian, Iraqi, Syrian bloc from the East, and the second, the Libyan sector from the South.

The four Muslim countries included in these two axes are well aware, individually and collectively, of the increasing strategic value of chemical and especially biological weapons as a means of deterrence, retaliation and intimidation. The imminent Iranian acquisition of nuclear weapons will no doubt provide a very significant nuclear umbrella, which will substantially reduce the threshold of threatening to employ, and the practical implementation of chemical and biological weapons.

However, even unrelated to Israel or Turkey, a geo-political constellation is liable to be formed in which the Muslim chemical/biological threat will be brought to bear against a European country or against the European community as a whole. At the entrance to the 21st century, which promises far-reaching scientific and biotechnological progress, these developments will unfortunately have totally undesirable military consequences, which will clearly exacerbate the biochemical threat. The introduction of biochemical warheads containing cluster armaments and carried by cruise missiles will magnify the threat even more. Eventually, those weapon systems may be directed to Europe as well as the USA. Unfortunately, the potential menace thus formed may constitute an overwhelming common denominator, relating concomitantly to Israel, Europe and the USA. The recently established pioneering agreement between the USA and Israel concerning greatly increased strategic cooperation between them, chiefly in terms of strengthening Israel as against the intensifying Iraqi-Iranian non-conventional threat, is a clear manifestation.

In that case, it will be an instance of “the biochemical monster which turned on its master”; as for many years, various European countries, plus the USA, and even more so, many supplier companies functioning within them, made a significant, perhaps even critical, contribution to this grave process.

The ratification of the chemical convention and the completion of the biological convention should ease the monitoring of (suppliers of) forbidden biochemical suppliers, especially in Europe and the USA, however, past experience indicates that, in general, evasive routes which confounded monitoring efforts were discovered. The name of the game, in this respect, is preventive intelligence and persistence.

Chemical and Biological Terrorism

One of the serious concerns recently aroused in the western world, and especially in the United States, is related to the heavy damages liable to be caused by terrorist acts involving chemical or biological weapons systems.[27]

This suspicion is to a great extent focused on terrorists who will be dispatched (in the sense of human "launch devices" of chemical and biological warfare agents, including suicide potential) from an Arab country or Iran. Technically, a significant fundamental feasibility exists for this sort of terrorism, whose implementation is possible with relative ease, and the launch destination could just as easily be in Israel. In fact, over the last decade, there were many incidents in which the Palestinians attempted sabotage through toxic materials (attacks with chemical weapons), though they were limited in scope, and it is possible that it was just a result of individual initiatives and not of a guided framework.

However, in recent years, concern is growing regarding purposeful and official biochemical terrorism, which will be initiated under the auspices of Libya, Iraq, Syria and especially Iran. The former director of the CIA, James Woolsey, recently noted that it is near certain that Hizbullah is apt to perpetrate a terrorist attack with biological weapons, as it is the easiest way to kill many people. It was also discovered that Hamas planned to poison the sources of drinking water and swimming pools in Israel[28] and that the Saudi terrorist bin-Laden, who heads an apparatus which has already apparently equipped itself with chemical-biological terrorism abilities, plans on attacking Israel using those abilities. Indeed, connections between bin-Laden, Hizbullah, and Palestinian terrorist organization have been uncovered, and it is feasible, then, that some joint venture against Israel, involving bio-chemical warfare agents may be configured in that context.

Furthermore, one of course cannot rule out that a directed "ecological intifada" in the media's phrase, is indeed transpiring, referring to the sewage pollution flowing from Judea and Samaria to the coastal plain's streams.

The term "chemical/biological terrorism" signifies sabotage or guerilla warfare implemented by means of toxic materials or micro-organisms which are liable to inflict damage upon people, animals, crops or functional materials, like gasoline. Chemical/biological terrorism includes sub-categories like environmental terrorism, in other words, when the environment – air and water, for example – is the element carrying the chemical/biological substances to murder specific people, or random people, indiscriminately, and narco-terrorism – introducing hallucinogenic drugs to the target population, and non-lethal warfare, which was recently developed to sabotage logistical infrastructures by means of chemical/biological substances. The consequences of chemical/biological terrorism are liable to be tactical or strategic, acute or chronic, and/or physical or psychological. There are those who relate to chemical/biological weapons as weapons of mass impact rather than weapons of mass destruction. Chemical/biological terrorism is not a new threat, but it is progressively becoming more and more worrisome.

The terrorists must have a motive to implement chemical/biological terrorism, but they will not need to manufacture the weapons on their own. Today, it is possible to purchase or steal many industrial or laboratory toxic materials, in substantial quantities. The decisive technical factor will, therefore, be the effectiveness of the dispersal of the chemical/biological substances at the time of attack. According to Stoke, chemical or biological weapons provide terrorists with certain advantages[29]:

- The terrifying results of their implementation will exacerbate anxiety and cause panic;
- These substances are undetectable by traditional anti-terrorist detection systems;
- The difficulty to defend against that sort of substance;
- The ease with which they can be camouflaged, transported and introduced into the target area, relative to conventional weapons;
- Their effectiveness as a means to murder individuals;

- The possible time lapse between dispersal and the appearance of symptoms;
- The possibility of attacking without being identified;
- Certain substances cause temporary disability and are not lethal;
- It is easy to purchase the technical equipment necessary to prepare the substances on a limited basis;
- The technology for the production of chemical or biological substances is described in detail in literature available to the public;
- Delivery of toxic or pollutant substances can be accomplished employing very effective methods, like the utilization of municipal water systems, or the atmosphere.

