NUCLEARIZATION AND STABILITY
IN THE MIDDLE EAST

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In the memory of my mother and

for my father

ABSTRACT

This study deals with nuclear development and policies in Israel and the Arab States and the associated risks of nuclear war. It is an attempt to analyse and explain nuclear proliferation in the Arab-Israeli conflict area in terms of a behavioural model and motivations to go nuclear. It traces the development of the international nuclear industry since the 1950s using the product life cycle theory as an explanatory and likely predictor of the spread of nuclear technology to the Middle East. It charts nuclear development and policies in Israel and the Arab states and explains the dominant motivations which might drive these countries to develop and deploy nuclear weapons. It draws a distinction between nuclear technology spread as a technological and economic process and nuclear weapons proliferation as a politico-military process. It connects and interrelates technological and political factors of nuclear proliferation in the Middle East since proliferation is the product of technology and politics.

The nuclearization of the Arab-Israeli conflict area entailed several risks of nuclear war. The study attempts to ascertain and assess the liklihood of these risks based on past experience and a survey of expert opinion. It identifies three levels of risks originating inside and outside the Middle East. The first level deals with nuclear risks in the Middle East. The second level focuses on the likely responses of the Superpowers to nuclearization of the Middle East. The third level discusses the impact of a nuclear conflict in the Middle East on the Superpower strategic balance.

The implications of this nuclearization on the Arab-Israeli conflict are discussed in terms of the nature of the conflict, the logic of deterrence and the risks involved. The evidence points clearly to nuclear proliferation increasing instability in the Middle East but not necessarily to a nuclear catastrophe.

TABLE OF CONTENTS

	Preface	V
	Acknowledgement	VI
	Introduction	1
I.	The Nature of Nuclear Proliferation	15
II.	Nuclear Proliferation: Alternative Propositions	84
III.	The Spread of Nuclear Technology in the Middle East	153
IV.	Nuclear Weapons Proliferation in the Middle East	263
V.	Nuclear Proliferation and Risks of Nuclear War in the Middle East	308
VI.	Survey of the Likelihood of Risks of Nuclear War in the Middle East	411
VII.	The Implications of the Nuclearization of the Middle East	453
	Conclusion	496
	Appendices	503
	Glossary	527
	Abbreviation	533
	List of Sources	535
	Bibliography	538

PREFACE

This study written by a generation of Middle Easterns born after the invention and first use of the atom bomb and the creation of the state of Israel, evolves from deep concern and interest over the prospects of the endless Arab-Israeli conflict.

Much has been written in recent years of the various disasters facing Mankind. But the greatest single threat to Man's survival is, undoubtedly, the spectre of global holocaust. The enormity of the threat of nuclear war increases year by year as rapid advances in military technology are incorporated into weapons and more countries acquire these destructive weapons. The study set out to analyse one of the most disquieting and controversial aspects of the current nuclear arms race, namely nuclear proliferation in the Middle East. The Israeli attack on the Iraqi nuclear research reactor in June 1981 and the new revelations of Israel's nuclear weapons capabilities published by the Sunday Times (5th and 12th October 1986), raised the nuclear question in the Middle East once more following the reports of the Israeli nuclear weapons programme in the 1960s and the 1970s. Though the question of a nuclear Middle East is a matter of deep concern to the world and, indeed, to the states of the Middle Eastern region, there is a great deal of complacency about these issues among Arab and Israeli politicians, officials and scholars. It seems nobody wants to be candid about the nuclear threat to the survival of all the people of the region, among Arabs and Israelis. There is no public debate or discussion nor disclosure of information about the nature and dangers of this prospect for reasons of excessive security. The author encountered enormous difficulties, and in several cases hostility, over the years in trying to ascertain facts about nuclear development and policies of the states concerned.

The author has thought to address vital issues of nuclear proliferation from the perspectives of the Israelis and Arabs and to make his evaluation as factual and concise as possible on the basis of available information. The study is based on published material both primary and secondary, and a survey carried out among experts of nuclear proliferation and Middle East politics. The documents released by the governments of the Middle East, U.S. Congress, U.N. debates and reports were of great value. Secondary sources like books, articles and newspapers were helpful in charting the development of nuclear technology and policies in the Middle East and the world.

A survey of experts on the likelihood of risks of nuclear war was instrumental in assessing these risks. The author sent identical questionnaires to 176 scholars and experts of nuclear strategy, proliferation and the Middle East from various Western countries, Israel, Arab states and Asian countries. Most of the Western scholars responded to the questionnaire while most of the Arab and Israeli respondents were not ready to respond. Some claimed they had no knowledge of the subject. The author wants to thank those who did have the courage to respond to the questionnaire.

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I owe enormous debts to my teachers at the Universities of Southern California and Kent. I am particularly grateful to two individuals - Dr. John Burton and Professor John Groom, who introduced me to the field of international relations. Dr Burton has provided appropriate measures of encouragement and discouragement. Professor John Groom is not only a master of teaching how to think about strategy, but also provided invaluable instruction on how to express these thoughts in writing. He has guided this work from its early two page proposal to the final copy-editing stage with enormous patience and goodwill. He took a deep personal interest in my work. His advice and criticism materially improved the form and content of this study. This study would not be what it is without his limitless help.

In the Winter of 1985/86 I spent three months sending questionnaires to several tens of distinguished scholars and experts from different parts of the world. I am grateful to those people for having alloted some of their precious time to answer my questionnaire.

Special thanks are due to Dr. Paul Rogers of Bradford University, William Walker of Southampton University, Dr. G. Segal of Bristol University, Dr. Abdul Moneim Almanshat of Cairo University and Lewis Dunn of the U.S. Arms Control and Disarmament Agency for having shown particular interest. I would also like to thank Keith Webb for his assistance with his thoughtful advice and help in the survey.

I wish to express my appreciation to many other people from the Middle East who were helpful in preparation of this study. I am indebted to several libraries in various parts of the world for their kind cooperation. In particular this applies to the librarians at the International Institute for Strategic Studies.

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Introduction

Since the publication of the MAUD report in Britain in April 1940 which envisaged military and civil application of nuclear power, modern science and technology have given mankind unprecendented power for good and destructive ends. Mankind crossed a fateful threshold when the first atomic device was exploded in 1945, but the consequences of this singular event for global security and conflict remain the subject of intense debate. Since the first detonation of a nuclear device, the world has lived with the spectre of nuclear proliferation. The spectre of a world populated by a large number of nuclear-armed states has haunted mankind since the death of the Baruch plan. There has been a wide concern about a nuclear holocaust triggered off by further proliferation. It is believed that nuclear proliferation is the most likely trigger of a future nuclear holocaust through escalation of a local conventional war in which, at some stage, the two Superpowers become involved.

> 'The escalation of a regional conflict to a general war is perhaps the most likely way in which a nuclear war would start; more likely than a direct nuclear attack by one Superpower on the other, although the danger of its starting by accident or miscalculation is ever present. A future conflict in, say, a Third World region ... might begin as a

> conventional war and then escalate to a limited nuclear war using the nuclear weapons of the local powers. This could in turn escalate to a general nuclear war involving the Superpowers. ... And that is why ... and nuclear weapon proliferation is so dangerous''[1]

Events during the 1973 Arab-Israeli War clearly brought home this danger. Thus the more nuclear weapons there are, the greater the chance of this type of involvement. This is particularly of great relevance if nuclear weapons spread to conflict prone regions, such as the Arab-Israeli conflict one. Nuclear proliferation is a crucial problem of our time. The question of the spread of nuclear arms in Third World countries raises several fundamental questions such as whether a proliferated world would be more or less stable than at the present.

In the 1960s several predictions were made about the possibility of a world in the 1970s with fifteen to twenty five nuclear weapon states. However, the spread of nuclear weapons has been contained for over 40 years. Today there are five declared nuclear weapons states, one state that has detonated a 'peaceful explosion' and one or two that are believed to be just below the explosion threshold. But despite this reasuring record, the threat of a nuclear conflict seems to rise at an alarming pace as an increasing

(1) Barnaby, F., The Nuclear Arms Race, Peace studies paper No. 4 (Bradford: University of Bradford School of Peace Studies, 1982), p.6.

number of countries in the Third World start or resume nuclear weapons programmes. Efforts by nuclear powers to check further proliferation have become inadequate with the spread of nuclear technology, which has given rise to both legitimate markets for nuclear materials and technologies, and facilities and 'illegal' markets where technologies and facilities are freely traded. So the relative success of containing proliferation over early decades of the nuclear era may be ending, the world today is entering a much more dangerous stage in which possession of nuclear weapons in conflict prone regions is not only a possibility but probable, and the threat of actual use of these weapons is growing. The Arab-Israeli conflict area is the most likely candidate. The conditions that checked the scope and pace of proliferation have eroded. For a number of countries, the technical barriers to acquisition of nuclear weapons are easier to overcome. The disincentives to going nuclear are becoming less compelling. Moreover, there are foreseeable international events that may even further loosen the checks on proliferation. The Indian explosion of a nuclear device in 1974, using plutonium derived from a research reactor supplied by Canada, and the oil crises of the 1970s led to a sudden surge of expectations about the importance of nuclear energy and eventually the wide spread of nuclear technology, including a new trading system outside the control of the nuclear weapons powers. The widespread of civilian nuclear programmes provides the essential expedient and in may occasions cover for gaining capabilities to make nuclear weapons.

Proliferation is sometimes conceived in simple terms of a single explosion. Indeed that concept is encompassed in the NPT. But it can also be conceptualized, in general, as a slower, ambiguous and of course dangerous process with many steps before and after a first nuclear test. One should study proliferation in considerable detail in order to explain and try to predict further proliferation. In the mid 1960s there were a number of assumptions being made about nuclear proliferation. The first assumption was that nuclear proliferation beyond the five nuclear weapons powers would be a chain reaction and very rapid. The sixth country going nuclear would start a chain 'nuclear domino' and the world would rapidly end up with twenty countries or more. The focus was on developing scenarios. The second assumption stressed the danger of regional wars which was actually a part of the chain reaction theory. The third assumption was concerned with the idea of nuclear weapons in the hands of 'irrational' leaders. This prospect for instability was the basis of the fear that proliferation in the Third World would be very dangerous. The fourth assumption was the notion that regional conflict would lead to Superpower involvement and Superpower confrontation. If regional nuclear powers were seen as proxies to the Superpowers and they introduced nuclear weapons into a conflict, then the Superpowers would be dragged in as well. However, in the late 1970s, a re-thinking about the problem occurred beginning with the examination of actual developments in nuclear proliferation rather than speculating about scenarios - the focus of attention in earlier thinking. The new thinking emphasized that one should talk less about the dangers and look more into the likelihood of proliferation and associated risks by deducing from the past to know about the future. Recent trends in nuclear proliferation, in fact, highlight the inadequacy of our present analytical tools of explaining and predicting proliferation.

Nuclear proliferation is widely anticipated between now and the end of the century, partly because of the spread of the capacity to acquire nuclear weapons and partly because the motives to do so in some cases appear strong. The questions remaining to be answered are what capabilities and intentions lead states to cross the nuclear threshold and develop nuclear weapons? What has been the experience of current proliferators? Will the current slow pattern of proliferation continue or is it likely to change? The focus of nuclear proliferation problems has been on strategies to halt, restrain and control further proliferation. Some argued for control of nuclear technology while others have called for conflict resolution and disarmament. Underlying these are explicit and implicit assumptions that the forces that drive the nuclear proliferation process and other factors may influence its course. Some place the responsibility for the spread of nuclear weapons on technological forces while others stress politico-military forces. Even within each group, there are substantial differences in opinion regarding the relative weights to assign to the various components. However, there has yet to be a systematic examination of the empirical validity of the assumptions underlying these strategies. Each school of thought is already convinced of the natural validity of its own view and the obvious shortcomings and single-mindedness of the views of the others. What is needed at least to establish the empirical validity of what are currently inadequate explanations of the proliferation process is a step backwards, ignoring the policy disputes and the undertaking of rigorous and systematic examinations of the assumptions and contending hypotheses that constitute contemporary thinking on nuclear proliferation. Furthermore, there is a direct link between proliferation of nuclear weapons and the spread of nuclear technology for peaceful purposes. The spread of nuclear technology must, therefore, be understood if the dimensions of the proliferation of nuclear weapons is to be fully appreciated.

At the heart of the concern over proliferation is the fear that the spread of nuclear weapons poses a grave and mounting threat to global security.

> 'Worries about stability in which nuclear weapons are spreading rapidly stem from the fact that a great many rivalries and hostilities exist among and within countries; the acquisition of nuclear weapons may drastically alter

> some relations among the powers and have wider repercussions short of war; and that it might increase the likelihood of wars and, more important, their destructiveness'[2]

First is the obvious danger that nuclear weapons might be used. As is frequently pointed out, the statistical probability of use increases with the spread of nuclear weapons, other things being equal. Second, new nuclear weapons states which could enter a nuclear arms race might be politically destabilizing, and that in itself increases the likelihood of an outbreak of war. Third, the expanding quantity and quality of weapons will increase the opportunities for theft, illicit sale, sabotage and nuclear terrorism. Finally, proliferation could undermine the current structure of the international political system as the acquisition of nuclear weapons alters the distribution of power. On the other hand, some contend that proliferation may have a comparatively benign impact on international politics by, in effect, removing resort to military force in conflict situations. Furthermore, those who view the possibility of a proliferated world with serious consequences may disagree on the precise dimensions of the nuclear threat of proliferation. However, a world with many nuclear-armed states would no doubt be fraught with uncertainty, one cannot be sure of the precise

(2) Wohlstetter, A. et al, Swords from Plowshares (Chicago: Chicago University Press, 1977), pp.127-8.

threshold beyond which the probability of war would increase. The literature on the relationship between nuclear proliferation and outbreak of war reflects this statistical ignorance. The ignorance is due to the fact that the events have never happened. With the lack of any form of patterned historical regularity to study, it becomes difficult to generalize about the causal connection between proliferation and the outbreak of war.

Over the years there has been increasing concern among countries regarding the introduction of nuclear weapons in the Middle East, arising particularly from reports that Israel may have developed a nuclear weapons capability and some Arab states may be going in that direction. This concern emerged in the context of a widespread preoccupation with political tension and the arms race in the Middle East, and of the desire to contain the nuclear arms race in general. A factor that has played a part in focusing attention on Israel's nuclear development has been the long-standing hostility in the Arab-Israeli conflict area which has four times erupted into full scale war. The long-standing hostility in the area has played a crucial part in Israeli and Arab military thinking, including their nuclear policies. The concern over the situation in the area has focused the attention on the military implications of the nuclear policies of the Middle Eastern countries as well as their past, present and possible future nuclear activities. The use of nuclear weapons in a Middle East war could cause untold destruction. A handful of nuclear weapons could destroy any country in the area as a national entity. Furthermore, one has to stress that many leaders of the conflict area may be willing to resort to war if that seems to advance their goals though the use of violence is counter-productive in the long run. It helps to make permanent enemies rather than friends.

The study deals with the changing nature of nuclear proliferation and the associated risks of war since the end of the Second World War in general, and the Arab-Israeli conflict in particular. The intent is to develop a better picture by using various schools of thought as analytical windows. A more precise understanding of how the process operates and the likelihood of risks of war in the Middle East should offer better guidance for predicting future nuclear proliferation. It aims at a realistic assessment of the development of nuclear programmes and policies in the Middle East and the risk of war involved in the nuclearization of the Arab-Israeli region to lay the foundations for building new, reliable hypotheses about its implications in the future, the first purpose is to discuss numerous schools of thought relating to the proliferation process. The second purpose is to deduce and assess the proliferation process in order to provide a data base for analysing strategic options. Strategic options themselves will not be examined. Rather, this study is more narrowly concerned with how the proliferation process is taking place and the risks involved so that future works may define possible strategic applications. The third purpose is to examine the risks and benefits that may be involved in a possible nuclearization of the Arab-Israeli conflict. The implications of this for regional and global security will also be examined because of their direct effect on the conflict.

The study attempts to identify areas of knowledge where a consensus can be said to exist and provide systematic surveys of factors aggravating proliferation and risks of war, and factors reducing them. Particular emphasis is also laid on those aspects which seem to be subject to dissenting assessment. By presenting different views put forward, the author of this study hopes to contribute to a further stimulation of discussion which deserves to be pursued on a large scale and by intense effort. It aims at a systematic examination of nuclear development and arguments of nuclearization and stability of the Arab-Israeli conflict in order to map various elements under consideration in a coherent and meaningful way. The analysis is based primarily on a critical examination of the literature available, the majority of which is Western and a survey carried out among nuclear strategy, nuclear proliferation and Middle East experts. The main rationale of the study is to collect, connect and integrate a widely dispersed multitude of perspectives and pieces of information. It is hoped that these efforts will lead to presentation of a comprehensive, systematic and hopefully exhaustive and coherent picture and evaluation of proliferation and risks of war in the Middle East.

While a number of published studies have given impressive descriptions of proliferation and associated risks in the Middle East, the main emphasis is on examination, understanding and assessment. It does not aim to define a political solution to the Arab-Israeli predicament, or to work out practical steps by which the Arabs and Israelis can reach a settlement. The author leaves to others those urgent tasks. It also aims at dispelling widespread and long held misconceptions about nuclearization and stability in the Middle East. It does not aim to issue moral or practical prescriptions.

The central theme of the study is how nuclear weapons could shape the future of the Arab-Israeli conflict. This question is a compelling one. The relationship between nuclearization and stability is an important facet of the general problems of nuclear proliferation. However, it is not a question which has received careful and systematic attention, rather it is discussed primarily or in terms of particular policy objectives and interests of Western countries or Israel. Yet systematic analysis of this relationship is warranted because of its direct relevance to security and peace in the Middle East in particular and the world at large. This study attempts to identify such a relationship in the Middle East.

In the interest of cohesion and brevity, several subject areas will be examined only in a limited context. For example, the historical background of the nuclear industry is restricted to the observation of trends with relevance to

the process of the development and emergence of the international nuclear industry. Several nuclear proliferation motives are noted only in brief in order to demonstrate the nature of the complexities entailed and the unpredictability of outcomes.
Finally, all the chapters in this study reflect a common belief that the problem of nuclear proliferation remains unsolved; that its underlying dynamics continue unabated, and it is vital to reawaken national sensitivities to proliferation issues.

The study is divided into seven chapters. It starts with an overall introduction to the scope and purpose of the study, The first chapter begins with an examination of the nature of nuclear proliferation. It discusses the meaning, the effects and attempts to control the nuclear proliferation process. This includes a survey of the literature on definition, forces, effects, risks and attempts to contain the nuclear proliferation process. The second chapter discusses, at great length, the process of nuclear proliferation in terms of a behavioural model of the international nuclear industry. The third chapter examines in great details and traces the development of nuclear programmes and policies of Israel, Egypt, Iraq, Libya, Syria, Saudi Arabia, Kuwait, United Arab Emirates, Morocco, Algeria, Tunisia and Jordan. The fourth chapter charts the motivations of Israel and some Arab states (Egypt, Iraq, Libya and Syria) to go nuclear, which are considered vital to taking the decision to manufacture nuclear weapons. The fifth chapter discusses the risks involved in nuclearization of the Arab-Israeli conflict, addressing the various risks inherent in the Middle East structure itself and risks originating outside the region, in particular the likely reactions of the Superpowers to a nuclear Middle East. An appraisal of the likelihood of these risks of nuclear war in the Middle East is also given. The sixth chapter describes the survey of experts on the likelihood of risks of war in a nuclear Middle East and analyses the results of the survey. And the seventh chapter addresses and attempts to foresee the implications of this nuclearization on the Arab-Israeli conflict. The process of nuclearization has far reaching implications that go beyond the confines of the Middle East. These could be formulated as generalized propositions applicable to similar small states and regions.

Finally, the literature of nuclear proliferation in the Middle East suffers from two limitations: the issues are approached from a Western-type rationality, perception and interest, which may differ considerably from that of the Middle East [3]; limited access to relevant material which is either in Arabic or Hebrew. The study attempts to balance these limitations because Western literature, which is based on fundamental assumptions of shared logic, values and

(3) See Gianfranco Poggi, The Development of the Modern State (Stanford: Stanford University Press 1978) pp.5-9; Dror, Y., 'Nuclear Weapons in the Third World Conflict' in The Future of Strategic Deterrence, Adelphi Paper, No 160, pp.96-103; His, Crazy States: A Counter Conventional Issue (Lexington, MA: Heath, 1971).

calculations, must be taken much less for granted. A few words may be appropriate as regards some of the empirical evidence presented herein. The evidence about nuclear policies, consisting of statements made by Middle Eastern leaders and commentators, deserves some word of caution. It is important to note that there is no single and coherent Arab strategy with respect to nuclear issues. The organization of the data assumes the various Arab states have a common denominator concerning the Arab-Israeli conflict and the Israeli nuclear threat. Also, it is assumed that the statements made by Israeli and Arab officials and commentators represent real perception. Some of the data presented here appears in the original form in Hebrew and Arabic. The author translated some of the quotations into English from Arabic. In a modest way it is hoped that the following chapters will contribute constructively to the debate on understanding the problem of proliferation and stability in the Middle East.

CHAPTER ONE

The Nature of Nuclear Proliferation

Definition of Proliferation

The most widely held view of nuclear proliferation is that of a continuous endeavour to produce and test an atomic bomb. The conventional indicator of nuclear proliferation is an initial nuclear test marking the birth of an additional member to the nuclear club. This definition was adopted by the Non-Proliferation Treaty of 1968 when distinguishing between nuclear weapons and non-nuclear weapons states. The case histories of all five recognized nuclear weapons powers reflect this view of the nuclear proliferation process. All the five powers pursued nuclear technology explicitly for the sole purpose of producing nuclear weapons. Hence, if this definition is used alone, the existing international non-proliferation efforts and agreements can be said to have been very successful in limiting proliferation. Since the Chinese test only one nuclear device, exploded by India in 1974, has been tested by a non-nuclear weapons state as defined by the Non-Proliferation Treaty.[1]

Such a state of affairs contradicts predictions made 20 years ago about an imminent multinuclear world called the

(1) Article IX, 3 of NPT states that «for the purpose of this treaty, a nuclear weapon state is one which has manufactured and exploded a nuclear weapon or other nuclear explosive device prior to 1st January 1967.»

"Nth Country Problem".[2] There are reasons to question whether nuclear test indicator will continue to be the most common form of proliferation in the future. In the period following the adoption of the NPT in 1968, changes have taken place in two significant sectors of the technical environment within which nuclear proliferation operates. The first focuses on the definition of proliferation and the nature of development processes for nuclear weapons. The second concerns the global spread of nuclear knowledge and materials.

Nuclear proliferation is a term that emerged in the late 1950s and early 1960s to distinguish, in part, between the indigenous production of nuclear weapons and their acquisition by transfer, then called 'diffusion'. This was the case at a time when it was predicted that many industrialized states, particularly in Western Europe, would rapidly acquire nuclear weapons if they could obtain supplies of uranium. This was because the required technology and scientific knowledge was within their grasp and also because power politics suggested that all states would wish to increase and enhance their national power by acquiring such weapons.[3] Moreover, The Oxford English Dictionary defines proliferation as 'increase rapidly in numbers, reproduce itself....' But the experience of

(2) See Wohlstetter, A., "Nuclear Sharing: NATO and the Nth Country", Foreign Affairs, April 1961, pp.355-87.

(3) Morgenthaw, H.J.Jr., Politics Among Nations (New York: Alfred A. Knopf, 1962), third edition, pp.4-15.

proliferation in the last 25 years was different from what had been expected and from the meaning of the term proliferation.

On the other hand, proliferation could be a meaningful concept in describing one specific scenario concerning the acquisition of nuclear weapons, in which the decision by one state to acquire nuclear weapons rapidly triggers off similar reactions by many others.[4] Waltz used the term 'spread' instead of proliferation. He objects to the term 'proliferation' on the ground that nuclear weapons have diffused too slowly to deserve that description. He argues that this spread will not make the bipolar world into a multipolar one and may reduce the chances of war.[5] John Simpson calls proliferation nuclear 'transmutation' or 'transformation' because it 'includes a new element that was not present in the 1960s.'[6] He argues that this element involves a shift from the existing pattern of behaviour in terms of harmful uses of facilities already existing within the state. However, the terms 'proliferation', 'spread', 'transmutation' or 'transformation' describe the technical aspects of the process of nuclear weapons acquisition but do not offer any guide to the motivations or decision-making

(4) Gummett, P., 'Academic Perspectives on the Non-Proliferation Problem', in John Simpson and Anthony G. McGrew (eds), The International Nuclear Non-Proliferation Systems: Challenges and Choices (London, Macmillan, 1984) pp.79-80.

(5) Waltz, K., 'The Spreads of Nuclear Weapons: More May Be Better' Adelphi Paper No. 171 (London: International Institute for Strategic Studies, 1981) p.1.

(6) Simpson, J., 'The Nuclear Non-Proliferation Problem, Diagnosis and Treatment', in Simpson and McGrew The International Nuclear Non-Proliferation Systems, op.cit., p.175.

processes involved in the decisions of states to begin to produce nuclear weapons.

Nevertheless this very simple idea of what constitutes nuclear proliferation remains acceptable for a number of reasons. First, no military organization is likely to place much confidence in weapons unless they have been shown to work. This implies that those given operational responsibility will insist on a test. Second, such a definition offers the prospects of reasonably reliable verification of nuclear weapons status despite the belief that satellite sensors and seismography can effectively identify all nuclear explosions, particularly for states involved in the negotiations for a Comprehensive Test Ban Treaty.[7] Third, any other definition of nuclear proliferation is likely to throw doubt on the non-nuclear status of certain states such as Israel and South Africa. Such a definition does not accommodate the significant changes that have taken place since 1968 in the areas relating to proliferation, namely: the diffusion of knowledge and technology related to the design and development of nuclear weapons, the growth and competitive nature of the civil nuclear industry and the emergence of a widening gap in some states between their statements of political intent and their potential for nuclear weapons development and production.[8] In other words, options are

(7) See Halstead, T., 'Why No End to Nuclear Testing?' Survival, ed.19, No 2, Mar/April 1977, pp.60-6; Westervelt, D.D., 'Candour, Compromise and the Comprehensive Test Ban', Strategic Review, Vol 5, No 4, Fall 1977, pp.33-44.

(8) Gummett, 'Academic Perspectives on the Non-Proliferation Problem', op. cit., p.81.

growing faster than weapons. 'Going nuclear' is no longer a precise term and deliberate use of ambiguity becomes part of nuclear proliferation politics.[9]

What is a nuclear weapon programme? A nuclear weapon programme necessarily encompasses the development of several related though independent capabilities such as warheads, delivery vehicles, command and control stations, strategic doctrine and assured second strike systems. There is no consensus about what a nuclear weapon programme is to be and this has led to different forecasts about nuclear proliferation. But there are certain indicators which enable one to evaluate a nuclear weapon programme. First, there is the element of how much is enough. Historically, the size and scope of nuclear weapons of existing nuclear weapon states has varied significantly and their experience does not provide a reliable base. The notion of a minimum threshold for the size of a nuclear weapon programme predicated on the assumption that, given the desire to go nuclear, any prospective Nth country would either develop a programme of, at least, some minimum size or otherwise the programme would not have been initiated.[10] Before the adoption of the NPT safeguards, the International Atomic Energy Agency exempted from inspection 'any reactor of less

(9) Kapur, Ashok., International Nuclear Proliferation: Multilateral Diplomacy and Regional Aspects, (New York: Praeger, 1979) Chap.2; Dunn, L.A. and W.H. Overholt, 'The Next Phase in Nuclear Proliferation Research', Orbis, Vol 20, No 2, Summer 1976, p.499.

(10) Meyer, Stephen M., The Dynamics of Nuclear Proliferation, (Chicago:University of Chicago Press, 1984) p.23.

than 3MW up to two such reactors per country.'[11] Similarly the US Congress enacted PL 93-485 of October 1974 reserving the right of full Congressional review of any US reactor sales with output greater than 5 MW.[12] In neither case did they consider the proliferation related threat of reactors of five to six MW to be substantial.
Such reactors are in theory capable of producing enough plutonium to make one 15 kiloton bomb every four to five years. Such a rate may satisfy the objective of 'weapon of last resort'.

A number of previous studies of nuclear proliferation have tended to settle on a minimum production threshold of some higher level (one 15 kiloton a year).[13] One can argue that the choice of a bomb a year is based on symbolic and psychological factors rather than on economic or military analysis. Olgard argues that

> «the danger of proliferation today is the emergence of what might be called the primitive nuclear powers with a limited stock of untested nuclear

(11) See INFCIRC/66/Rev 2 in Sanders, Benjamin., Safeguards Against Nuclear Proliferation, (Cambridge, M.A.: MIT Press, 1975) p.98.

(12) Barber, Richard S., Associates Inco, LDC Nuclear Power Prospects: 1975-1990: Commercial, Economic and Security Implications, (Washington, D.C.: Barber Associates, 1975), IV - 53.

(13) Ibid; Beaton, L. and John Maddox, The Spread of Nuclear Weapons (New York: Praeger, 1962) p.173; Office of Technology Assessment, Nuclear Proliferation and Safeguards, (Washington, D.C.: National Technical Information Service, 1977) p.142.

weapons».[14]

Similarly, Quester elaborated this point in a more subtle form.

> «One must be careful to consider thoughts about physical realities as well as the realities themselves. Even if physical developments pose no real problem, the fears they bring can take on a life of their own.»[15]

This led to the conclusion by Barber Associates that a minimum size of primitive weapons could lead to unprecedented consequences.

> «Even a minimum size, inefficient and unreliable 'bomb' could result in a local disaster and an international crisis of immense proportions.»[16]

This focus on size led to concentration on the 'diversion option' using or diverting spent reactor fuel from a power reactor and reprocessing it to make plutonium. So, by using safeguards techniques, one can ensure accountability within a few percentage of total inventory.[17]

(14) Olgard, P.L., 'The Soviet-American Draft Non-Proliferation: Will It Work?' in Frank.Barnaby (ed).Preventing the Spread of Nuclear Weapons (New York: Humanities Press, 1969) p.219.

(15) Quester, George., The Politics of Nuclear Proliferation (Baltimore: Johns Hopkins University Press, 1973) p.210.

(16) Barber Associates, LDC Nuclear Power Prospects, op. cit., V-5.

(17) Willrich, Mason and Taylor, T.B., Nuclear Theft: Risks and Safeguards (Cambridge, M.A.: Ballinger, 1974) Chap.3.

Then comes the question of testing which stems from both technical and decision making considerations. If one argues that an operational test is required to attain some technical and political confidence in development and manufacture of nuclear weapons; then testing becomes an inherent part of the programme. So inability to conduct tests translates into inability to undertake a nuclear weapons programme.[18] Beaton took the argument a step further by focusing on an unavailability of areas where the test might be carried out.

> «Not all nations are provided with deserts within their boundaries. Uninhabited oceanic islands are not always accessible .... Where would a Swiss bomb or a German bomb be tested? In these and other cases the need to actually test atomic weapons would be a serious obstacle in the attainment of nuclear power.»[19]

The notion that testing is an essential technical element of a nuclear weapons programme was one of the basic arguments for a Comprehensive Test Ban Treaty in the late 1950s and early 1960s.[20] More recently international pressure on

(18) Hohenemser, Christoph., 'The Nth Country Problem Today', in Seymour, Nelman (ed.) Disarmament Today: Its Politics and Economics (Boston: American Academy of Arts and Sciences, 1962) p.269; Beaton,L., Must the Bombs Spread (Baltimore: Penguin, 1966) pp.38-39.

(19) Beaton and Maddox, The Spread of Nuclear Weapons, op.cit. p.20.

(20) See Jacobson, Harold and Stein, Eric, Diplomats, Scientists and Politicians: US and Nuclear Test Ban Negotiations (An Arbor: University of Mitchigan Press, 1966)

South Africa to halt an imminent test in 1977 was equated with preventing South Africa from embarking on an atomic weapons programme.[21]

The question remains whether there is a technical need for a prospective Nth country to test a proto-nuclear bomb? Or whether an inability or unwillingness to test a nuclear explosive device mean that a nation cannot pursue a nuclear weapons programme?