In general, it can be said that the chemical/biological terrorism threat constitutes a danger, which must be practically confronted in an appropriate manner. The chance that this danger might really come to bear and spin out of control is relatively greater now than ever before and more conspicuous in absolute terms, and it is worsening. There is no doubt that chemical/ biological terrorism today constitutes a non-conventional threat with especially grave potential. There are a number of trends predominant in the world, which are apt to sustain each other and engender escalation in the nature of this threat:

- In terms of concept – the appearance of "avant-garde" terrorists and the implementation of extreme terrorist tactics;
- In practical terms – limiting the effectiveness of conventional terrorism, state-sponsored and not state-sponsored;
- Accumulated and developed abilities of various countries to conduct chemical/biological warfare which will be transferred or channeled improperly as a result of chemical/biological disarmament processes, and will constitute important resources for chemical/biological terrorism;
- Innovative technical approaches which will be developed in the area of chemical engineering and biotechnology which will be suitable for chemical/biological terrorism;

- The ability to avoid leaving tracks which could implicate the perpetration or his sponsors.

It is reasonable to expect that this confluence of trends will manifest itself the world over, but it seems that it is most likely in the Middle East. And, indeed, characteristics and tactics, which are liable to develop into a stark transition from conventional to non-conventional terrorism, typify the Middle East. It seems that the indicators are already in place – the Middle East is undoubtedly the region in which the speed and the scope of both conventional and non-conventional weapons armament processes are among the highest in the world.

The polarization between Israel and the Arab countries and Iran is gradually intensifying. Israel is, in every sense, the most threatened nation in the world, strategically and militarily. There are Muslim countries in the Middle East which are extreme by nature and not politically stable. Terrorism is active in the Middle East these days and it is ongoing both in state-sponsored organizations and in those not sponsored by any country. The knowledge regarding chemical and biological weapons and their availability has been revealed in most of the Middle East and the proliferation of these weapons unavoidably reaches terrorist organizations at least in terms of its ideas and theories. Various "legitimate" terrorist organizations are supported by Arab countries and Iran as far as the conduct of conventional warfare is concerned, while at the same time, those countries are trying to equip themselves with chemical/biological weapons and cultivate them.

It can, therefore, be concluded that all of the circumstances described above are liable to arouse, and encourage, Middle Eastern terrorist organizations to contemplate the usefulness of chemical/biological weapons, especially against Israel. The next steps liable to take place are the equipping of terrorists with chemical/biological weapons and their deployment (steps which have already taken place randomly as was described above). It does not seem to be an especially difficult mission: Chemical laboratories exist which deal with explosives and are capable of treating toxic substances and regular microbiology laboratories, which are connected to hospitals and universities, can handle germs without much difficulty. There is no doubt that the fact that throughout most of Israel streams flow, which originate in lands populated by Arabs, will ease intentional pollution. Reciprocal trade between Israel and Arabs is liable to play a similar role.

All in all, this is certainly a bleak picture, which must be addressed. The two primary directions are, naturally, preventing chemical/biological terrorism and managing situations of this sort after the fact. Recently, substantial efforts relating to the chemical/biological terrorism threat have been expended in the United States, and the American program, which was consolidated and developed in this matter, is extremely comprehensive. The modalities in Israel are very different, of course, but, nevertheless, the American program is a suitable model, in a fundamental sense; in any case, Israel has attained a certain degree of readiness. As a result, in practical terms, the implication will be primarily that the two alignments already existing in Israel – preparation for all kinds of terrorist attacks and for incidents involving chemical/biological weapons – must be a coordinated task force for dealing with issues and incidents of chemical/biological terrorism.

PART D – Summary and Prognosis

Cardinal Points and Fundamental Factors

In this survey, a comprehensive thought succinct description of the situation was presented, on the Syrian, Egyptian, Libyan, Iraqi, Sudanese, and Iranian acquisition of chemical and biological weapons, and on the ramifications thereof. This area is of ever-increasing importance, both conceptually and practically, in the strategic dimension of the Israeli-Arab-Iranian situation.

It is possible that suitable illustration of this was provided by an almost consecutive series of statements (over three weeks in 1997) in the non-conventional strategic context by the leaders of Egypt, Syria and Jordan, which certainly was not coincidental, as it was concentrated over so short a period:

- The Egyptian declaration that the Egyptian army is conducting a nuclear defense exercise against Israel;
- The Jordanian declaration that Israel is liable to need their gas masks again;
- The Syrian declaration that it possesses the capability to implement chemical weapons against Israel.

This series of statements apparently embodies three noteworthy fundamental components:

1. A coordinated Arab effort to engender a passive deterrence effect and an active intimidation effect as to the Arab willingness to implement weapons of mass destruction and to confront them;
2. An attempt to diminish the deterrence dimension of the nuclear weapons attributed to Israel by expressing the readiness to defend against them;
3. A reflection of the clear existence of a chemical and biological arsenal in the possession of Arab/Muslim countries, which is operationally functional and potentially extremely damaging.

From a theoretical perspective, neutral and lacking any obligatory basic assumptions, there is no doubt that the sweeping Arab demand for a Middle East free of all types of weapons of mass destruction in totality, is suitable

and desirable. However, it seems that the difficulty in implementing that desire stems from severe exigencies, at least some of which are substantive, to this point at least. Consequently, unavoidably, and even before we assess the nature of these exigencies, it is highly doubtful whether there is any way for an agreement of this sort to be implemented properly, in other words, in a fundamentally perfect fashion, even if there is in a certain order, or preferential circumstances, which will provide a relatively better objective chance of success than any other alternative.

The exigency, or central doubt, regarding the liquidation of chemical and biological weapons is threefold:

- What is the chance of attaining complete (physical) liquidation of these weapons (in light of the attempts at concealment of the weapons)?
- What is the chance to actually negate the ability to quickly restore these weapons (within days or weeks in light of the attempts at concealment of the related facilities)?
- Furthermore, what is the chance that the entire Arab-Muslim totality will be cured of its desire to possess these weapons?

It seems that today, and in the foreseeable future, the issue of chemical and biological weapons constitutes the central criterion in the strategic military strength of the Arab countries and Iran in general, and in the context of disarmament and arms control in particular, to the degree that they reflect the intended direction of Arab countries and Iran, *vis-à-vis* both Israel and the West, including Western Europe.