That question can be addressed in the following manner: the consensus is that if some Nth country adopts one of the tried and true designs, there would be few compelling reasons not to expect its first bomb to work.[22] The USA in fact, did employ an untested uranium bomb against Japan. It is hard to imagine that dedicated scientists and engineers could not devise a moderate confidence nuclear weapon design, taking into account that all the necessary physics is set out in the open literature[23] and that a high explosive detonation system can be tested without fissile material.

(21) John F.Burns, 'South Africa Stirs New A-Arms Flurry' New York Times, 31 August, 1977.

(22) Karmish, Arnold., The Peaceful Atom in Foreign Policy (New York: Harper and Row, 1963) p.23; Wentz, Walter., Nuclear Proliferation (Washington, D.C.: Public Affairs Press, 1968) pp.23-24; Quester, 'The Politics of Nuclear Proliferation', op. cit., p.39; Brennan, Donald., 'A Comprehensive Test Ban: Everybody or Nobody', International Security,
Vol 1,No 1, Summer 1976, p.108.

(23) Olgard, 'The Soviet-American Draft Non-Proliferation Treaty', op.cit. pp.219-220;
UN , Effect of the Possible Use of Nuclear Weapons and the Security and Economic Implications for States of the Acquisition and Further Development of these Weapons (New York: UN,1968) p.58.

Over the last decade details have been published in the USA on the nature of atomic and thermo-nuclear weapons designs.[24] Not only has the key design concept for a hydrogen weapon been uduly publicized but both the relatively low level of costs and type of activity required for the design and production of asecond or third generation atomic explosive device have become apparent.[25] This encouraged experimental work on the development of suitable conventional explosives and detonation systems which can be tested using telemetry techniques, without the absolute need for a full-scale test.[26] Moreover, today's would-be proliferators will not necessarily duplicate the pattern of development activities undertaken by the existing nuclear weapons states prior to their first nuclear test. Thus it may prove difficult to determine with certainty whether specific activities are aimed at developing nuclear weapons.[27]

Hence a simple but effective atomic weapon could be manufactured without recourse to full-scale nuclear testing:

(24) Beckett, B., Weapons of Tomorrow (London: Arbis, 1982) pp.11-23.

(25) Simpson, J., The Independent Nuclear State: The United States, Britain and the Military Atom (London: Macmillan, 1983) pp.72-4, 43-4.

(26) Department of Energy Authorisation, Legislation (National Security Programs) for Fiscal Year 1982, Hearings before the Procurement and Military Nuclear System Subcommittee of the Committee of Armed Services, U.S. House of Representatives, HR 2969, 94th Congress, 1st Session (Washington, D.C.: Government Printing Office, 1981) p.214.

(27) Ibid, Simulation techniques can be used today with high degree of reliability to test nuclear explosive device without recourse to full-scale nuclear test and to avoid adverse political consequences of a public explosion. See New York Times, 15 March, 1976.

only in the case of an H-weapon could such testing remain essential. While the criterion of an explosion of a nuclear device is still an indicator of intent to develop nuclear weapons of all types. The absence of an explosion of a nuclear device is no longer totally convincing of a non-nuclear weapon status (case of Israel and South Africa). Testing is not a technical necessity. Testing has also been raised in relation to politico-military considerations. It has been argued that nuclear weapons provide military security through deterrence. Deterrence requires communication of a threat to the target party and testing helps in achieving this. However, deterrent effects can be achieved in other ways. Israel has obtained nuclear mileage[28] through its ambiguous status propped up by inconclusive reports. Moreover, testing for small nuclear powers may compel adversaries to go nuclear[29] and could lead to adverse international pressures and condemnation.

Thirdly, in the 1950s and early 1960s there were extensive discussions on the relative significance of nuclear weapons stockpile lacking an advanced means of delivery systems. It was argued that the military and political value of nuclear weapons would be dubious. However, the reaction of the USA to the first Soviet test in 1949 was that the Soviet would soon attempt to acquire the

(28) See Lefever,E., Nuclear Arms in the Third World (Washington, D.C.: Brookings Institution, 1979) pp.61-71, 74-77; Harkavi, R.E., 'Pariah States and Nuclear Proliferation', International Organisation, Vol 35, No 1, 1981, pp.135-63.

(29) Wentz, 'Nuclear Proliferation', op. cit., pp.34-41.

required delivery vehicles. Moreover, most previous studies took for granted that the targets of the Nth country nuclear forces would include either the Superpowers or their well-armed allies. But a broader perspective notes that

> «The principal sufferers from nuclear spread would be the countries and the people in those areas in which the infection takes place.»[30]

The focus is on conflict between less well endowed countries which Betts calls pygmies.[31] In a regional context even a comparatively primitive nuclear force of several fission bombs and aircraft may acquire considerable military and political influence. Commercial aircraft, for example, have dual capability and this was demonstrated by Israel during the 1973 war. US war plans, too, include using commercial aircraft. Civilian aircraft which can transport armoured vehicles and tanks can also carry nuclear weapons, such as Boeing 707. Today many small countries can purchase advanced weapons systems either from their allies or friendly countries and even from the international market. It is hard to find any country in a position to contemplate nuclear weapons production that lacks a regionally effective delivery capability.[32] Moreover, the less developed

(30) Schlesinger, James R., 'Nuclear Spread: the Setting of the Problem' in Stephen B. Kertesz, Nuclear Non-Proliferation in a World of Nuclear Powers (Notre Dame: University of Notre Dame Press, 1967) pp.11-12.

(31) Betts, Richard., 'Paranoids, Pygmies, Pariahs and Non-Proliferation', Foreign Policy, No 26, Spring 1977, pp.157-83.

(32) The Military Balance 1977/78 (London: International Institute for Strategic Studies, 1977) p.108.

countries have the advantage of a much cheaper unsophisticated defence environment.[33] There are, indeed, less conventional ways to deliver nuclear weapons to their targets, especially in a regional setting.

> «It is a myth that for any country to attack any other country requires anything like the sophisticated long range missiles that we have. There have been rather detailed (classical) studies of which the overall results would lead one to a conviction that any country in the world could attack any other country by means other than large bombers or missiles using clandestine infiltration operations of various kinds.»[34]

Moreover, it was argued that during the initial stage of the development of nuclear weapons, 'how to get the bomb from here to there' is overshadowed by 'how to get the bomb.'[35] Thus the conclusion is that the American-Soviet model should be the exception rather than the rule.

(33) Kaul, Pari., India's Nuclear Spin off (Allahabad, India: Chankya, 1974) p.4.

(34) U.S. House of Representatives, Nuclear Proliferation: Future U.S Foreign Policy Implications, Hearings before the Sub-committee on International Security and Scientific Affairs of the Committee on International Relations, 94th Congress, 1st Session, 21, 23, 28, 30 October and 4 and 5 November 1975 (Washington, D.C.: Government Printing Office, 1975) p.84.

(35) Hohenemser, 'The Nth Country Problem Today', op.cit., pp 255-56; U.S. Senate, Non-Proliferation Treaty, Hearing before the Committee on Foreign Relations, 90th Congress, 2nd session, 10-12 and 17 July 1969 (Washington, D.C.: Government Printing Office 1969) pp.30-31.

Fourthly, peaceful nuclear explosives and nuclear weapons are indistinguishable from a technical point of view. Fred Ikle argues that

> «We do not now have a way of discriminating between tests of a nuclear device of a country that is just beginning a test program, discriminating whether it is for peaceful purposes or military purposes. A country that is just beginning a program of testing nuclear explosives will inevitably learn something about nuclear explosives and such an explosive is a very destructive device that could be used for military purposes.»[36]

Furthermore, the relation between the Threshold Test Ban Treaty and peaceful nuclear explosives confirms this point.[37] Therefore, a latent capacity to manufacture peaceful nuclear explosives is a latent capacity to manufacture nuclear weapons. The NPT definition of a nuclear weapon state is inadequate in the case of India which detonated a peaceful nuclear device but did not follow it up with either a production programme for atomic weapons or any further test explosions.

(36) US House of Representatives, Nuclear Proliferation: Future U.S. Foreign Policy Implications, op. cit. pp.225-26.

(37) US Arms Control and Disarmaments Agency, Arms Control and Disarmament Agreements (Washington, D.C.: U.S. Arms Control and Disarmament Agency, 1977) pp.155-80.

Finally, a country is said to possess a latent capacity to produce nuclear weapons when there is a reasonable confidence that such a programme is feasible. It needs to meet a range of resource demands with a finite resource base such as uranium together with scientific and technological expertise and an industrial base.[38] Otherwise producing nuclear weapons would be impossible. The country must possess nuclear infrastructuress such as a plutonium production reactor before embarking on a nuclear weapons programme.[39] The ability to design a nuclear weapon and to assemble all its non-nuclear components is irrelevant if the country in question is unable to obtain enriched uranium or plutonium.

The Spread of Nuclear Technology and Proliferation

In the early 1960s it was accepted that a freeze on fissile material production by the nuclear weapons states was incapable of being effectively verified once the first generation of nuclear power plants was commissioned. The British, French and Soviet power reactors of this generation were direct derivatives of designs used for weapons-grade plutonium production. This did not prevent attempts both to expand the number of nuclear power reactors on a global basis, and to set up an international system of safeguards to ensure that material from civil nuclear power reactors

(38) Office of Technology Assessment, Nuclear Proliferation and Safeguards, op. cit., pp.174-81.

(39) Wohlstetter, A., et al., Swords from Plowshares (Chicago: Chicago University Press, 1979) pp.42-6.

was not being used for weapons purposes. Thus, Plutonium production capacity increased dramatically fivefold between 1960 and 1965 and 16 times between 1965 and 1970, then 72 times in 1975, 156 times in 1980 and an estimated 289 times for 1985.[40] This diffusion of reactor technology and the global scale of fissile material production that it implies, appears to represent a quantum leap in the ease with which certain non-nuclear weapons states could gain access to nuclear weapons materials. Almost all this fissile material is still in reactors or stored in used fuel, mainly in countries within NATO alliance and the WARSAW pact organization. However, there are other countries outside NATO and WARSAW organizations such as Argentine, Brazil, Finland, India, Japan, South Korea, Pakistan, South Africa, Sweden, Switzerland, Taiwan and Yugoslavia and many other states which have small experimental reactors[41] and are gaining access to this fissile material. Two thirds of reactor capacity remains within the nuclear weapons states and enrichment and reprocessing capacity is largely confined to them.[42]

But, what changed significantly over the last two

<40> See Nuclear Power Reactors in the World, IAEA reference data series no.2 (Vienna: IAEA, 1982) p.8.

<41> Ibid pp.13-21; Wohlstetter, et al, Swords from Plowshares, op. cit., pp.203-10.

<42> Ibid p.213; Barnaby, C.F.,'How States Can Go Nuclear', Annals of the Academy of Political and Social Sciences, Vol 430, Mar.1977, pp.29-43; Keeny, Spurgeon M., et al, Nuclear Power: Issues and Choices (Cambridge, M.A.: Ballinger, 1977) pp.367-69. 278; SIPRI, World Armament and Disarmament Yearbook 1977 (Cambridge, M.A.: MIT Press, 1977) pp.6-14; Willrich and Taylor, Nuclear Theft, op.cit., pp.59-76.

decades is that certain states 'break out' to nuclear weapons status, especially their ability to acquire nuclear stockpile of operational weapons, will be easier and more rapid if they possess a large nuclear power reactor which has the potential to produce substantial amount of weapons-grade plutonium in a short period of time. A reprocessing plant would be required to separate plutonium from spent fuel and this would represent a major barrier to proliferation. But, what prevents many states from acquiring weapons-grade plutonium may be found in their international commitments;[43] inability to gain access to certain specific technologies and, perhaps, their calculation that it is not in their best interest to produce nuclear weapons. Then it is reasonable to argue that the political climate is the key limitation upon nuclear proliferation rather than a state's technical inability to produce nuclear weapons.

However, the shift of the centre of technology from the USA towards less politically active states such as Japan and finally the possible emergence of an uncontrolled Third World nuclear trading system could make efforts to prevent proliferation more difficult. In the long run, the greatest cause of concern in maintaining a system of physical prevention of nuclear weapons proliferation lies in the limited scope of the non-proliferation and safeguards regime, and the shift of gravity of the international nuclear industry away from the USA. The first of these

(43) Relevant international commitments are; Partial Test Ban Treaty, Treaty of Tlatelolco, NPT, IAEA safeguards and suppliers' agreements.

issues was highlighted by the destruction of the Iraqi nuclear reactor by Israeli planes in 1981.[44] The Iraqi reactor would have operated under the provisions of an IAEA safeguards agreement, but Israel, by its action, indicated that it perceived these provisions were insufficient guarantee that it would not be used for military purposes. Secondly, it has already become clear that the near monopoly status possessed by the USA in the late 1960s and early 1970s in nuclear fuel and reactor technology has been substantially weakened and that the USA cannot hope to manage global proliferation problems in the 1980s and the 1990s by introducing domestic legislation as it attempted to do in 1976-1978.[45] In the mid 1970s the USA's hegemonic position in global nuclear industry was under threat from France and West Germany who had become the major competitors to the USA by providing package sales full fuel cycle services to countries such as Brazil, South Korea, Pakistan and Iraq.[46]

There is considerable evidence to suggest that over the next decade the global nuclear industry will undergo major restructure as France, West Germany and possibly Japan, become the dominant suppliers.[47] The USA would become a

(44) Feldman, Shai., 'The bombing of Osiraq revisited', International Security, Vol 7, No 2, Fall 1982, p.115.

(45) Simpson, John., 'Global Non-Proliferation Policies: Retrospect and Prospect', Review of International Studies, Vol 8, No 2, April 1982, pp.77-82.

(46) Dunn, L.A., Controlling the Bomb (New Haven, Conn.: Yale University Press, 1982) Chap.2.

(47) Walker, W. and Lonnroth, M., Nuclear Power Struggles: Industrial Competition and Proliferation Control (London: Allen and Unwin, 1983) pp.78-9.

junior partner. So, for the first time in the proliferation system a considerable gap may arise between its commercial structure resting upon European-Japanese hegemony and its political structure based on the Superpowers and in particular US hegemony. Moreover, with the exception of France, the leading suppliers will be non-nuclear weapons states.[48] This creates considerable difficulties regarding regulations of the nuclear trade and maintaining and strengthening non-proliferation safeguards. Furthermore, over the last few years, the nuclear industry has witnessed the rise of a separate nuclear trading system outside the existing non-proliferation control. These trading links, which are predominantly Third World, consist of an increasing number of bilateral agreements for nuclear cooperation, exchange of information and materials transfer.[49] Some of these Third World countries are not party to the NPT. There is the problem often referred to as 'nuclear grey and black marketing' which is difficult to trace and substantiate. There is also evidence to suggest the existence of covert nuclear deals involving Third World countries and Western suppliers.[50]

The growth of the civil nuclear programmes worldwide further accelerated the break from the past. Today more

(48) Ibid.

(49) Ibid.

(50) Dunn, Controlling the Bomb, op. cit., pp. 37-41; Dorian, T.F. and Spector, L.S., 'Covert Nuclear Trade and International Non-Proliferation System', Journal of International Affairs, Vol 5, 1981, pp. 29-68.

than 50 countries have research reactors in operation compared with only four in 1955 and more than 30 countries have nuclear power reactors in operation compared with only six in the 1950s. Slowly but surely countries round the globe began to develop substantial nuclear infrastructures. This creeping evolution raised a number of questions about the meaning of proliferation and predictions of the likely proliferators.[51] Nuclear proliferation could no longer be viewed as well as defined as a straight jump to nuclear weapons status. Instead, it had to be seen as a developmental process reflecting the growth of latent capacity round the globe. Though no non-nuclear weapons state had detonated nuclear explosive devices after 1964, with the exception of India's peaceful test in 1974, that did not mean that nuclear proliferation had not advanced. On the contrary, it was widely perceived as moving forward in the form of ever developing latent capacities encompassing substantial nuclear infrastructures.

The gradual spread of nuclear technology and material, especially the proliferation of sensitive nuclear fuel cycle facilities, constitutes the proliferation of capabilities to develop nuclear weapons as described by the former director of the Atomic Energy Commission in Israel, 'there are no two atomic energies.'[52] So, a non-nuclear weapon state by

(51) Dunn, L.A., and Kahn, Herman., Trends in Nuclear Proliferation: 1975-1995 (Croton-on-Hudson, N.Y.; Hudson Institute, 1976); Wohlstetter et al, Swords from Plowshares, op.cit., chap.1.

(52) Professor A.D. Bergman, quoted in Bader, William B., The United States and the Spread of Nuclear Weapons (New York; Pegasus, 1968) p.92.

acquiring a nuclear power industry moves along what Quester has called 'the innocent progress toward the bomb' curve, in which the time lag between innocent progress in the development of a nuclear power industry and a crash programme to produce nuclear weapons shrinks to the very short time required for additional efforts to fabricate, at least, crude nuclear weapons.[53] Schlesinger argued, in this respect, that an innocent move toward the bomb is a meaningful concept.

> «Proliferation is really unlike pregnancy ... being a little bit proliferated may be a meaningful concept while being a little pregnant is not.»[54]

Quester used the term quasi-proliferation to describe the countries which are capable of going nuclear and which have political reasons for doing so. Beaton argued that 'we are dealing with a definable group of countries.'[55] This group of quasi-proliferators includes at least 30 - 40 countries with high political incentives.[56] This definition, however, excludes other small powers unless an international 'grey market' were to emerge in nuclear explosive devices which could make nuclear weapons easily available to such states.[57]

<53> Quester, George., 'Some Conceptual problems in Nuclear Proliferation', American Political Science Review vol. 66, No. 22, June 1972, p. 491.

<54> Schelsinger, James R., 'The Strategic Consecquences of Nuclear Proliferation' in Rakon, L.M. (ed), Arms Control and Foreign Policy in the Nuclear Age (New York: Oxford University Press, 1972) pp. 360-61.

<55> Beaton, 'Must the Bomb Spread', op. cit., p.128

<56> Walske, C., 'Nuclear Electric Power and Proliferation of Nuclear Weapon States', International Security, 1, 3, Winter 1976/77, pp.94-106; Epstein, W., The Last Chance, (New York: Free Press, 1976) pp.335-6; Schelling, T.C., 'Who Will Have the Bomb?' International Security, 1, 1, Summer 1976, pp.77-91.

<57> Dunn, L.A., 'Nuclear Grey Marketeering', International Security, 1, 3, Winter 1976/77, pp.107-118.

There are two contending views about this link between civil nuclear technology and development of nuclear weapons production. One view argues that producing nuclear material from peaceful energy programmes does not result in automatic weapon production. In more than thirty years, only a very few countries acquired nuclear weapons out of over 100 which signed the NPT.[58] The other view is that nuclear energy programmes, however peaceful, create expertise that brings with it the temptation to produce nuclear weapons which would otherwise not exist or be attainable.

> «The technologists of the recipient states inevitably acquire at first hand some of the skills required for the operation of an independent reactor system for manufacturing military plutonium.»[59]

Falk explains that 'the link between civilian nuclear proliferation and the proliferation of nuclear weapons has now passed into the conventional wisdom.'[60] Baker argued that nuclear energy programmes may be important in

(58) Hill, John., 'The Driving Forces of Proliferation', Arms Control, Vol 1, No 1, 1980, p.54.

(59) Maddox, John., Prospects for Nuclear Proliferation, Adelphi Paper no.113 (London: International Institute for Strategic Studies, 1975) p.11; See Simpson, John., 'Power, Plutonium and Politics: Nuclear Arms Production and the British Civil Nuclear Industry' Armament, Disarmament Information Unit (ADIU) Report, Vol 4, No 3, May/June 1982, pp.7-13.

(60) Falk, R.A., Nuclear Policy and World Order: Why Denuclearization (New York: Institute for World Order, 1978) p.19; Dure, S. and Edwards, R., Fueling the Nuclear Arms Race: The Link between Nuclear Power and Nuclear Weapons (London: Pluto, 1982) p.103.

justifying the costs of a weapon programme.[61] Such a programme is far easier to justify if it can be presented as a low overhead spin-off from an economical domestic nuclear energy programme, since it makes military research possible. Some scholars proffer an elaborate argument to explain this point.

> «Arguing that reactors have little to do with bombs is like arguing that fish hooks do not cause the catching of fish, since this can also involve rods, reels and anglers.»[62].

Furthermore, the emergence of both new enrichment technologies and the advocacy of the use of plutonium for civil purposes in the 1970s, centrifuge and laser enrichment technology has reduced the scale, cost and the prominence of the uranium enrichment facilities. It has also expanded the potential for a non-nuclear weapons state to acquire an enrichment capability and so increase the proliferation risks.[63] Dunn argues that the technological momentum of the civil nuclear industry, seen in these developments, had virtually abolished the more obvious technical thresholds

(61) Baker, Stephen J., 'The International Political Economy of Proliferation' in Carlton, D., and Schaerf, C., (ed) Arms Control and Technological Innovation (London: Croom Helm, 1977) p. 97.

(62) Lovins, Amory B., R. Hunter Lovins and R. Leonard Ross, 'Nuclear Power and Nuclear Bombs', Foreign Affairs, Summer 1980, p. 1147.

(63) Glackin, S.S., 'The Dangers Dript in Uranium Enrichment', Bulletin of Atomic Scientists, February 1976, pp.22-9,; Brenner, M.J., Nuclear Power and Non-Proliferation (Cambridge: Cambridge University Press, 1981) Chap.3.

between civil and military use of nuclear technology.[64] It can be argued that any country with nuclear power reactors is not only accumulating plutonium which could be used in production of nuclear weapons but also producing scientists and engineers with nuclear skills who could be employed in a nuclear weapons programme. Frank Barnaby concludes that

> «The horrible truth is that as civil nuclear power programmes spread world wide, more and more countries are acquiring the expertise to construct efficient nuclear weapons and the capability to produce fissile materials, particularly plutonium, for such weapons.»[65]

This leads to the conclusion that an increasing number of countries, especially in the Third World, could eventually fabricate nuclear weapons rapidly once they took the political decision to do so.

Attempts to Control the Spread of Nuclear Weapons

Several attempts have been made to control the spread of nuclear weapons since the beginning of the nuclear age.

<64> Dunn, Controlling the Bomb, op. cit., chap.2; See also Wohlstetter et al, Swords from Plowshares, op. cit., chap.3; The distinction between 'weapons-grade' and 'reactor-grade' plutonium is considered no longer valid in terms of proliferation risk (see Department of Energy Authorisation Legislation for Fiscal Year 1982, op. cit., p.170)

<65> Barnaby, Frank C., 'Forward' in Thijs de la Court; Deborah. Pick, and Daniel. Nordquist, The Nuclear Fix (Amsterdam: ELVAS, 1982) P IV.

The first attempt made to deal with the problem of proliferation involved denial of nuclear material or technology to any country other than those which had developed the first nuclear weapons. In 1945 the USA, Britain and Canada agreed to maintain the secrecy of the technology and buy up between them all available stock of uranium. The USA went further by withholding access to nuclear information from its two partners. The USA presented the Baruch plan to the United Nations Atomic Commission in 1946 for the establishment of an international body that would own all nuclear fuel, carry out all nuclear research and operate all nuclear reactors and their associated nuclear fuel plants. These attempts did not succeed because the Soviet Union exploded its first atomic bomb in 1949, followed by Britain in 1952, and France decided to build reactors fuelled with uranium produced in France to make plutonium.

A second attempt was made in December 1953 when US President Eisenhower proposed to the UN General Assembly the creation of an International Atomic Energy Agency to make available the use of nuclear technology for peaceful purposes. The USA also amended its existing restrictive legislation in 1954 and authorized the release to other countries of US technology and material for peaceful uses.

In August 1955, the first UN Conference on the peaceful use of atomic energy was held which provided a forum for open international discussions. This led, eventually, to the preparation of the stature of the International Atomic

Energy Agency in 1956 and the creation of the agency in 1957. Five years later, the IAEA safeguards came into operation to replace bilateral safeguards. During this period nuclear research reactors were sold to many developed and developing countries including India and Israel. Also during this period France carried out its first atomic explosion in 1960 and four years later was followed by China. However, in 1965 the UN Commission on Disarmament asked the Eighteen Nation Disarmament Committee to consider the preparation of a non-proliferation treaty. This led, after long discussions and negotiations between the Superpowers, to the acceptance of the NPT in July 1968. The NPT was preceded by the adoption of the treaty of Tlatelolco in February 1967 by several Latin American countries. Thus, with the emergence and the adoption of the NPT by 1970, the main political barrier against nuclear proliferation, the principal control of the spread of nuclear weapons, had been made possible. During this period 1945-74, there was a consensus on the control of the spread of nuclear weapons among nuclear weapons states and nuclear suppliers, especially when the USA's hegemonic position over nuclear technology and material trade and export was in no doubt.[66]

By the mid 1970s, the consensus began to break down. Distrust and disagreements grew among the major nuclear

(66) Goldschmidt, B., and Krayzer, M., Peaceful Nuclear Relations: A Study of the Creation and Erosion of Confidence (New York: Rockefeller Foundation, The Royal Institute of International Affairs, 1978).

suppliers themselves and between suppliers and customer countries and between proponents and opponents of the nuclear power industry. This situation was more complicated when India exploded a nuclear device in 1974 using material supplied from a Canadian research reactor which led to deep concern over further proliferation. In 1974, also, the US Atomic Energy Commission announced that it would accept no new contracts for enrichment of uranium. This step had a profound impact on nuclear relationships between major Western suppliers. West European governments began to look for other supply sources in order to secure supplies of enriched uranium for their nuclear programmes. Some looked to the Soviet Union or the creation of their own fuel industrial base in the form of Eurochemic and United reprocessors in the field of reprocessing and Urenco and Eurodif in the field of enrichment. Furthermore, growing interest in nuclear power, following the Oil Crisis of 1973, at home and abroad led to the expansion of demand for nuclear reactors production. Fierce competition between major Western suppliers in export markets drove some of them to offer package deals to outbid their competitors. France offered to supply Pakistan and South Korea reprocessing facilities and West Germany agreed to sell Brazil a complete fuel cycle including enrichment and reprocessing facilities.

This state of affairs and the deep concern over disagreements between major nuclear suppliers brought to light the search for new policies and procedures to deal with the changing nuclear proliferation problem, in particular during the period of 1974 - 78. The first move was made in 1974 when representatives of the USA, Soviet Union, Britain, France, West Germany, Japan and Canada met in London to establish a uniform code of nuclear export behaviour. They formed the nuclear suppliers group, better known as 'the London Club' and agreed on guidelines and the triggers list. These efforts led France to cancel sales of reprocessing facilities to Pakistan and South Korea. France and West Germany agreed not to export reprocessing and enrichment units in the future. Eight other countries joined the London Club. Unfortunately tension grew again in 1978 between nuclear suppliers countries which prevented the effective continuation of the London Club. Following the collapse of the London Club, the so-called 'war of plutonium' against the development of fast breeder reactors which was declared by US President Ford in October 1976 and followed by President Carter in two policy statements of 1977, led to the emergence of the US Nuclear Non-Proliferation Act of 1978 and suspension of the US reprocessing and fast breeder reactor programmes. But this new US non-proliferation policy is argued to have been inspired by commercial motives[67] when the USA initiated the London Club because of its failure to lead commercial reprocessing operations; meanwhile France and Britain emerged as the major commercial operators. Britain, France and the Soviet Union began operating fast breeder prototype

(67) Lellouche, P., 'Breaking the Rules Without Quite Stopping the Bomb: European Views', International Organisation, Vol 35, No 1, Winter 1981, pp.38-39.

reactors unlike the USA, and West Germany snatched the Brazilian nuclear deal from the USA because it agreed to provide Brazil with the full cycle facilities.

Subsequently other steps were taken to stop the spread of nuclear weapons by the USA, by insisting on the application of full-scope IAEA safeguards as a condition of supply of nuclear materials and technology. The USA also initiated the International Fuel Cycle Evaluation (INFCE) Study group, during the period 1976 - 80, as a peace conference to end the war of plutonium and to resolve the differences between promoting specific non-proliferation policies. The INFCE was originally proposed by US President Carter in August 1977. It held its first meeting in August 1977 in Washington and then the IAEA took over the conference which was attended by 62 countries. These efforts, however, were not successful because US policy took little or no account of the different energy supply situations of other countries, especially those of Western Europe and Japan. It might be possible for the USA, with large domestic reserves of uranium, to give up the use of plutonium as a fuel, but most other countries lacked uranium reserves and aimed at making their nuclear power industries as self sufficient as possible. Moreover, one of the most important outcomes of the INFCE was to cast doubt on some of the assumptions underlying the war on plutonium by the USA because it questioned the assertion that sufficient uranium was available. The INFCE Studies concluded that various proposed 'technical fixes' which it was believed could generate nuclear equipment and material proof against the dangers of proliferation would not be effective.[68] The INFCE showed that an attempt to impose unilateral efforts to control the spread of nuclear weapons by curbing the export of sensitive technologies had failed and the problems of proliferation remained.

Meanwhile, political pressures were applied in the 1970s to stop the spread of nuclear weapons. These pressures were based on the assertion that the answer to the problem of proliferation might lie in the field of broad foreign policy rather than in the limited field of non-proliferation policy.

> «The most essential component of a nuclear military programme is not the nuclear material nor the nuclear technology, but the political will, supported by a minimum of scientific and industrial capacity. If the political will is there, any country will, sooner or later, succeed in producing and creating the necessary nuclear material and technologies. If it is not there, it is not the mere presence in a country of nuclear material in a power

(68) See US Congress, Nuclear Proliferation Factbook (Washington, D.C.:Government Printing Office, 1977) 455.

> production fuel cycle under
> safeguards that creates a
> proliferation risk.»[69]

It is argued that the application of political pressures has succeeded in a number of cases in halting the spread of nuclear weapons.[70] The USA was able to persuade South Korea to give up its planned reprocessing unit; and Taiwan and France agreed not to sell reprocessing facilities to Pakistan. France and West Germany were persuaded to pledge that they would not sell sensitive technology in the future. On the other hand, India carried out no further nuclear tests after 1974, and Israel and South Africa claimed not to have carried out a nuclear test, and denied possession of nuclear weapons. These are the examples of positive and negative successes claimed to have been achieved as a result of US non-proliferation efforts to stop the process of 'going nuclear'. On the other hand, there are a number of compelling cases of failures since the West German-Brazilian deal went ahead. Pakistan began construction of its own enrichment plant and Iraq gave sufficient ground for suspicion of her nuclear intentions to trigger off the Israeli attack. No amount of persuasion succeeded in convincing India, Pakistan, Israel, South Africa, Brazil and Argentina (countries assumed to have the capabilities to

(69) A. Petit, 'Views from France', quoted by Wilmshurst, M.J., 'The Development of Current Non-Proliferation Policies' in Simpson, and McGrew, The International Nuclear Non-Proliferation System, op. cit., p.46.

(70) Wilmshurst, 'The Development of Current Non-Proliferation Policies', op. cit., pp.64-65.

fabricate nuclear weapons) to join the NPT and accept full-scope safeguards.

The NPT, however, remains the main political barrier against nuclear proliferation, especially articles I and II.[71] Article I of the treaty obliges nuclear weapons states not to provide non-nuclear weapons states with nuclear weapons or other nuclear explosive devices and not to help them in acquisition of nuclear weapons. Article II prohibits non-nuclear weapons states from acquiring or developing nuclear weapons. Moreover, Article IV obliges nuclear weapons states to contribute to the spread of civil nuclear energy. The treaty has been continuously criticized for a number of reasons. The first set of arguments criticizing the NPT focuses on non-nuclear weapons states' objections to three main issues covered by articles III - VI. Article III obliges a non-nuclear weapons state to accept international inspection which is seen as being politically inadequate, since the restrictions are not placed upon nuclear weapons states. Secondly, for many non-nuclear weapons states the obligations under article IV have been avoided. They believe also its spirit has been undermined by the manner in which states with nuclear energy programmes are constantly criticized as potential nuclear weapons states even when their adherence to the NPT is adequate. The non-nuclear weapons states see the NPT as

(71) See U.N. Doc.A/Res/2373 (XXIX).

perpetuating the commercial advantages of the nuclear powers since article V reserves to 'nuclear weapons states the right to carry out peaceful nuclear explosions. Thirdly, and perhaps most significantly, Article VI states that 'nuclear weapons states will pursue negotiations in good faith on effective measures relating to the cessation of the nuclear arms race at an early date and to nuclear disarmament.'[72] Instead, the superpowers have dramatically increased the number of their nuclear arsenals as well as there being a lack of progress towards a Comprehensive Test Ban Treaty ending all nuclear weapons testing, not to mention lack of progress in arms control and disarmament. Epstein argues that this lack of progress towards a Comprehensive Test Ban Treaty undermined Article VI which assumed good faith.