The fundamental components comprising and shaping the perception of the strategic balance in the chemical/biological weapons dimension in Iran and the Arab countries dealing with it are:

- Conventionalization of chemical/biological weapons in Arab countries and Iran, especially in contrast to the maintenance of the clear non-conventional status of nuclear weapons;
- The effectiveness of the implementation of chemical weapons by a nation with a superior chemical capability against a country whose non-conventional capability at that point is inferior (Iraq vs. Iran). According to conventional wisdom, this factor was one of the

significant components in halting Iran and inducing its agreement to end the fighting;

- The strategic balances among the Arab countries and Iran themselves, especially when a certain measure of sectarianism still exists among them;
- The pace of the processes, whether the process of forming an arsenal or the quantitative or qualitative expansion of an existing arsenal, can reveal considerable differences between different various countries, for different reasons, though it is impossible to point to, at least in the present reality, a clear factor (other than physical intervention) which would significantly delay those processes. Therefore, it would not be an exaggeration to view them, in this sense, as deterministic or terminal processes.

The Ramifications of the Arab-Iranian Strategic Perception of Chemical/Biological Weapons

The 1980s and 1990s conspicuously signaled the culmination of a fundamental process in the strategic thinking of the Arab countries and Iran – acquisition of chemical and biological weapons as a central strategic weapons component, on the basis of local development and production efforts, but heavily relying on outside technologies, concomitant to accelerated ballistic development.

The aspiration to procure a capability to win wars decisively (a capability which Arab armies lacked in previous wars with Israel) or alternatively, to ensure, at least, the ability to prevent decisive victory by Israel or negate Israeli superiority, constitutes, undoubtedly, a central motivating and animating essence of the Arab-Iranian strategic concept, which is forced to assume that these capabilities will not be attained with conventional weapons, which have always ultimately proved to be inferior relative to the IDF.

The fact that Syria, Libya and Egypt have not really entered into the nuclear realm apparently reflects the recognition of their lack of adequate (budgetary and technological) resources and/or a perception which assumes that chemical and biological weapons are sufficient to satisfy their needs, and that, regardless it is neither advantageous nor likely that nuclear

weapons will be implemented in the course of a military conflict with Israel. In contrast, their technological capabilities in the chemical and biological fields are at a level which can absorb auxiliary technologies. The budgets of the Arab countries also enable them to develop and equip themselves with chemical and biological weapons, which require attainable sophistication in preparation, are not dependent on certain super-technologies, or unique critical components, and are not especially expensive.

Nevertheless, it seems that there is a certain gradation between chemical and biological weapons, in the sense that developing and equipping oneself with chemical weapons somewhat precedes biological weapons in terms of the process of mastering the relevant technologies and their implementation for the purpose of deployment. Even so, it is noteworthy in each of the relevant countries that these two weapons categories always proceed in formation, one after the other, whether it is accompanied – after a much greater time lapse – by a nuclear effort or not. The close relationship between legitimate civilian technologies – production of insecticides, medicinal chemicals, vaccines or other biotechnological products contribute to this; this relationship enables, specifically, those developing countries like the Arab countries and Iran, which are still dependent on the supply of equipment and development and production materials from abroad, to anchor their purchases on legitimate ground and confront, with a considerable degree of success, the various commercial limitations and constraints which are dictated on both the political and international levels, but have not effected any interruptions or delays in the development and acquisition processes underway in the Arab countries to this point, at least. In this sense, the rate of these strategic deployment processes, in their general multi-year span, which applies to them in any case, is not considerably breached, even if there are significant local delays.

In conjunction with that, the Arab countries have accumulated rich experience, which channeled their acquisition activity to circuitous and convoluted paths covering almost all corners of the world, and created difficulties in the enforcement of the various commercial restrictions and standards against them.

This aspect of the intra-Arab aid, in addition to the physical transfer of chemical weapons in a number of cases from one Arab country to another (Egypt to Syria in 1972, Egypt to Iraq in 1983, Libya to Iran in 1987, Iraq to Sudan in 1991) and the general atmosphere extant in the Arab world

regarding the necessity of equipping themselves with non-conventional weapons, raises the question whether an increased strategic cooperation between two (or more) Arab countries is liable to develop in a number of forms:

- Transfer of technologies, experts;
- Transfer of chemical/biological weapons;
- Transfer of raw materials for the production of chemical warfare agents or strains for the production of biological warfare agents;
- Transfer of chemical/biological warfare agents;
- Transfer of components for the launch and dispersal of chemical/ biological warfare agents;
- Permission to implement chemical/biological weapons by an Arab army from the territory of another Arab country;
- Coordinated implementation of chemical/biological weapons.

It is clear that some of these channels of cooperation existed and still exist in the Arab-Iranian bloc. All of these methods of cooperation can be divided fundamentally into situations of calm, situations on the verge of battle and situations in the midst of battle and also of situations of pre-implementation as opposed to post-implementation of non-conventional weapons by one of the countries in the region in the given scenario.

Without presuming to incisively address this key complex issue, it seems that one cannot rule it out, on the basic strategic level, in light of similar past occurrences and the tendency towards strategic adhesiveness which is becoming apparent in different ways and is consistently increasing among the various components of the Arab-Muslim world.

The concept of initiated implementation can develop in the course of an ordered and established planning of offensive maneuvers, like a preemptive strike, which will provide very quick advantages in terms of time and space and alternatively, leading up to, or in the course of war, according to developments.

Should this scenario, in the parameters delineated above, be considered – in terms of its likelihood – as realistic or extreme, and are there substantial

differences between chemical and biological weapons in that specific context?

On the basis of all mentioned above – and especially in light of the extensive accumulated experience of Arab-Israeli wars, which were all conventional to this point and ultimately lacking in sweeping military accomplishments for the Arab side, and the enhancement over the last decade of the approach calling for the maintenance of chemical/biological offensive capabilities in the various Arab countries and Iran – a scenario like the one above is realistic; even if today it must be considered as somewhere between the realm of the realistic and the realm of the severe, on a time line, as it has clearly functioned up until now, with both its fundamental and concrete trends, the balance will lean in the direction of realistic.

In this sense, it seems that the extreme view includes the coordinated implementation of chemical/biological weapons by more than one Arab country in the build-up towards/in the midst of a developing/existing military constellation of an Arab coalition, and/or the implementation of chemical/biological weapons as an opening strike against targets deep in Israeli territory/civilian population. The fact that the Egyptian and Syrian armies which simultaneously attacked during the Yom Kippur War did not ultimately attain comprehensive military accomplishments, despite the advantage which they enjoyed due to the total surprise, could serve as a significant factor and consideration in the consolidation of the nature of the offensive scheme on the part of an attacking Arab coalition, if and when it launches an attack, and one can assume that the introduction of chemical/biological weapons will be seriously and realistically considered, despite the fact that it is undoubtedly an extreme action. Biological weapons falling into the category of toxins will constitute a parallel to chemical weapons in terms of its threshold of implementation; furthermore, in a given situation of a decision to implement chemical weapons, if one comes about, perhaps priority will be given to the toxin option, defense against which is considerably more difficult than against chemical warfare agents. Nevertheless, it is reasonable to attribute a different, higher implementation threshold to genuine biological weapons (viruses and bacteria) with broad strategic dimensions. Genuine biological weapons require an incubation period of at least two days before taking effect and, therefore, if an immediate effect is required, chemical weapons substances or toxins must be utilized.

Even if we analyze matters retrospectively, we will encounter a gradual escalation which included, on Iraq's part, a systematic and prolonged use of chemical weapons on the battlefield (against the Iranian army in the Iraq-Iran War), of chemical weapons against civilian targets (in the later stages of the Iraq-Iran War), of conventional surface-to-surface missiles against the citizens of Teheran and of conventional surface-to-surface missiles against the citizens of Israel and against Saudi Arabia. To this reckoning, one must add the calculated though sporadic implementation of surface-to-surface missiles by Egypt and Syria against Israel in the past. If an additional escalation is anticipated, it will manifest itself with the launch of chemical/ biological surface-to-surface missiles.

One of the central considerations in the Arab/Iranian assessment of the nature of an Israeli reaction, is its perception of the existence of Israel's nuclear capability. If the Arab/Iranian side estimates that in that case an Israeli nuclear counterstrike can be anticipated, then it will, presumably refrain from implementing genuine biological weapons, though at present there exist no tools with which to analyze whether or not this is their estimation. Therefore, the extreme scenario calls for the implementation of long term surface-to-surface missiles armed with warheads containing genuine biological warfare agents, however, its feasibility depends primarily on the existence of an Arab/Iranian nuclear option/umbrella which will *a priori* neutralize, methodically, the possibility of Israeli nuclear retaliation.

Projected Probability for the Implementation of Chemical/ Biological Weapons

In summary, we will now attempt to analyze the prospects for the implementation of biological and chemical weapons in various scenarios, as a result of all said until now, and subordinate to the above defined term, namely, the "probability of the threat".

We will analyze this issue assuming the existence of a Muslim nuclear capability or umbrella, trying to reach a reasonable assessment (neither lenient nor severe) with regard to a situation of the outbreak of acts of hostility (like the Kuwait War), though not necessarily with the magnitude of a comprehensive war.

Estimated Probability for the Implementation of Chemical/ Biological Weapons (in percentages):

Country	First Strike	Escalatory Step	Retaliation for Implementation/ Destruction of Non-Conventional Weapons	Step to Extract from a Dire Predicament
Iraq	30-50	40-70	80-100	60-90
Syria	20-40	30-60	70-100	60-80
Iran	30-60	50-70	90-100	50-70
Libya	20-50	50-60	80-100	40-60
Egypt	10-30	20-40	70-100	50-70

Comments:

- The targets of the chemical/biological weapons can be very diverse according to the constellation at hand and to the explanations provided in earlier chapters.
- In some of the (studies) cases, the probability that a given constellation will eventuate is configured in conjunction with the probability that it will lead to the implementation of the weapons.
- It is calculated that in the absence of an Islamic nuclear capability/umbrella, the probability calculated in the chart will be reduced by a factor of 1.5-2.
- The calculation is that in a state of comprehensive war, or on the verge of comprehensive war, the probability mentioned in the chart will increase by a factor of 1.5-2.
- The estimate is that toxin biological weapons have the same implementation probability in this system, as that of chemical weapons.
- The estimate is that the implementation probability of genuine biological weapons is greater by a factor of 1.5 than that of chemical weapons/toxins, assuming the existence of the aforementioned

nuclear capability/umbrella (for the purposes of achieving the maximal sub-nuclear effect), and is reduced by the same factor in the absence of this nuclear capability/umbrella.

- The chart does not take a synergistic effect among the Arab countries and Iran into consideration, though the existence of an effect of this sort can be presupposed whether in a premeditated or in a spontaneous manner.
- The chart does not specify the types of delivery and dispersal systems with which the chemical/biological weapons will be implemented; these are liable to influence the feasibility, probability as missile launchers are not the only ones relevant in this context. For countries which routinely sail in the Mediterranean Sea – Syria, Egypt and Libya, there is an option to implement a surface or underwater vessel in order to clandestinely disseminate a cloud of chemical or biological warfare agents in the course of sailing parallel to the coastline, at a calculated distance and considered timing based on forecast winds, so that the cloud will be carried to the coast and land on the coastal strip.

The overwhelming majority of the Israeli Jewish population resides between Acre and Ashkelon, or between Herzliya and Rehovot if you will, and its vulnerability in that sense, is great, especially if the implementation of chemical/biological weapons is accomplished clandestinely as above, which will prevent a mobilization of defenses until the appearance of casualties.

Pilotless drones can generate a similar cloud along a parallel route. Different operational experiments, which were performed recently during the 1960s by the Allies, illustrated high feasibility, in technical terms at least, of dispersal of chemical and biological weapons in this fashion. The confrontation states are certainly aware of this, which is liable to increase the likelihood of implementation.