> «The simplest and most dramatic way in which the superpowers could demonstrate the honesty of their commitment to arms control.»[73]

This will have effect on the proliferation urge for prestige.[74] On the other hand, Baker argues that it will have little effect on the likelihood of further proliferation because the decisions of the threshold states 'will be based on more local and regional kinds of concern.'[75]

(72) Ibid.

(73) Epstein, W., 'The Proliferation of Nuclear Weapons' Scientific American, Vol 232, No 4, April 1975, p.24.

(74) Ibid p.27.

(75) Baker, 'The International Political Economy of Proliferation', op. cit. p.87.

The second set of arguments deals with the problem of non-signatories and that the NPT does not represent a permanent undertaking not to develop nuclear weapons. There is a number of countries who have refused to sign the treaty, including two nuclear weapons states, and six other countries that are assumed to have the capability to produce nuclear weapons. Also, under the terms of Article X, any of the signatories to the treaty can withdraw on three months notice if events jeopardize their 'supreme national interests'. The duration of the treaty is 25 years.

The NPT still faces a number of considerable challenges described thus by Kapur: 'the quest for an international non-proliferation regime is exhausted and the present regime is full of loopholes'.[76] First, the changing relationships of the Superpowers have dramatic effects on priorities that they attach to different policy objectives. This was made clear during US President Carter's administration in the wake of the Soviet invasion of Afghanistan in 1979. The non-proliferation policy objective had dramatically become a minor one on US foreign policy. The US 1980 Non-proliferation Act bans all further shipments of nuclear fuel and materials of US origin to states such as India, which refuses to accept full safeguards. The Soviet invasion of Afghanistan vetoed the Act to lift the ban on India because it damaged overriding the US policy objective in the region. Military aid was also given to Pakistan.[77]

(76) Kapur, A., 'Nuclear Proliferation in the Eighties', International Journal (Toronto: Canadian Institute of International Affairs) Vol 36, No 3, Summer 1981, pp.53.

(77) Brenner, 'Nuclear Power and Non Proliferation', op. cit., pp.201-3, see also P.F. Power, 'Indo-American Controversy', Asian Survey, Vol 19, No6, June 1979, 594-95.

Secondly, the oil crisis of 1973 and subsequent events in the World Energy Market has left its impact on the growing interest in nuclear energy, especially in meeting the legitimate demand of Third World countries for nuclear energy. Developing countries have argued that if the supplier states were truly concerned about the horizontal proliferation problem, they would ensure that states which are parties to the NPT would receive preferential treatment over non-parties. However, the converse position tends to prevail whenever economic conditions favour the non-party.[78] Energy needs became an important factor in the quest for development, especially in the developing countries.

> "It is almost certain that many countries (particularly underdeveloped ones) deficient in indigenous fossil supplies, will increasingly look to nuclear power, at least as a partial solution to their energy problems."[79]

Thirdly, technological advances in enrichment technology and advocacy of the use of plutonium for civil nuclear power reactors have constantly spurred proliferation and made safeguarding more difficult due to the quantity of materials to be inspected. Verification of the quantities of fissionable materials in the more advanced reactors becomes a formidable task for the

(78) NPT/Contf, 11/C,11/34, p.5; Simpson, 'Global Non-Proliferation Policies: Retrospect and Prospect', op. cit., pp.68-89.

(79) Stockholm International Peace Research Institute, The Nuclear Age (Cambridge, MA: MIT Press, 1975) p.34.

IAEA inspection teams. This prospect led to the expansion of the potential for 'near-nuclear states'. Furthermore, IAEA can only hope to detect rather than prevent diversion of material if a state is intent on diverting material towards a weapon programme. No action can be taken by the IAEA against operations which have overriden the safeguarding system[80].

Fourthly, in the mid 1970s, the leading position of the USA in the global nuclear industry was eroded by France and West Germany, who had become the major competitors of the USA by providing full fuel cycle services. This situation posed formidable difficulties concerned with the regulation of nuclear trade and the strengthening of safeguards. This was further complicated by the rise of a separate nuclear trading system outside the non-proliferation control system and by the emergence of the possibility of covert nuclear deals involving Third World countries.

Finally, political conflict between major suppliers and strategies to restrain horizontal proliferation have reinforced commercial challenges. The conflicts have stemmed generally from unilateral US actions and policies such as the 1978 Nuclear Non-proliferation Act.[81] The Act obliged the US to ban all nuclear exports to Euratom countries until they agreed to revisions in their nuclear cooperation agreements with the USA.

<80> 'An Alarm System not a Police Organization', International Herald Tribune, 19 February 1982; Kapur, International Nuclear Proliferation, op. cit., Chap.5; Simpson, 'Global Non-proliferation Policies: Retrospect and prospect', op. cit., p.82.

<81> McGrew, A.G., 'Nuclear Revisionism: The US and the Nuclear Non-proliferation Act of 1978', Millennium, Vol 7, No 3, 1979; see also Brenner, Nuclear Power and Non-proliferation, op. cit., chaps. 4 & 5.

West European countries and Japan perceived US motivation as purely commercial. Despite US attempts to resolve the disagreements by initiating the INFCE, the European and Japanese opposition to the US non-proliferation policies continued which led, eventually, to the breakdown of the consensus between suppliers over policies to restrain proliferation.

The analysis of attempts to control the spread of nuclear weapons has been further complicated by various conditions and assumptions made, that led nuclear proliferation scholars and policy makers to adopt one of the several positions in the non-proliferation issues. It is argued that there are those who regard proliferation as undesirable but inevitable and those who regard it as undesirable andpreventable, but preventable only by a totally committed crusade. There are those who regard it as undesirable and preventable, but preventable only by a substantial superpower disarmament. There are also those who regard it as undesirable and largely preventable but only by gentler and less total approaches.[82] The pessimistic view of proliferation is based on a variety of judgements that within the next decade further proliferation is inevitable and that the current control mechanisms can never be fully effective. Thus strategies designed to prevent proliferation in a technologically advanced but politically decentralized world are obviously futile. These premises led the pessimists to focus on global factors such as the growth in the nuclear capabilities of

(82) Quester, George. (ed), Nuclear Proliferation: Breaking the Chain, (Madison: University of Wisconsin press, 1981) pp.2-3.

countries acquiring civil nuclear technology and on the fact that some of the sensitive technologies in certain states are outside IAEA safeguards (India, Pakistan, South Africa). They argue that the International Non-Proliferation System has failed so far to contain the growth in the number of the so-called 'near nuclear states'.[83] Moreover, they consider nuclear proliferation is open to different technical interpretations, because an explosion of a nuclear device is not outlawed by the NPT. An explosion is merely a public demonstration of the ability to master the basic elements of nuclear weapons technology but such public demonstration offers fewer political and military advantages. On the contrary, uncertainty has obtained greater political leverage and strategic advantages for Israel.[84] Several predictions are made about the possible proliferation of nuclear weapons, [85] while others argue that commercial competition between major suppliers and the US led Western suppliers to take advantage of the strict supply conditions imposed by the USA by offering more favourable terms.[86]

On the other hand, the optimistic view of nuclear proliferation sees the current international non-proliferation arrangements as having been remarkably successful in containing

(83) Dunn, Controlling the Bomb, op. cit., chap. 3.

(84) Lefever, Nuclear Arms in the Third World, op. cit., pp. 66-71, 74-7; Harkavy, 'Pariah States and Nuclear Proliferation', op. cit., pp.135-63.

(85) Gompert, D.C., Mandelbaum, M., Garwin, R.L. & Barton, J.H., Nuclear Weapons and World Politics (New York: McGraw Hill, 1977) p.231.

(86) Krugman, Hartmut, 'The German - Brazilian Nuclear Deal', Bulletin of the Atomic Scientists, Vol 35, No 2, February 1982, p.32.

the emergence of additional nuclear weapons states.[87] The optimists argue that since 1952 only two additional states exploded nuclear weapons, France and China, while India exploded a peaceful device following the adoption of the NPT. This suggests that the structure of the NPT has succeeded in preventing horizontal proliferation as more countries have joined the treaty and accepted safeguards. More recently, one analyst concluded:

> "The striking thing about nuclear proliferation is that, while many see it as a widespread inevitability, it can still be said in 1985 that there has been little of it and its pace has been slow."[88]

Accordingly, the two different sides advocate different policy responses to the problem of non-proliferation because they are based on contrasting judgements and focus on different factors; that led them to arrive at incompatible conclusions. But at least they both assume that nuclear proliferation is a bad thing.

There is a number of reputable scholars who argue that the

(87) Nye, Joseph, 'Maintaining a Non-Proliferation Regime' International Organization, Vol 35, No 1, 1981, pp.15-38, and his 'Prospects for Non-Proliferation', Survival, Vol XXIII, No 3, May/June 1981, p.107; King, John K. (ed), International Political Effects of the Spread of Nuclear Weapons (Washington D.C.: Government Printing Office, 1979) p.IX; US Congress, Nuclear Proliferation Factbook, op. cit.

(88) Hiester, D.W., 'Nuclear Proliferation: A cause for optimism?', International Relations (Journal of David Davies Institute of International Studies) Vol VIII, No 3, May 1985, p.223.

spread of nuclear weapons is desirable.[89] Valtz concludes that

> "The gradual spread of nuclear weapons is better than no spread and better than rapid spread. We do not face a set of happy choices. We may prefer that countries have conventional weapons only, do not run arms races and do not fight. Yet the other alternative to nuclear weapons for some countries may be ruinous arms races with high risk of their becoming engaged in debilitating conventional wars"[90].

The thrust of the 'more may be better ' thesis is that the spread of nuclear weapons will not change fundamentally the current structure of the International System, 'make the bipolar world into a multipolar one', but it may reduce the chances of war as it has been the case between the Superpowers.

There are divergent views on the desirability of nuclear weapons proliferation and how to deal with it, centring on the different arguments about whether nuclear deterrence theory works and on the probability of war, as well as on the transferability of nuclear deterrence from the central balance to lower levels.

(89) Waltz, 'The Spread of Nuclear Weapons: More may be Better', op. cit., p.30; Feldman, Shai., 'A Nuclear Middle East', Survival, Vol 23, No 3, 1981, pp.107-15, and his, Isreali Nuclear Deterrence: a Strategy for the 1980s (New York: Columbia University Press, 1982), p.242.

(90) Waltz, 'The Spread of Nuclear Weapons: More may be Better', op. cit., p. 28.

Contending Views of Nuclear Proliferation

The complexity of the issues involved in making an adequate analysis of the problem of nuclear proliferation arises basically from the mix of tangible and intangible activities involved, the different levels of analysis associated with it.[91] The mixture of tangible and intangible stems from two main sources: the contrast between the tangible technical and capabilities considerations and the intangible political intentions related to them. The link between the two contrasting elements creates a temptation to focus on the tangible elements such as capabilities and formal membership in international organizations and treaties because it is much easier to come up with substantial arguments. The second source is the apparent difference between the binding nature of formal membership to an international organization and commitments and the informal understanding and efforts to create a voluntary code of behaviour. The other problem deals with the question of the level of analysis which has two major impacts upon nuclear non-proliferation policies.[92] The first impact concerns the argument that states have a tendency to pursue both national interests and solutions to their security problems that are inconsistent with global considerations. This is what John Herz called a security dilemma.[93] The dilemma exists for each

(91) Simpson, 'The Nuclear Non-Proliferation Problem: Diagnosis and Treatment', op. cit., p.176.

(92) Singer, J.D., 'The Level of Analysis Problem in International Relations' in Knour, K. & Verda, S. (eds), The International System: Theoretical Analysis (Princeton; Princeton University Press, 1961) pp.77-92.

(93) Herz, John H., 'Idealist Internationalism and Security Dilemma', World Politics, 2 Jan. 1950, pp.157-80; see also Jervis, R., 'Cooperation under Security Dilemma', World Politics, 30 Jan. 1978, pp.169-70; Buchan, A., 'Introduction' in Buchan, A. (ed), A World of Nuclear Powers? (New York, Columbia University Press, 1966), pp.1-2.

state from its own perspective, and since every state resists any efforts to diminish its security, it is almost inevitable that the general quest for security often leads to war. The second impact deals with whether nuclear proliferation should focus upon problem states or problem structures. Overlapping issue areas and nuclear non-proliferation policies lead to two contending views about those who are concerned with generating a political climate in which states will choose not to acquire nuclear weapons and those who are occupied with the more technical tasks of regulating the standards of international nuclear trade.

The latter contending view has been the core of non-proliferation policies over the last fifteen years, as witnessed in the attempts to control the spread of nuclear weapons through strengthening IAEA safeguards, London Club guidelines and triggers list and NPT review conferences. Subsequently a number of studies were carried out to address the problem of proliferation in terms of the global creep of nuclear technology and hardware and to assess the technological dimensions of nuclear proliferation in the 1980s.[94]
This strong emphasis on technical factors led to the impression that nuclear proliferation was entirely a technological problem. It also gave rise to emphasis on the descriptive dimensions of nuclear proliferation because it focused on the number of countries with latent capabilities, rate of power reactor purchases and the growth in global plutonium stocks. However,

(94) Office of Technology Assessment, Nuclear Proliferation and Safeguards, op. cit., pp.45-50; Keeny, et al. , Nuclear Power: Issues and Choices, op. cit., Chap. 9.

various technical and political factors are significant in the nuclear proliferation process only if there is reason to believe that some states might decide to transform capabilities into operational weapons.

Why do states go nuclear? The cornerstone of the nuclear proliferation process is the decision to pursue nuclear weapons production. A distinction must be made between the decision to acquire nuclear capability and the decision to acquire nuclear weapons in order to understand the nuclear proliferation process. States may acquire the fundamental capability to fabricate nuclear weapons either by intentional efforts or as an unintended byproduct of industrial and economic development. A decision to establish a nuclear capability may occur before or in association with a decision to produce nuclear weapons. A decision to establish capabilities in the absence of a decision to produce nuclear weapons reflects the development of nuclear option, enhancing a nuclear option and keeping the option open. Many countries fall in this category. On the other hand, Bhutto's government of Pakistan is reported to have made a simultaneous decision to produce nuclear weapons and to acquire a nuclear capability in the early 1970s.[95] But the decision to acquire nuclear weapons could come about only after an explicit government decision to transform a capability into an operational weapon.

The starting point in the proliferation process is the decision to go nuclear. This decision may or may not lead to production

<95> Dunn, Controlling the Bomb, op. cit., p.31 and pp.44-48; Potter, William., Nuclear Power and Non-Proliferation (Cambridge, MA: Oeleschlager, Gunn & Haen, 1982),pp.157-61.

of operational nuclear weapons because the state may find that the cost outweighs the benefits or that the technical hurdles are more formidable than anticipated. Whatever the subsequent outcome, there is a number of cases where the decision and the following efforts were made.[96]

Though a large number of studies were carried out on the technological aspect of nuclear proliferation, few were made to examine nuclear decision making in individual countries.[97] This is because the historical experience of the decision to go nuclear is limited to only five nuclear weapons states and evidence generated from them is limited and ambiguous. In at least four of the five cases, perception of threat and security concerns appear to have played the crucial role. Moreover, the decision by many developed Western states not to go nuclear took place in the context of a US policy of being prepared to make the weapons available to them in times of war within the NATO alliance. France is the only exception. Furthermore, it is argued that nuclear proliferation process in the future would not

(96) Gowing, M., Independence and Deterrence, Britain and Atomic Energy, 1945-52 (New York: MacMillan, 1974), Vol 1, pp.160-193; Scheinman, Lawrence, Atomic Energy Policy in France under the Fourth Republic (Princeton: Princeton University Press, 1965), pp.181-85; Kapur, A., India's Nuclear Option: Atomic Diplomacy and Decision Making (New York; Praeger, 1976); Kohl, Wilfrid L., French Nuclear Diplomacy (Princeton; Princeton University Press, 1971), chap. 1.