The likelihood of implementation is influenced, of course, by the decision-making process of the ruler of the country under discussion, because, clearly, the weapons will not be implemented – at least initially – without his direct approval. In this sense, the dimension of the personality of the ruler plays a central role, along with the nature of the apparatus surrounding him in the context of decision-making. Most of the recent rulers

of the confrontation states have been well known for a long period, both in periods of calm and times of crisis. They have proven balanced or at least very deliberate even if they are extreme, at times. Nevertheless, one cannot necessarily conclude that their behavior will be similar in the situations under discussion here.

Beyond all this, there is the time dimension and the existing and developing symbiotic relationship between it and the geo-strategic dimension in the Middle East. In other words, what is the nature of the most basic, authentic, process – the primary process or the original process, for our purposes – taking place in the present, these days, from a geo-strategic Middle Eastern perspective, from which, for all intents and purposes, all the rest follows. To what degree it is at all clear, and what are its ramifications in terms of the non-conventional power balance in the Middle East, and in terms of the likelihood that they will manifest themselves in practice.

Concrete Implementation Scenarios

Basically, therefore, the implementation scenarios for the Arab countries and Iran against Israel can be divided into those subordinate, conceptually, at least, to the Israeli nuclear monopoly (the present situation) and those dependent on a mutual balance of nuclear deterrence (the anticipated future situation). In any case, the basic assumption of all of the scenarios described below is that they are sub-nuclear, in other words, that they are based on the assessment of the Arabs/Iranians implementing the use of chemical/ biological weapons and that Israel will not respond with nuclear weapons. The implication is that in the absence of an Arab/Iranian nuclear umbrella, the operator will necessarily need to create a staged escalation, in which the chemical/ biological weapons will be implemented in a less than maximal fashion while the maximal chemical/biological weapons will serve, at the same time, as a deterrent against an Israeli nuclear counterattack to the implementation initiative. On the other hand, one can assume that nuclear weapons in Israeli hands and an Arab/Iranian nuclear umbrella, will serve exclusively as mutual deterrence on the nuclear dimension alone, and as a result, all of the scenarios are sub-nuclear. Even so, one must distinguish between the following two approaches:

1. A sweeping sub-nuclear approach, according to which no limitations will exist in the implementation of chemical and biological weapons,

in other words, if the implementation threshold is crossed, then it should be totally crossed in order to attain maximum impact.

2. A controlled sub-nuclear approach, according to which calibrating the degree or scope of the implementation is necessary due to apprehension from Israeli chemical/biological retaliation or for other reasons.

There are three circles of implementation, though combinations among them are possible:

- Implementation by a country bordering Israel;
- Implementation by a country not bordering Israel;
- Terrorist and guerrilla warfare tactics.

The implementation scenarios of chemical/biological weapons can manifest themselves, according to Yehezkel Dror, in the form of myriad possibilities for exerting pressure of a new type, with the aid of attrition, intimidation and extortion strategies based on various forms of signals, threats and displays preceding the open alignment for launch. Assumptions concerning the "rationality" of the threatening and attacking element on his own terms are sometimes decisively important, or perhaps the actions are cathartic in nature or random as well. These issues require consideration which takes into account different contexts of Arab-Iranian employment of chemical/biological or nuclear weapons, including the threat to utilize them as a component of political-security pressure, or their implementation as the opening stage of an initiated war, as part of a series of belligerent actions which do not constitute war, or as an individual act standing alone.[30]

And, indeed, in outlining the different confrontation situations, Dror describes the following possible scenarios and their ramifications[31]:

1. A comprehensive attack against Israel, which will begin with an attack with missiles carrying chemical weapons, which will disrupt the mobilization of the reserves, while the internal and external political circumstances will make an Israeli preventive or preemptive strike very difficult. As a result, the need for the capability to absorb and halt a broad-based attack of this type, and also to severely punish the attacker without dependence on an extensive mobilization of reserves, though in a manner which will not prevent the reestablishment of a situation of peace.

2. A limited strike against Israel from the East by means of missiles carrying chemical weapons – a scenario which obligates Israel to a plentitude of options, ranging from absorbing the blow through a precise destructive strike against a regime, and in the enhancement of deterrence aimed directly against the motives and considerations of the initiators of an action of this type by force.
3. A terrorist action against Israel utilizing substances of mass destruction, directly assisting a hostile country not bordering Israel – a scenario which requires credible deterrence against the preparations for this sort of action, and a variety of tools designed to strike that country and its leaders and the ability to demonstrate the existence of these tools in a manner which will not lead to escalation by the other side.

In addressing the issue of the implementation of chemical/biological weapons with surface-to-surface missiles, Ze'ev Bonen outlined the following scenarios in descending order of likelihood[32]:

1. A surprise attack as an opening belligerent act from neighboring countries against the home front and military targets in Israel;
2. Launch of surface-to-surface missiles by neighboring countries in the course of a comprehensive war;
3. Launch of surface-to-surface missiles by countries not bordering Israel in order to assist belligerent acts by Israel's neighbors;
4. Independent launch of surface-to-surface missiles by countries not bordering Israel.

We will attempt to illustrate the matter with the help of two examples – the first regarding a country bordering Israel (Syria) which has stood, potentially, on the threshold of implementing chemical weapons since the late 1980s, and the second, regarding a country which does not share a border with Israel (Iraq) and was very close to the implementation threshold in 1991.

The Iraqi Implementation Threshold in the Gulf War, 1991

In the period leading up to the allied attack in 1991, the chemical and biological ballistic missile units of the Iraqi Army were put on

implementation alert, *vis-à-vis* both Saudi Arabia and Israel. The level of the alert was raised to maximum with the onset of the attack. Furthermore, it was reported that a missile carrying a warhead containing the VX chemical weapons substance was actually launched by Iraq in February 1991 towards the Dimona nuclear reactor, and landed in the Negev without causing damage,[33] and that Iraq aimed a very powerful biological weapon towards Tel Aviv, however, Iraqi apprehension from Israel or American nuclear retaliation prevented its actual launch.[34]

There is no doubt that the threat against Israel has never been so grave, especially when dozens of conventional missiles were launched in effect towards Israel with no constraints. It is clear that this situation effectively illustrates the extreme, perhaps even, critical, volatility of the deterrence balance equation when nuclear weapons will be in the possession of Iraq or Iran, as mentioned above. In any case, Saddam Hussein is the architect of this threshold situation, and the chance that he will attempt to recreate it in the future is no less valid than it was then, and will certainly increase during a direct confrontation with Israel, as in 1991 it was not a direct confrontation with Israel. In other words, if under these circumstances, Saddam or the Iraqi regime was so close to actualizing the non-conventional threat against Israel, then it is reasonable to expect that in case of a direct confrontation with Israel and/or under the protection of a nuclear umbrella, the chemical/ biological threat against Israel will be implemented with great force.