(97) Yaeger, Joseph A. (ed), Non-Proliferation and U.S. Foreign Policy (Washington D.C.: Brookings Institution, 1980), p.3; Dunn, Controlling the Bomb, op. cit., chap.3; Dunn & Kahn, Trends in Nuclear Proliferation, op. cit.; Lefever, Nuclear Arms in the Third World, op. cit., p.22.

be similar to that of the observed past.[98] This is because a substantial amount of the data base of the nuclear proliferation process is composed of Western industrial states while much of the future nuclear proliferation activity will take place in the developing countries of the Third World. The political and economic character of the international system in the future is likely to be quite different from that of the past.

Kapur explains that there is a possibility of making a detailed analysis of decision making processes about nuclear proliferation and the rejection of the concept of nuclear proliferation as a 'phasal activity' that proceeds fairly automatically once triggered, suggests the importance of this detailed analysis within countries to identify their nuclear politics,[99] especially the study of bureaucratic politics found in such decision making situations.

> "The real danger of proliferation lies not so much in the growth of nuclear arms and nuclear wars initiated by irresponsible states as in the hysteria caused by unfamiliarity with the decision

(98) Nacht, Michael, 'The Future unlike the Past: Nuclear Proliferation and American Security', in Quester, Nuclear Proliferation, op. cit., pp.193-212; Epstein, W., 'Why states go - and do not go - nuclear', Annals of American Academy of Political and Social Sciences 430, March 1977, pp.16-28; Quester, Nuclear Proliferation, op. cit., pp.217-18; Kapur, International Nuclear Proliferation, op. cit., pp.187-96.

(99) Kapur, International Nuclear Proliferation, op. cit., p.55.

apparatus and decision psychology
of states who possess nuclear
options and nuclear arms."[100]

He went on to explain that in order to understand these pressures on the decision makers, it is necessary to appreciate that governments are not monolithic entities and that 'bureaucratic power play is the real level of analysis'[101]

Nevertheless this issue area of decision making is the least substantiated in the nuclear proliferation literature because of the lack of a solid empirical base to advance adequate propositions and conclusions.

There are three schools of thought in the literature. The first school argues that nuclear technology itself is the driving force behind the decision to go nuclear. Since governments decide to produce nuclear weapons because the technology is available and technical and financial costs are manageable and opportunities are irresistible. The second school sees the quest for nuclear weapons as resulting from the systematic effects of a set of political and military variables. So, decisions to go nuclear are motivated by political and military considerations and when the proper politico-military conditions converge, a proliferation decision follows. The third school views proliferation as mainly unpredictable since countries go

(100) Ibid., p.31; see also van Cleave, W., 'Nuclear Technology and Weapons' in Lawrence, Robert M. & Larus, Joel (eds), Nuclear Proliferation: Phase II (Lawrence: University of Texas Press, 1974) p.59.

(101) Kapur, International Nuclear Proliferation, op. cit., p.41.

nuclear because particular individuals and events come together at specific times and create proper conditions. There is no pattern and the mixing of variables is random; this leads to unpredictable outcomes.

The technological school of thought stands by the proposition that once a state possesses a capability to produce nuclear weapons, it will eventually do so. Herbert York calls it the technological imperative.

> "The decision to develop nuclear weapons is not a fluke of certain governments but a general technological imperative"[102]

Another analyst sees nuclear technology as the main driving force behind nuclear proliferation and its greatest cause in the future[103] and that the greater the level of nuclear related infrastructure in a country, the more likely it is to go nuclear. He related nuclear technology in a country to the level of the development of the state's latent capacity and so a country with nuclear power reactors would be more likely to pursue nuclear weapons production than one without. The technological model of proliferation gives consideration to the domestic and international situation or any other contextual elements not related to the national

<102> Quoted by Shapely, Deborah., 'Nuclear Weapons History: Japan's wartime bomb projects', Science 199, 13 January 1978, p.155.

<103> Lovins, et al., 'Nuclear Power and Nuclear Bombs', op. cit., pp.1138 & 1176; Barnaby, C.F., 'The Development of Nuclear Energy Programmes', in Barnaby (ed), Preventing the Spread of Nuclear Weapons, op. cit., pp.16-35; Bull, H., The Control of Arms Race (New York: Praeger, 1961), pp.152-53; Schwab, G.,'Switzerland's Tactical Nuclear Weapon Policy', Orbis, 13, 3, Fall 1969, pp.902-3.

resource capacity.[104] Though the model recognizes that a decision must be made to go nuclear, the technological momentum remains the strong influence and the pressure for production of nuclear weapons is so persuasive that the decision makers are carried along. The conclusion of the technological hypothesis is that a latent capacity to produce nuclear weapons is, itself, sufficient to produce a decision to go nuclear. So all nations with latent capacities will eventually go nuclear.

However, at least one empirical research shows that the relationship between both the degree of national wealth and scientific capacity to countries armament position to be very weak or non-existent.[105] Other inquiries have concluded that these propositions are inadequate and that the observed patterns 'are not easily accommodated in the traditional proliferation paradigm'[106] and that past approaches to proliferation based on past definitions are

(104) National Planning Association, 'The Nth Country Problem and Arms Control', in Rakone, Arms and Foreign Policy in the Nuclear Age, op. cit., pp.323-33; Bader, The United States and the Spread of Nuclear Weapons, op. cit., p.98; Rosecrance, R., 'The Nth Country Problem', Orbis, 7 Sep 1963, p.173; Bull, The Control of Arms Control, op. cit., pp.151-52; Quester, The Politics of Nuclear Proliferation, op. cit., p.110; Hohenemser, 'The Nth Country Problem Today', op. cit., pp.238-76; Mueller J.E., 'Incentives for Restraint: Canada as a Non-Nuclear Power', Orbis 11, Fall 1967, p.875.

(105) Kegley, C.W. Jr., 'International and Domestic Correlates of Nuclear Proliferation: A Comparative Analysis', quoted in McGowan, Pat, and Kegley, C.W. Jr. (eds), Threats, Weapons and Foreign Policy (London and Beverley Hills: Sage Publication, 1980), pp.236, 250.

(106) Dowty, A., 'Nuclear Proliferation: The Isreali Case' International Studies Quarterly, 22 Mar 1978, pp.79-120.

outdated.[107] Furthermore, the technological hypothesis does not provide adequate explanation of the non-nuclear weapons status of countries like Canada, Italy, Sweden and Netherlands which are well advanced in nuclear technology. The conclusion is that the technological model by itself does not give an adequate explanation about the process of nuclear proliferation. Perhaps the availability of nuclear technology today means that the indigenous capabilities are no longer viable restraints which prevent some countries from going nuclear.

In contrast with the long term determination of the technological model, the motivational hypothesis involves an inherently probabilistic process. Technical ability is cast in the role of a necessary condition for going nuclear but not a sufficient one. The fact that a nuclear weapons programme seems feasible does not imply that a decision to begin such a programme will be made or still less that it is inevitable. Beaton and Maddox concluded twenty years ago that

> "Nations do not decide to manufacture nuclear weapons merely because they realize that it is feasible and the spread of nuclear

(107) Greenwood, T. et al. (eds) Nuclear Proliferation: Motivations, Capabilities and Strategies for Control (New York: McGraw Hill, 1977) p1; Feivson, H.A. & Taylor, J.B., 'Alternative Strategies for International Control of Nuclear Power', in Greenwood et al., Nuclear Proliferation, op. cit., pp.123-183; Keeny et al., Nuclear Power: Issues and Choices, op. cit., pp.282-290; Epstein, 'Why States go - and do not go - nuclear', op. cit., pp.16-28; Greenwood T., Rathjens G.A. & Ruina, J., Nuclear Power and Weapons Proliferation, Adelphi Paper No 130 (London: International Institute for Strategic Studies, 1976) pp.1-2.

> weapons is obviously not as inexorable even as the spread of the jukebox"[108]

The motivational model postulates that specific politico-military conditions motivate or cause national decision makers to initiate a nuclear weapons programme. It is the convergence of the technological capabilities with significant proliferation-related motivations that results in nuclear proliferation. The motivational hypothesis brings together the concepts of decision making: stimuli, options and choices. The decision stimuli could be a leaked information that an adversary possesses a nuclear capacity. The decision response might be selected from various decision options such as beginning a nuclear weapons programme, speeding up basic scientific and engineering research, increasing covert intelligence or doing nothing. The capability to convert a nuclear capability into an operational weapons programme should conditions warrant it, is a decision option. However, there are also specific conditions which act to dampen the nuclear option. So the decision to go nuclear is not an automatic one.[109] Once the decision option has been raised, its relative attractiveness

<108> Beaton & Maddox, The Spread of Nuclear Weapons, op. cit., pp.81-82.

<109> Lefever argues that the decision to go nuclear is a profound and delicate act of will, a result of long and painstaking calculation of costs and benefits in Lefever, Nuclear Arms in the Third World, op. cit., p119. Also Beaton describes the decision as 'an inevitably public act', in Beaton, Must the Bomb Spread, op. cit., p.13.

compared with other options would be determined by the perceived balance between incentives and disincentives attached to each option. Furthermore, the correct balance between the incentives and disincentives may be affected by the country's technological capabilities, especially sensitive technology, and international control on transfer of nuclear technology.

Traditionally, one of the major elements in the nuclear proliferation equation is military security and that nuclear weapons may seem to represent a viable answer to a variety of military threats as states consider military capabilities to be related symbolically.[110] Basically, three arguments have been presented in the literature as the main incentives behind nuclear proliferation: prestige and power, military and security, and domestic politics.[111] The prestige and power argument focuses on regional and global power pretensions. The possession of nuclear weapons is equated with regional and global power status.

(110) Dunn & Kahn, Trends in Nuclear Proliferation, op. cit., Gallois, Pierre., The Balance of Terror: Strategy for the Nuclear Age (Boston: Houghton Miffin, 1961) pp.7-14; Kissinger, H., Nuclear Weapons and Foreign Policy (New York: Harper, 1957) p.222; Boulding, K.E., Conflict and Defence: A General theory (New York: Harper & Row, 1962); Frank, T.D., Sanity and Survival (New York: Random House, 1968), p.21.

(111) Beaton & Maddox, The Spread of Nuclear Weapons, op. cit., p192; Rosecrance, R., 'British Incentives to Become Nuclear Power', in Rosecrance, R. (ed) The Dispersion of Nuclear Weapons, Strategy and Politics (New York: Columbia University Press, 1964) pp.48-65; Office of Technology Assessment, Nuclear Proliferation and Safeguards, op. cit., pp.94-96.

> "acquiring nuclear weapons is an act of 'arriving on the nuclear front' as one has arrived or is arriving on the other fronts of national power and success"[112]

In the age of the two Superpowers, the concept of global powers may seem inappropriate, but for many the Suez crisis of 1956 represented the influence of superpower interests dictating the flow of international events. There are still medium powers who can influence events outside their region, such as France and Britain. The fact that the five members of the UN Security Council are the five nuclear weapons states is an obvious illustration. It can be equally argued that some states have gained increased international status by pursuing non-nuclear policies, such as Sweden, Canada and Switzerland. Non-nuclear economic giants such as Japan and West Germany have gained major worldwide influence. Kapur argues that proliferation has been slow and controlled due to the caution of the Third World elite.

> "They are not moving madly towards economically and diplomatically expensive nuclear weaponry when other sources of power and

(112) Lefever, Nuclear Arms in the Third World, p119,; Groom, A.J.R. British Thinking about Nuclear Weapons (London: Frances Printer, 1974), p.44; Gowing, Independence and Deterrence, op. cit., pp.63, 184, 220, 407; Dhar, S., Atomic Weapons in World Politics (Calcutta: Gus Gupta, 1957) P.5.

influence (such as resource diplomacy and conventional military power) exist and, in fact, may be more useable in the foreseeable future"[113]

On the other hand, the military and security arguments deal with the problems of threat perception and gaining independence. The military argument postulates that a state may acquire nuclear weapons for a variety of reasons concerned with an adversary having or pursuing nuclear weapons, by having the ability to retaliate in kind and to deter a nuclear attack on itself. A state may acquire nuclear weapons because a potential enemy has already done so, or has a latent capacity to produce nuclear weapons.[114] A state may also acquire nuclear weapons as a hedge against a possible overwhelming military threat and conventional military imbalance or inferiority[115] or even to achieve a decisive military advantage against a state that does not have them. A state may want to acquire nuclear weapons in order to make itself independent, in order to avoid the

(113) Kapur, A., "The Nuclear Spread: 'a Third World View'", Third World Quarterly, vol2, No1, January 1980, p. 60.

(114) Epstein, 'Why states go - and do not go - nuclear', op. cit., p18; Garthoff, Raymond, 'On Estimating and Imputing Intentions' International Security, vol2, No3, Winter 1978, pp.22-31.

(115) The conventional wisdom is that defending nations can hold their own up to three to one ratio military force disadvantage. See Liddell-Hart, B.H., STRATEGY (New York: Praeger, 1954).

consequences if its greater power ally did not retaliate in the event of an attack by other great powers. This desire for independence stemmed from criticisms of the US nuclear umbrella provided to Western Europe, the case of Britain and France.[116] Finally, there is the case of the 'pariah' states, a small group of countries that are characterized as international pariahs or outcasts such as South Africa, Israel and Taiwan which are shunned by regional neighbours if not by the international community at large. Nuclear weapons may provide this group of states with security assurances.[117]

The domestic politics argument is based on the influence of internal factors in initiating the decision to go nuclear, factors such as domestic instability and turmoil triggered by a power struggle or a major defeat abroad. The nuclear weapons issue may be pushed ahead to mobilize internal support and to raise morale of the defence establishment;[118] or it could be viewed as a 'pain reliever'

(116) Waltz, 'The Spread of Nuclear Weapons: More may be better', op. cit., pp.7-8.

(117) Chain, Steven., 'Incentives for Nuclear Proliferation: the Case of International Pariahs', Journal of Strategic Studies, vol3, No1, May 1980, pp.26-45; Harkavy, Robert E., Spectre of a Middle East holocaust: The Strategic and Diplomatic Implications of the Israeli Nuclear Program (Denver: Denver University Press, 1977) pp.7-9; Betts, 'Paranoids, Pygmies, Pariahs and Non Proliferation', op. cit., pp.157-83.

(118) Kelly, George., 'The Political Background to the French A-bomb' Orbis,4, Fall 1961, p293; Smart, Ian., 'Non-Proliferation Treaty: Status and Prospects', in Marks, A. (ed) NPT: Paradoxes and Problems (Washington D.C.: Arms Control Association, 1975) pp.26, 28-29, 41; Epstein 'Why states go - and do not go - nuclear', op. cit., pp.16-28,; Quester, George., 'Reducing the incentives to proliferation', Annals of the Academy of Political and Social Sciences, no430, Mar 1977, pp.70-81.

for a demoralized defence establishment.[119] Nuclear weapons could be a cheaper and safer alternative to an intolerable economic defence burden.[120]

On the other hand, there are a number of factors that tend to work against the decision to go nuclear - dissuasive factors that affect considerations of the nuclear option.[121] These factors focus on alliance relationship, fear of being a target of nuclear attack, desire for peaceful reputation, fear of loss of control on weapons, fear of intervention by a nuclear power, domestic pressure and technical and economic capacity. A state may seek security beneath a nuclear umbrella provided by the nuclear alliance partner. A client state that goes nuclear risks the dissolution of the bonds of the alliance. South Korea has a strong incentive to go nuclear to enhance its overall military strength and to use fear of nuclear escalation to deter North Korea, because of the conventional military threat posed by North Korea and its alliance. However, there are equally strong dissuasive factors against going nuclear because of the present deployment of US troops in South Korea, as well as US tactical nuclear weapons.

<119> Joshua, Wynfred & Hahn, Walter F., Nuclear Politics: America, France and Britain, (Beverly Hills, Calif.: Sage Publications, 1973), p16.

<120> Waltz, 'The Spread of Nuclear Weapons, More may be better', op. cit., p8; Beaton & Maddox, The Spread of Nuclear Weapons, op. cit., p.196.