The Syrian Implementation Threshold – From the Late 1980s On

In the context of analyzing the overall military strength of Syria, whose offensive chemical capability matured in the late 1980s, four possible basic scenarios were outlined[35] as will be detailed below:

1. Implementation of chemical weapons in a first strike. In this scenario the motive is to attain swift, lasting operational accomplishments. The temptation exists, especially in Syria, to cause Israel heavy fatalities, in order to ensure and preserve military achievements in the first strike, especially since Syria is less sensitive to the loss of life than Israel. In addition, Syria's preparedness to defend against chemical warfare is considerable and the Soviet/Russian doctrine, which the Syrians follow, holds that the use of chemical weapons is an inseparable attack component (though in the Yom Kippur War it

was not used). It appears that the implementation of chemical weapons against Israel, especially in a first strike, is designed to impair the basic Israeli military superiority, in other words, airfields and IDF command and control installations. Other likely targets are mobilization centers, equipment warehouses and perhaps even transportation intersections. The mission will be, certainly in the early stages of the war, to prevent the arrival of reserve forces at the front and to exert pressure on the forces at the front. Nevertheless, if the Syrians decide to cross the Rubicon and attack Israeli citizens, they will strike at population centers and industrial areas. Possible targets of this type are government installations and densely populated areas in northern and central Israel, especially population and industrial centers in Haifa and the Dan region. And, indeed, the exposure of the Syrian operational alignment of Scud-C missiles by satellite photographs indicate that chemical armaments were introduced in a manner that provides them with a surprise chemical attack option and that the missiles were aimed at the reactor in Dimona, the airports and the large cities in Israel. This is a first-rate strategic option at Syria's disposal, and it was pointed out by the American researchers Kurt Gottfried and Bruce Blair quite a while ago (1988). Ballistic missiles armed with chemical warheads constitute a threat both to the army and the civilian population; this is that much truer against Israel if the missiles are implemented in a first strike and even more so – in a surprise attack.[36]

2. Implementation of chemical weapons in response to Israeli maneuvers. The operational characteristics of this scenario are fundamentally similar to the first scenario (the **El-Qabs** newspaper mentioned in this context the Bnot Yaakov bridge and Tzemah junction crossings as potential chemical weapons targets[37]).

3. Implementation of chemical weapons due to extreme distress. The possibility that Syria, when on the verge of defeat, will turn to chemical weapons in order to avoid disaster, represents an approach that was non-existent in the previous wars between Arab countries and Israel. One can assume that the Syrians will justify the use of chemical weapons by claiming that their very survival is at stake. That sort of utilization of chemical weapons, in the case of military distress, will almost certainly be aimed towards the core of the

immediate danger – Israeli forces and other targets at the front, and air force bases – and less towards civilian centers. But also in circumstances like these, a chemical attack on civilian targets cannot be ruled out, in an attempt to turn any possible Israeli victory into a Pyrrhic victory, or in order to accelerate superpower intervention.

4. Implementation of chemical weapons due to a strike against strategic targets deep in Syrian territory. Syrian's chemical weapons are specially designated to deter strikes against strategic targets deep in Syrian territory, and especially super-sensitive targets like government installations and installations vital for Syria's existence. The implication being that Syria will implement chemical weapons, in this context, as the actualization of a failed deterrent. An additional example of this scenario was brought in the **El-Qabs** newspaper from its Damascus office, which noted that Syria will implement missiles carrying chemical warheads in response to an extremely limited attempt to bomb Damascus.[38]

The first scenario is manifest in a number of additional versions, among them, those of a general nature: There is no doubt that in a surprise Syrian attack against Israel, in an attempt to gain a substantial military advantage, the missiles carrying chemical weapons can significantly abet this effort;[39] while at the same time, Syria is capable of using its air power and missiles for a first chemical weapons strike, as chemical attacks of that kind on bases and civilian targets in Israel do not require the movement of many troops and advance warning time is for the most part non-existent.[40]

John Hemsley, among the knowledgeable chemical warfare experts in the British army, holds that stationary military targets, which can easily be predetermined, are the targets which will be subject to the immediate danger of chemical attack. In his opinion, Israeli nuclear facilities or mechanisms, operational headquarters and command, control and communications systems will be at the top of the list of priorities. Due to the dispersal and the consolidation of the facilities in Israeli airports, they will be especially vulnerable to a combined chemical and conventional weapons strike. Nevertheless, the most outstanding telltale sign, in Hemsley's opinion, can be found in a strict analysis of the usefulness of chemical and biological weapons in the context of the existing and developing military doctrine, and in the perception of the danger in the framework of the dimension of war with Israel as a basis for identifying the aggressor's intentions.

A third version of the first scenario is a better-defined version and relates to a Syrian attack on northern Israel in an attempt to conquer the Golan Heights. In this scenario, Syria is liable to adopt a strategy which will combine the Soviet/Russian military doctrine with the exploitation of Israel's uniquely vulnerable aspects.[41] This strategy will involve the implementation of long-range launch systems and long-lasting chemical warfare agents in order to neutralize air force bases, command and control centers, radar stations, reserve mobilization and assembly areas and equipment warehouses. The short-range launch systems will implement volatile chemical warfare agents at the front in order to ease the rapid penetration of the Syrian ground forces. The success of this strategy will enable Syria to achieve its goal of conquering the Golan Heights before the IDF can complete reserve mobilization, and to present the international community with a *fait accompli*.

Furthermore, a scenario also exists which includes the possibility of the Syrian implementation of chemical weapons in Lebanon.[42] According to this scenario, a Syrian threat will be established to implement chemical weapons against infantry and armored task forces located east of Beirut, for the purpose of preventing a civil war and attacks against the city. The implementation of the chemical weapons will be accomplished, tactically, according to the utilization patterns formerly practiced by the Soviets. Volatile nerve gas will be implemented against forces at the front in order to achieve rapid slaughter and break through the front lines, while more persistent nerve gas will be employed against surrounding forces, encampments, flanks and rear positions. The persistent chemical warfare agents will be employed for the attainment of a continuing deleterious psychological effect as well.

The actual threat of chemical warfare in this scenario is regarded to be low to medium. Syria possesses this capability, but perhaps does not want to use chemical weapons against a force which possesses the ability to retaliate in a similar fashion, and which has in its possession other means to strike forces deployed on the battlefield, in permanent facilities and the population in Syria itself. The decision to implement chemical weapons will be a political one, and it is possible that the Syrians will be unwilling to bear the political and military consequences of a decision of that sort.

Impact of the Damage

A comprehensive study dealing with the revolution in the Israeli security concept indicates the extreme severity of the non-conventional threat on civilian population centers in Israel and that the "revolution in security matters in Israel will not put an end to Israel's vulnerability to chemical, biological or nuclear weapons attacks nor will it lead to its significant diminution". Unrelated to the anticipated addition of nuclear weapons, the presently increasing scope of the non-conventional threat stems, according to this study, from the Islamic countries' challenge to the international order, the vulnerability of the Israeli home front and its sensitivity to fatalities, its dependence on the United States, the sophistication of missile launch systems, development of secret delivery techniques and the concealment of offensive capabilities. The study outlines different war scenarios, in which non-conventional weapons implementation by Syria, Iraq, Iran and Libya against Israel can be anticipated.[43]

Another detailed analysis of war scenarios foresees that even in a "relatively good" case, when a non-conventional confrontation between Israel and its enemies will take place and Israel will emerge victorious, critical damages will be caused to Israel, "totally intolerable ones", whether due to mutual implementation of nuclear weapons or due to mutual implementation of just chemical and biological weapons; the conclusion follows that "in existing conditions of extraordinary animosity, the traditional concepts of victory and defeat are liable to lose any serious relevance".[44]

This situation, to a large degree, stems from the fact that even a multi-tiered defensive alignment against missiles, sophisticated though it may be, will provide, in real terms, a success rate of 70-80 percent,[45] since no technology will recreate the situation in which the Israeli home front (in the past) was invulnerable.[46]

And, indeed, there is no way for a country to provide total protection against attacks with weapons of mass destruction and any claim that an "almost hermetically sealed" situation can be achieved is no more than an extremely dangerous illusion.[47] This is a very dire conclusion for the State of Israel, as on the one hand, it is very vulnerable to weapons of mass destruction, and on the other hand, is confronted by the substantial

possibility that attempts will be made to threaten and perhaps even attack it with weapons of that type.

Thus,

> Israel will be forced to choose a security concept whose main meaning would be 'flexible response', because the alternative of massive reward (namely, threatening to use the last resort as a single response) would bring about paralysis and lack of ability to react under a too wide variety of possibilities, towards which applying the last resort would be implausible.[48]

The popular assumption is that the anticipated damage in the wake of the implementation of chemical weapons by Syria, for example, will be inflicted primarily to reserve mobilization sites, supply centers, air force bases and the city of Tel Aviv (as a model), as will be detailed below.

Chemical attacks on reserve mobilization bases and supply centers are liable to severely disrupt this central component in the Israeli defense strategy.[49] In addition, chemical attacks designated to disrupt or paralyze Israeli air force bases are liable to cut off the preeminent force in the IDF, at least until the decontamination actions are completed. In other words, chemical weapons specifically directed against military bases and targets will impinge upon the ability of the IDF to guarantee the existence of the State.

The impact of the damage resulting from the Syrian acquisition of ballistic missiles armed with chemical weapons was noted as the most serious threat imaginable.[50] Potentially, these weapons are capable of paralyzing Israeli air force bases and reserve mobilization sites and to endanger the foundations of Israeli security. From this perspective, this weapon is to a large extent a factor which undermines stability in terms of a strike liable to kill thousands or tens of thousands of people.

An equally grave characterization of the damage impact relates to the implementation of missiles carrying chemical warheads on the city of Tel Aviv, for example. Assuming that Syria is capable, practically, of dispatching its missiles to Tel Aviv, for example, and assuming that some of them reach their target and their chemical warheads function properly, the impact upon the unprotected population in densely populated areas will be horrifying. One chemical warhead containing 500 kilograms of nerve gas can cause (if protective measures are not taken) hundreds and perhaps

thousands of fatalities and an even greater number of moderately wounded casualties. It would not be unrealistic to estimate that several chemical warheads on a city like Tel Aviv could cause more fatalities than those suffered by Israel in all of its wars and confrontations with terrorism since the establishment of the State.[51] And, indeed, a very detailed and pessimistic, though not necessarily unrealistic, description outlines the Dan region as a death trap with no way out and no hope due to the implementation of chemical weapons and certainly biological weapons against it, which will lead, for all intents and purposes, to massive collapse, whose occurrence, according to this source, is simply a matter of mathematical probability.[52]

The consequences of Syrian implementation of missiles carrying chemical warheads were analyzed recently in an extremely detailed manner.[53] As the range of the chemical warhead bearing missile increases, it becomes possible to launch them from deep in Syria to various targets throughout the State of Israel, making its detection and destruction before launch much more difficult. However, if the missile is located after launch, the length of time for preparation for defense and interception will increase as well. Despite this, even successful interception of a chemical missile by an intercept missile is liable to cause casualties to the civilian population on the ground as its destruction at a relatively low altitude is prone to enhance the dispersal of the chemical warfare agents. In case of a VX warhead, its interception at a high altitude will also enhance the dispersal of the chemical warfare agent, due to its great persistence.