<121> Ibid., chap 12; Beaton, Must the Bomb Spread, op. cit., p.48; Rosecrance 'British Incentives to go Nuclear', op. cit., pp.12-18; Office Technology Assessment, Nuclear Proliferation and Safeguards, op. cit., pp.96-98; Greenwood et al., Nuclear Proliferation, op. cit., pp.57-80; Potter, Nuclear Power and Non-Proliferation, op. cit., p.3; Dunn & Kahn, Trends in Nuclear Proliferation, op. cit.; Epstein, 'Why states go - and do not go - nuclear', op. cit.

There is the possibility of withdrawal of US troops if South Korea goes nuclear and of adverse political reaction. Moreover, South Korea can keep US troops by threatening to go nuclear as is the case with Israel. The state's international and legal commitments in the form of treaties and agreements, such as the NPT, may act as a barrier or disincentive to proliferation because breaking off these commitments may result in diplomatic protests and strain in diplomatic relations. It may also lead to economic, technical, military and trade sanctions. Several states such as Sweden, Switzerland and India are thought to have gone to considerable length to establish a peaceful reputation by not going nuclear.

There are fears of attacks by rivals and major powers and the risks involved in the loss of control on nuclear weapons. A state whose rival possesses the nuclear capability to produce nuclear weapons will necessarily have to take into account how its own decision will affect its rivals. However, a state may indicate that it will forgo nuclear weapons so long as its rivals do likewise.[122] A state has also to take into account that its decision to go nuclear may trigger a chain of proliferation with other states not directly its rivals.[123]

(122) Quester, George., 'Nuclear Proliferation: Linkages and Solutions', International Organisation vol33, No4, Autumn 1979, p.546.

(123) The concept of proliferation is explained in Dunn & Overshot, 'The Next Phase in Nuclear Proliferation', op. cit., pp.297-524.

There is the fear that if a state goes nuclear it may face the risks of being a target for nuclear attacks and preemptive intervention by a major power, a concerted action by one or more nuclear weapons states to enforce a non-proliferation norm through active policing and force. Historically, this has been the prevailing situation in West Germany and East Europe since the end of the Second World War.[124] In addition, a prospective proliferator may face the possibility of a preemptive strike by any concerned regional rival. This was demonstrated by the Israeli attack on the Iraqi nuclear reactor in 1981.

To conclude, the motivational model postulates that decisions to begin nuclear weapons programmes should be systematically related to the prevailing motivational conditions, careful calculation between benefits and risks. But the motivational hypothesis does not require any assumptions as to how the decision process takes place. It implies only that specific military and political conditions motivate the national decision makers towards either going nuclear or not. The prominence of political considerations has the strongest bearing on the nuclear proliferation process.

The third model of proliferation, in contrast with the technological and motivational hypotheses, postulates that the pattern is that there is no pattern. Events take place (or fail to take place) because countless factors fuse for

(124) . See Modelski, George.<u>Atomic Energy in the Community Block</u>(New York; Cambridge University Press, 1959)

an instant in a manner that will never be repeated.[125] This arises because of statistical ignorance about the systemic pattern of proliferation which will result from individual decisions as Schelling pointed out in his analogy of highway lighting to explain the need for exploring the link between macro pattern and micro decisions.[126] So, the best one can hope for is to try to understand why past proliferation decisions were made by examining each in detail, despite the fact that the historical cases are limited and evidence generated from them is regarded in many cases as ambiguous and inconclusive. The 'no pattern' or unique model argues that while technology is seen as a necessary condition for future proliferation decisions, the remaining necessary conditions are neither identifiable nor predictable nor consistent. Proliferation decisions that take place will do so because particular states perceived themselves to be in specific circumstances and because the individuals and conditions involved favour going nuclear. The central point of this hypothesis examines why events take place precisely the way they did rather than dismissing the notions that certain underlying conditions are necessary for events of a given type to occur.

In general, all three hypotheses recognize that it is human decision makers that choose whether to produce nuclear

(125) Meyer, The Dynamics of Nuclear Proliferation, op. cit., p.17.

(126) Schelling, T.C., Micromotives and Macrobehaviour (New York: W.W. Norton, 1978) pp.3-14.

weapons or not, and that politics and technology have roles to play in the proliferation process. They differ basically however in the attribution of primary influence; what is necessary and what is sufficient for a decision to go ahead with the production of nuclear weapons. This basic difference in the primacy attached to one main variable in the proliferation process leads to quite contrasting conclusions and predictions. If one adds the enormous complexity of defining what proliferation is, then one can appreciate that there are no unitary and coherent perspectives on nuclear proliferation or simple answers.[127]

Nevertheless, both technological and political factors are essential ingredients in the nuclear proliferation process. The question of how they interact in setting the stage for nuclear proliferation remains to be answered. There is an element of dynamism in the interaction process between technological capabilities and motivational variables because both vary with time.[128] The technological elements of the nuclear proliferation process are fairly stable but technological factors increase both qualitatively and quantitatively with time. The experience of the global nuclear industry since the beginning of the nuclear era demonstrates clearly the stable spread of nuclear technology

<127> Simpson, 'The Nuclear Non Proliferation; Diagnosis and Treatment', op. cit., p.175.

<128> see Rosecrance, Richard,Problems of Nuclear Proliferation, UCLA Security Studies Project No7 (Los Angeles; University of California, 1960); Nye, Joseph., 'Time to plan the Negotiation of Nuclear Technology' Bulletin of the Atomic Scientists, vol33, No8, Oct 1977, pp.38-41.

and materials worldwide. In contrast, there is no reason to assume that the motivational variables will follow a particular trend or pattern over a period of time, that is to say, systematic increases or decreases in the future. This is because the evolution of the motivational variables depends on how the configurations of domestic and international events and politics develop. One needs to consider the technological and political variables separately and how they interact over time. Technology and politics - each is necessary, but only together are they sufficient for proliferation decisions. Technology provides the opportunity to carry out a proliferation decision and may even affect the balance between incentives and disincentives. The spread of nuclear technology and materials could lower the nuclear threshold. Political and military motivation make the proliferation decision possible.

Before a country acquires a nuclear capability, regardless of its political and military motivation level, nuclear proliferation is not possible because technological capability does not exist. But a strong motivation is sufficient to stimulate governments to allocate resources specifically towards the possession of nuclear capability. Once this capability is acquired and should the strong political and military motivations persist, then one would expect a proliferation decision to follow. Israel's uninterrupted strong nuclear motivation provided the impetus for the Israeli leaders to fund the deliberate development of a nuclear capability[129]. This was the experience of the five nuclear weapons powers and possibly of South Africa. There are other cases where nuclear capabilities have existed for long periods - constant - but in which motivational variables have fluctuated considerably. This state of affairs led to the development of the notion of keeping the nuclear option open in face of a changing political and military environment and future uncertainties. More recently there has been a number of cases of proliferation behaviour that are less clear-cut than the previous ones and surrounded with controversy, such as Brazil, Argentina, Taiwan, Pakistan, Iraq and Libya[130]. This is because, for example, in the Libyan case it involved an attempt to acquire nuclear weapons by more unorthodox methods such as purchase or theft to pass indigenous nuclear weapons production. Next, nuclear proliferation problem countries are non-European Third World countries, some of them are portrayed as 'crazy states' where nuclear policies are arrived at via at least quasi-national decisions[131]. Many factors which inhibit proliferation process in Western countries such as domestic opposition and desire to maintain

(129) Perlmutter, Amos., 'The Israeli Raid on Iraq', Strategic Review, vol10, No1, Winter 1980, pp.34-43.

(130) Winkler, Theodor., 'Israel's Preventive Strike', International Defense Review, vol 14, No7, 1981, p.838; Rowen, Henry & Brody, Richard, 'The Middle East' in Yaeger, Joseph (ed), Non Proliferation and US Foreign Policy, op. cit., p.207.

(131) Dror, Y., 'Small Powers Nuclear Policy: Research Methodology and Exploratory Analysis', Jerusalem Journal of International Relations, No1, Aug 1975, pp.29-49; Dror, Y., Crazy States: A Counter Conventional Strategic Issue (Lexington, MA: Heath, 1971) p.23.

the status quo are lacking in the Third World[132].

Taking all these factors into consideration, besides recent developments: mainly the oil crisis of 1973, the Indian detonation of a nuclear explosive device and the global spread of nuclear technology spurred by transnational rivalry[133] nuclear proliferation in the Middle East is approached by offering a model to explain the technological aspects of the proliferation process and looking in detail into political and military motivations which could lead Israeli and Arab decision makers to take the decision to proceed with nuclear weapons production. No assumptions or claims are made that either Israel or any of the Arab states have already produced deployable nuclear weapons or that nuclear development in the Middle East will inevitably lead to nuclear weapons production. However, there are several indicators that nuclearization in the Middle East has been underway for more than thirty years and will continue to play a major role in Middle East politics in the future.

(132) Dror, Y., 'Nuclear Weapons in Third World Conflict', in The Future of Strategic Deterrence, Part II, Adelphi Paper No 161 (London: International Institute for Strategic Studies, 1980),p.103; Maddox, Prospects for Nuclear Proliferation, op. cit., pp.19-20; SIPRI, The Near Nuclear Countries and Non Proliferation Treaty (Stockholm: Almquist & Wiksell, 1972) p.76; Dore, R.R., 'The Prestige Factor in International Affairs', International Affairs, vol 51, No 2, April 1975, p.202.

(133) Kegley, Charles W. Jr., Gregory A. Raymond & Richard A. Skinner, 'A Comparative Analysis of Nuclear Armament', in MacGowan & Kegley, Threats, Weapons and Foreign Policy, op. cit., p.234.

The Effects of Proliferation

On the other hand, this likelihood of going nuclear entails risks and benefits for Israel, the Arab states, the Middle East and the world. The benefits involve an assessment of the extent to which nuclear weapons might enhance the security of the holder. The risks associated with any country going nuclear are based on fear expressed by observers that an increase in the number of fingers placed on nuclear triggers will highlight the possibility of one of them being pressed. C.P. Snow once wrote:

> We know with the certainty of a statistical truth that if enough of these weapons are made ... by different states ... some of them are going to blow up."[134]

He added that it does not matter whether it was caused by accident or a deliberate act and what really matters is 'the nature of the statistical fact'. It is assumed that minimization of the proliferation of nuclear weapons to non-nuclear weapons states in the long run is a necessary condition for a stable international security, though some proliferation may occur.

> "In considering how far non-proliferation is feasible it is necessary to distinguish between

(134) Quoted in Schlesinger 'Nuclear Spread: The Setting of the Problem', op. cit., p.10.

> stopping the spread of nuclear weapons and controlling it. It has never seemed likely at any point in the nuclear era, and it does not seem likely now, that all further proliferation will be stopped. It is simply not credible that one of the most vital strategic and political instrumentalities of the time which is technically within reach of many states, will remain permanently the monopoly of the few that first developed it"[135]

That proliferation is a thing to be feared is a rarely challenged belief. Senator Robert Kennedy argued in 1965 that proliferation was the most vital issue facing the world and that should the process of nuclear proliferation go unchecked, every passing crisis 'might well become the last crisis for mankind'[136] Most people believe that the world will become a more dangerous one as nuclear weapons spread

(135) Bull, H., 'Rethinking Non-Proliferation' International Affairs, vol51, No2, 1 April 1975, p.15.

(136) Quoted in Schlesinger, Arthur M. Jr., Robert Kennedy and His Times (London: Groom Helm, 1978) p.692; see Evron, Y., 'Israel and the Atom: Uses and Misuses of Ambiguity, 1957-1967', Orbis, 17, Winter 1974, pp.1326-43; Dowty, 'Nuclear Proliferation: The Israeli case', op. cit., pp.79-120; Marwah, O., 'India's Nuclear and Space Programs: Intent and Policy' International Security 2, Fall 1977, pp.113-14; Aron, R., The Great Debate: Theories of Nuclear Strategy (Garden City, N.Y.: Doubleday, 1965) pp.61-62; Hoffmann, Stanley, 'Nuclear Proliferation and World Politics' in Buchan, A. (ed), A World of Nuclear Powers op. cit. pp.89-90.

because this increases the chances of war. These chances of use of nuclear weapons vary with the type of new nuclear weapons states, and so the greater the chances of the outbreak of nuclear war.

One simply cannot be certain about the cumulative risk associated with incremental additions of new members of the nuclear club[137]. Though a world of many nuclear-armed states would no doubt be fraught with uncertainties, one cannot be sure of the precise threshold beyond which the probability of nuclear war would increase. Unlike the case of risk in which probabilities regarding the occurrence of an event are known, in statistical terms, decision making under statistical ignorance involves an absence of such information regarding two types of uncertainties. The first type of uncertainty is that one does not know when an event will happen. The second is that one does not know if it will happen at all.

Statistical ignorance regarding the relationship between proliferation and the outbreak of war arises from the absence of any kind of patterned historical regularity to observe and study. Furthermore, predictions based on this statistical ignorance point less to the likelihoods and more to the dangers because they identify some possibilities among many and this would not enable one to say how they are likely to evolve in the future. So it becomes impossible to generalize about causal connections between nuclear

(137) Kegley, Raymond & Skinner ' A Comparative Analysis of Nuclear Armament', op. cit., p.232.

proliferation and outbreak of war.

On the other hand, the destabilizing effect of nuclear proliferation has been challenged on the premise that the spread of nuclear weapons would make interstate conflict more dangerous and therefore less likely.

The proponents of this view argue that in certain strategic situations the acquisition of nuclear weapons by one or more adversary states may actually contribute to a relationship of stable mutual deterrence much as the development of invulnerable second strike nuclear capabilities have arguably stabilized relations between the Superpowers. They reached the conclusion that in these circumstances, nuclear proliferation is either positively beneficial for, or at least not detrimental to, the stability of the international system'[138]. Waltz argues that the spread of nuclear weapons will not make the bipolar world into a multinuclear one but it may reduce the chances of war.

> "Many wars might have been avoided had their outcomes been foreseen .... Predicting the result of conventional wars has proved difficult .... The likelihood of

(138) Ra'anan, V., 'Some political perspectives concerning the US-Soviet strategic balance' in Kemp, G. et al. (eds) The superpowers in a multinuclear world (Lexington, MA: D.C. Heath & Co., 1974) p.20; Rosen, S.J., 'Nuclearization and Stability in the Middle East' in Marwah, Onkar, and Schulz, Ann (eds) Nuclear Proliferation and the Near Nuclear Countries (Cambridge, MA: Ballinger, 1975) p.157; Sandoval, R., 'Consider the Porcupine: Another View of Proliferation' Bulletin of the Atomic Scientists vol 22, No 5, May 1976, pp.17-19; Waltz, 'The Spread of Nuclear Weapons: More may be Better', op. cit., p.30; Feldman 'A Nuclear Middle East', op. cit., pp.107-15, Israeli Nuclear Deterrence, op. cit., p.242.

> war decreases as deterrent and defensive capabilities increase. Whatever the number of nuclear states, a nuclear world is tolerable if those states are able to send convincing deterrent messages."[139]

He dismisses the fear of coups and instabilities inherent in new nuclear weapons states as exagerration[140]. He concludes his thesis by saying that 'the measured spread of nuclear weapons is more to be welcomed than feared'[141].

Whatever the pessimism or optimism expressed by the two contending views of the relationship between nuclear proliferation and the probability of the outbreak of nuclear war, there are a number of possible risks inherent in the future proliferation of nuclear weapons. Basically, there are two types of risk of war: Accident and deliberate action[142]. Accidents may be caused by human and machine error. The deliberate act could be an outcome of the action

(139) Waltz 'The Spread of Nuclear Weapons: More may be better', op. cit., pp.6,7.

(140) Ibid pp.10 & 11.

(141) Ibid p.30.

(142) See Fischer, D., Preventing War in the Nuclear Age (Totowa, N.J.: Rowman & Allen Held, 1984) pp.80-83; Dror, Crazy States, op.cit., pp.30, 39, 45; Feldman, Israeli Nuclear Deterrence, op. cit., pp.143, 174-5; Waltz 'The Spread of Nuclear Weapons: More may be Better' op. cit., pp.10-12; Frei, D., Risks of Unintentional Nuclear War (Beckenham: Croom, 1983) pp.155-65; Williams, P., Crisis Management: Confrontation and Diplomacy in the Nuclear Age (London: Martin Robertson & Co, 1976) pp.11-12, 95-101, 91-92, 94-95, SIPRI, Postures for Non-Proliferation(London: Taylor and Francis, 1979) pp.5-7.

of state decision makers or subnational groups. The composite hosts of risks associated with nuclear proliferation will in some way complicate international politics. Beaton summarized these complicating effects of nuclear proliferation.