The range of Syria's SCUD-B, SCUD-C and SCUD-D missiles and their accuracy are suitable for the launch of chemical payloads against huge target areas throughout Israel. With their chemical payloads, they have the ability to strike relatively small military targets, like air bases, weapons stockpiles and electronic installations throughout Israel. A chemical offensive on an air force base will cause disruption of maneuvers and the strength of the air force will diminish due to the decrease in effectiveness and the reduction in the number of planes, despite the base's defense capabilities.

Armament stockpiles are even more vulnerable to chemical attacks, despite the fact that storage facilities are partially sealed and the dry clad storage method, which is employed for both vehicles and other equipment, will significantly decrease the exposure to contamination. Nevertheless, many reservists are liable to be hurt while traveling to their units, if they are not equipped with sufficient protection against a chemical attack. A chemical

attack at an early stage of the war, therefore, is inclined to substantively delay the IDF mobilization efforts.

The physical and psychological effects of strikes with missiles armed with chemical warheads on Israeli population centers and the scar which they are liable to leave on Israel's morale are significant. One missile in a center of that sort is liable to cause dozens of deaths, even with early warning, and without early warning, hundreds are liable to be killed and thousands are liable to suffer delayed effects including temporary or permanent loss of functionality. Therefore, protection measures are so vital.

Furthermore, it is important to remember the deterioration of Israel's deterrence capability due to the fear of Syrian implementation of chemical weapons. Among the Arab countries, Syria is the most likely to conclude that the non-conventional capability which it has acquired will constitute a deterrent factor against Israeli threats to retaliate against a Syrian ground attack with a counterattack against its military-strategic facilities and civilian population centers deep in Syrian territory. The arms proliferation trends in the region, therefore, are capable of creating combinations, which will erode Israel's deterrence, and thereby enhance the probability of war in the Middle East.[54]

In general terms, Syria's chemical weapons are perceived as a terrifying weapons system, capable of wreaking significant damage upon Israel,[55] and the implementation of Syrian chemical warheads is perceived as a decisive psychological blow to Israel's population, even if effective use is made of gas masks and shelters.[56]

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Appendix – Charting Chemical and Biological Weapons in Arab Countries and Iran

Syria

Chemical Weapons

Acquisition of Egyptian Chemical Weapons – 1972 (aerial bombs and artillery shells containing sarin and mustard gases)

Beginning of (self) Development– 1978

Beginning of Deployment – 1983

Chemical Warfare agents – sarin, VX and cyanide

Armaments – aerial bombs, surface-to-surface missile (SCUD-B, SCUD-C, SCUD-D) warheads, perhaps also for Frog missiles

Implementation – killing 18,000 Syrian Sunnis with cyanide

Primary objectives – arming SCUD-D, M-9, and Cruise missiles with warheads

Biological Weapons

Beginning of Development – 1982

Beginning of Deployment – 1992

Biological Warfare agents – anthrax, cholera, ricin and botulinum

Egypt

Chemical Weapons

Beginning of Development – 1960

Beginning of Deployment – 1963

Chemical Warfare agents – nitrogen and sulfur-based mustard, phosgene, psychochemicals, sarin, VX

Armaments – mines, artillery shells, rockets, aerial bombs, surface-to-surface missile warheads

Implementation – in Yemen: Aerial bombs containing phosgene or mustard gas (1963-1967)

Primary objectives – arming SCUD-C and Vector missiles with warheads

Biological Weapons

Beginning of Development – 1963

Beginning of Deployment – 1970

Biological Warfare agents – botulinum, plague, cholera, Q fever, Rift Valley fever, viral encephalitis

Armament – aerial bombs, surface-to-surface missile warheads

Primary objectives – as above

Iraq

Chemical Weapons

Beginning of Development – 1974 (in partnership with Egypt)

Beginning of Deployment – 1982

Chemical Warfare agents – mustard gas, cyanide, tabun, sarin, GF, VX, sarin. Most of the chemical warfare agents were destroyed.

Armaments – artillery shells, aerial bombs, surface-to-surface warheads and air-to-air rockets. Most of the ammunition was destroyed.

Biological Weapons

Beginning of Development – 1975 (in partnership with Egypt)

Beginning of Deployment – 1984

Biological Warfare agents – anthrax, plague, gas-gangrene, botulinum, smallpox and more. The biological warfare agents apparently were mostly saved.

Implementation – against Kurds and Iranians, locally

Extrication and transfer of development and production technology – to Sudan, Libya and Algeria (at least)

Primary objectives – preservation of remaining weapons and rehabilitation of its production capability

Libya

Chemical Weapons

Beginning of Development – 1982

Beginning of Deployment – 1989

Chemical Warfare agents – mustard gas, tabun

Armaments – artillery shells and aerial bombs

Implementation – one-time utilization of aerial bombs containing mustard gas (from Iran) in Chad

Primary Objectives – producing lewisite, sarin and soman and arming long-range warheads (including Nodong, Otrag and others)

Biological Weapons

Beginning of Development – 1986

Beginning of Deployment – 1994

Biological Weapons Substances – botulinum, brucella, anthrax

Armaments – aerial bombs

Primary objectives – arming long-range warheads

Iran

Chemical Weapons

Beginning of Development – 1984

Beginning of Deployment – 1986

Chemical Warfare agents – cyanide, phosgene, mustard gas, tabun

Implementation – against Iraq, on a limited basis

Primary Objectives – production of lewisite and sarin and arming long-range (thousands of kilometers) warheads

Biological Weapons

Beginning of Development – 1986

Beginning of Deployment – 1992

Biological Warfare agents – botulinum, ricin, anthrax, foot and mouth disease

Armaments – aerial bombs, aerosol generators

Primary Objectives – arming long-range warheads

Sudan

Transfer and concealment of chemical weapons from Iraq – 1991

Implementation of Iraq's chemical weapons – since 1993

Iraqi establishment of chemical and biological weapons production facilities – 1997

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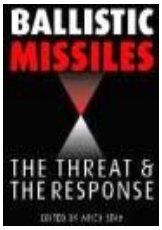

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