> "The new complexity in the relations of powers is the most fundamental danger in a nuclear spread and so often appears to be the case with these weapons, the advantage will be with the incautious or apparently incautious ...If means are not found to contain proliferation, the whole structure of world security is going to become very difficult to sustain"[143]

Furthermore, several questions remain to be answered as to whether nuclear weapons spread would lead to fewer conventional wars, threaten alliances, lead to multipolarity and decision making under stress.[144] However, the

(143) Beaton, Must the Bomb Spread, op. cit., pp.23, 131; see Hoffmann, 'Nuclear Proliferation and World Politics', op. cit., pp.89-121; Rosecrance, R., 'Introduction', pp.1-9 and Quester, G., 'The politics of twenty nuclear powers', pp.56-77 in Rosecrance, R. (ed) The Future of International Strategic System (San Francisco: Chandler & Co., 1972).

(144) Frey, F.W., 'The adequacy of our conceptual tools for dealing with a proliferated world', in King, John (ed) International Political effects of the spread of nuclear weapons, op. cit., pp.208-9; Dunn, L.A., 'Aspects of Military Strategy and Arms Control in a More Proliferated World' in King, International political effects of the spread of nuclear weapons, op. cit., p.157.

proliferation of nuclear weapons involves a significant measure of risk. Some of the dangerous aspects are more worrisome than others. An attempt will be made to examine in detail the risks associated with nuclear proliferation in the Middle East, based on analysis of these risks and an experts judgements, to arrive at a balanced perspective of the likelihoods of these various risks.

CHAPTER TWO

NUCLEAR PROLIFERATION: ALTERNATIVE PROPOSITIONS

INTRODUCTION

Twenty five years ago, US president John F. Kennedy saw the possibility of a world in the 1970s with 15 to 25 nuclear weapons states.

> "I am haunted by the feeling that by 1970, unless we are successful, there may be ten nuclear powers instead of four, and by 1975, fifteen or twenty .... I see the possibility in the 1970s of the president of the United States having to face a world in which fifteen or twenty nations may have these weapons. I regard that as the greatest possible danger"[1]

On the contrary, in the mid 1980s, there are only five declared nuclear weapons states; one which had detonated a peaceful nuclear device, and one or two believed just below the explosion threshold. The proliferation of nuclear weapons has been very slow indeed, and the rate of proliferation has varied between one state to another as follows:

(1) President Kennedy commenting on failure of test ban treaty between USA and USSR in March 1963 quoted in Schlesinger, Arthur M, Jr., A Thousand Days: John F. Kennedy in the White House (London: Andre Deutsch, 1965) p.765.

USA and USSR	4 years (1945 - 1949)
USSR and Britain	3 years (1949 - 1952)
Britain and France	8 years (1952 - 1960)
France and China	4 years (1960 - 1964)
China and India 'peaceful'	10 years (1964 - 1974)
India and ?	years (1974 - ?)

Taking into account that nuclear weapons are a 45 year old technology, what was expected is that it has spread not that it has not spread further[2]. Given the extent of the revolution brought about by nuclear weapons and the advantages they might have posed to nuclear weapons states, the overwhelming view was that the spread of nuclear weapons would be relatively rapid and that a significant number of states could possess these weapons[3]. This view was based on the assumption that the scientific, technical and financial capabilities of a state determine its path in the proliferation chain. The focus of proliferation was to show which states have these capabilities and eventually possess the capacity to produce them, called 'Nth country problem'.

In this context it was predicted in the 1960s that 20 states were capable of developing nuclear weapons within the decade. Only two have done so, France and China. But the major defects of these propositions lie in focusing on the

(2) Nye, Joseph Jr., 'Political Solutions' Bulletin of the Atomic Scientists, Aug/Sep 1982, p.30.

(3) Beaton & Maddox, The Spread of Nuclear Weapons, op. cit., p210; Hohenemser, 'The Nth Country Problem Today', op. cit., pp.238-76; Bull, The Control of Arms Race, op. cit., chap 9; Bader, the United States and the spread of Nuclear Weapons, op. cit., chap 3; Barnaby, Preventing the Spread of Nuclear Weapons, op. cit., pp.16-35.

technical aspects of the problem without proper consideration for the political factors. These propositions eventually led to misleading conclusions about nuclear proliferation that were based on evaluations of capabilities without examination of the motivating elements. That could lead to the decision to develop independent nuclear weapons capabilities. It is not sufficient to establish which countries are capable of developing a nuclear weapons capability; their respective motivating factors for developing these capabilities must be examined. Security considerations, for example, may be the most important factor leading the country to go nuclear. Canada, one of the most advanced countries in the nuclear reactors field, could undoubtedly produce nuclear weapons with few problems, if such an undertaking would meet security or prestige needs. The same can be argued for most Western European countries and Japan. The reason behind their not going nuclear could have been political. In addition, there are some other countries which might not have produced or tested nuclear devices but which worked towards acquiring the option to do so whenever certain conditions arise. This could be true for countries such as India, Israel and South Africa.

When France and China became nuclear weapons powers, it was widely assumed that the spread of nuclear weapons was gathering an unbending momentum[4]. It was assumed that the

(4) Halperin, Morton H., China and Nuclear Proliferation (Chicago; Chicago University Press, 1966) p8; Bader, The United States and the Spread of Nuclear Weapons, op. cit., p.56.

process would only conclude when the 'Nth country' acquired a nuclear weapons capability. Since 1964 no other state has emerged as a nuclear weapons state. The main reason for this is that a state would not develop nuclear weapons simply because it has the capability to do so. Such a decision has to be based on other considerations of the impact of these weapons on its national security, especially at a time when the nuclear weapons states are continuing the development of their arsenals at a fast rate. Their example is not a good one. This gives justification for other states to acquire nuclear weapons. Meanwhile, the technical and economic burdens of going nuclear are gradually decreasing with time, because of the evolution and the spread of nuclear technology including nuclear power, electronics, chemical and engineering. The real cost of developing nuclear weapons is now less than it was in 1945[5].

The conventional wisdom of nuclear proliferation assumed that the scientific, technological and economic investments required for the construction and operation of nuclear reactors were such that relatively few countries would be able to undertake an indigenous weapons programme. Nevertheless, the process of nuclear weapons proliferation has been surprisingly low. A number of explanations have been given for this, including (a) the restrictive policies of the nuclear weapons states concerning commercial access

(5) UN, Report of the Secretary General, Comprehensive Study on Nuclear Weapons (New York: UN, 1980) p25; Jabber, Fuad, Israel and Nuclear Weapons (London: Chatts & Windus, 1971), chap VI.

both to sensitive technologies and weapons-grade materials, (b) calculated self interest of many non-nuclear weapons states for not going nuclear and (c) the development of international regimes, rules and procedures that establish a general predisposition against nuclear weapons proliferation[6].

The position of most countries with regard to nuclear weapons capability was not a matter of formulation and decision making but was determined by the state's level of scientific expertise, technological skills and economic resources. However, several events took place in the 1970s to change this state of affairs. First, following the 1973 Arab-Israeli war and subsequent oil crisis, nuclear power came to be seen as an attractive and perhaps the only alternative to oil in the foreseeable future for oil-deficient countries. Secondly, the competition of multinational corporations in nuclear technology and fuel led some of them to offer uranium enrichment and reprocessing technology along with reactors, in the expectation that this kind of package deal, with a cheap source of financing, would attract new customers. Thirdly, India detonated a peaceful nuclear device in 1974 using plutonium from a reactor supplied by Canada. External assistance could greatly facilitate the development of skills needed for such an undertaking. Fourthly, nuclear cooperation and collaboration between the Third World countries showed the possibilities of developing nuclear

(6) Nye, 'Political Solutions', op. cit., p.30.

weapons capabilities outside the direct control of the nuclear weapons powers. South African and Israeli collaboration and Arab-Pakistani-Latin American cooperation are now classical examples.

Moreover, the NPT, the main barrier against nuclear proliferation, faces several problems and challenges. Perhaps the most important is the problem oforganizing effective sanctions against a nuclear weapons proliferator. If there is a violation of IAEA safeguards or if there is another explosion of a nuclear device, then the response of all states, especially the Superpowers will be of the utmost importance in its impact upon further proliferation[7]. Nuclear exporting countries, especially the superpowers, could seek commercial and political advantages by restricting adverse reactions against new nuclear club members. The mild response of the USA and the Soviet Union to the Indian explosion of 1974 is a case in point. Superpower cooperation is possibly the most important step to be taken in the face of growing fears of further spread of nuclear weapons.

Collectively, these developments argue for new ways of thinking about nuclear proliferation. They constitute the reasons for suspecting that the assumptions on which the conventional wisdom rested have little relevance to a world where nuclear technology is increasingly attractive and

(7) Marwah, 'India's Nuclear and Space Programs: Intent and Policy', op. cit., p116; Williams, Shelton, The US, India and the Bomb (Baltimore: Johns Hopkins University, 1969) p11; Nacht, Michael, 'The United States in a World of Nuclear Weapons' Annals of the American Academy of Political Science No 430, March 1977

available and where the relative cost of a nuclear reactor is being reduced and diversion of materials from a research reactor is a demonstrated fact and nuclear cooperation is growing between Third World countries. In this sense, many countries can now make more substantive choices about nuclear weapons proliferation than ever before. Given that an increased number of countries may now gain the option of acquiring a nuclear weapons capability despite their lack of the required local scientific, technological and economic resources, we must revise our view of who might go nuclear, when, and under what circumstances.

The post-conventional nuclear proliferation wisdom argues that a country may choose to go nuclear, and this depends upon two sufficient conditions: the balance between incentives and constraints and the presence of any accelerating factors that might trigger the decision whenever incentives take precedence over constraints[8]. In the light of recent developments shown above and the inadequacy of the NPT and IAEA safeguards, the validity of the mechanistic prerequisite model seems dubious. Previous research and emergent events have demonstrated the inability of the prerequisites to correlate and predict the behaviour of a potential proliferator[9]. So what is needed is a

(8) Kegley, Raymond & Skinner, 'A Comparative Analysis of Nuclear Armament', op. cit., p.234.

(9) Ibid., p236. They found relationship between national wealth and scientific capacity of a country to its armament position is very weak; see Greenwood et al., Nuclear Proliferation, op. cit., p.57; Keeny et al., Nuclear Power: Issues and Choices, op. cit., pp.280-90; Wohlstetter, A. et al., Swords from Plowshares (Chicago: Chicago University Press, 1977) pp.17, 137-38.

revised and dynamic model which reflects current international technological and political realities.

Alternative Propositions of Proliferation

The alternative model is expected to be dynamic and able to contain the economic and technological factors as well as the political motivations and circumstances. Though the technological and economic aspects of nuclear proliferation are fully explored in the literature[10], the strategic, security and political dimensions from the small powers perspective are few and incomplete. We need a model which integrates both the technological and economic aspects with the political and security dimensions of the nuclear proliferation process.

The international product life cycle theory which explains the behaviour of a product throughout its life, progressing from 'new' to 'mature' and ultimately to 'standardized' product stages[11] could be the starting point. It is easier to describe the development of the international nuclear industry in terms of a behavioural model since the experience of the nuclear industry has had persistent

(10) Goldschmidt, Bertrand, The Atomic Adventure: Its Political and Technical Aspects (London & New York: Pergamon & MacMillan, 1964); Barnaby, Preventing the Spread of Nuclear Weapons, op. cit., pp.65-112; Bull, The Control of Arms Race, op. cit., chap.9.

(11) Posner, M.V., 'Technical Change and International Trade' Oxford Economic Papers, 13, 1961, pp.323-41; Leontief,W., 'Domestic Production and Foreign Trade: American Capital Reexamined' in Bhugwati, J., ed, International Trade (Hammondsworth: Penguin, 1969) pp.93-139; Vernon, R., 'International Investment and International Trade in the Product Cycle' Quarterly Journal of Economics, 80, 1966, pp.190-207, Hirsch, S., Location of Industry and International Competitiveness (London: Oxford University Press, 1967).

regularities that may fit in well with the product cycle explanations and prediction. The product cycle theory which was originally based on the theory of diffusion of innovation sees the history of a product as three basic stages: new, mature and standardized. The most significant assumption is that the different factors of production, skilled labour, unskilled labour and physical capital, are of varying relative importance in these phases. At the first stage when the new products and processes are introduced, the industry will employ a higher proportion of skilled labour than in other stages. At this stage, the comparative advantage is expected to be with countries such as the USA and certain developed countries which have a relative abundance of skilled labour. At the second stage, design and marketing of the product are the problem, so the proportion of research labour input will fall. At the final stage when the product becomes more standardized, the cost of the product will be the main focus. Since technology is fairly stable, an input of large unskilled labour will be relatively of great concern. The importance of human capital will diminish. So comparative advantage shifts between countries as the product passes through the different stages of the cycle. The theory seems to have achieved greater success in explaining and predicting international trade and investment than the factor

There is a basis for picturing the development of the international nuclear industry in the following terms: To begin with US industries generate new products and processes and respond to the relative abundant availability of production factors and high per capita income. They introduce these new products and processes abroad through export. When their position is threatened they establish overseas facilities to exploit what remains of their advantage. They retain their oligopolistic advantage for a period of time, then lose it because the original lead is completely eroded.

On the other hand, the political and security considerations and the dimensions of nuclear weapons proliferation can be seen in terms of the international political system, the actors and major political and military circumstances. These factors are the main motivations, mitigations and precipitance for the development of nuclear weapons capabilities by major powers in different periods of time. The bipolar nature of the international political system was the main reason behind the accumulation of large nuclear weapons capabilities by

(12) See Vernon, R., Storm over Multinationals: The real Issues (London: MacMillan, 1977), pp.39-88; His (ed) The Technology Factor in International Trade (New York: Columbia University Press, 1970); Hubfauer, G.C., Synthetic Materials and the Theory of International Trade (London: Duckworth, 1965); Stobaugh, R.B., 'The Technology Account of International Trade: The Case of Petrochemicals' Journal of International Business Studies, Fall 1971, pp.41-60; Wells, L.T. Jr., (ed) The Product Life Cycle and International Trade (Boston: Harvard Business School, 1972); Vernon, R., Sovereignty at Bay: The Multinational Spread of US Enterprises (New York: Basic Books, 1971).

the superpowers[13]. Alliance cohesion, guarantees, assurances and friction between the USA, Britain and France was a major motivating factor which led to creation of the independent nuclear arsenals of Britain and France[14]. Regional rivalry and concern over security could be the main force behind the development of nuclear weapons capability of China and nuclear weapon potential of India and perhaps of Israel and South Africa[15]. It is possible to draw some observations about the political and security dimensions of nuclear weapons proliferation process by picturing major political and security events of the international system on a time scale. The proposition of the alternative model of nuclear weapons proliferation is that major political and military variables of the international, national and subnational systems play a major role in the development and spread of nuclear weapons. These factors determine the decision of many countries to go nuclear.

(13) Waltz 'The Spread of Nuclear Weapons: More may be Better', op. cit., p.2.

(14) Gowing, Independence and Deterrence, op. cit., p.441; Freedman, Lawrence., The Evolution of Nuclear Strategy (London: Macmillan, 1981) chap.1, Britain and Nuclear Weapons (London; MacMillan, 1980) p.7; Buchan, A., British Defence Policy and the Western Alliance (Stockholm: Swedish Institute of International Affairs, 1963) p.4; Groom, British Thinking about Nuclear Weapons, op. cit., p.562; Kohl, French Nuclear Diplomacy, op. cit., pp.32-36.

(15) Dunn & Kahn, Trend in Nuclear Proliferation, op. cit., ; Beaton & Maddox, The Spread of Nuclear Weapons, op. cit., p.185; Beaton, Must the Bomb Spread, op. cit., p.66; Epstein, 'Why states go - and do not go - nuclear', op. cit., ; Greenwood et al. Nuclear Proliferation, op. cit., p.33.

Product Cycle of the International Nuclear Industry

To understand the nuclear proliferation process on the alternative model it is necessary to give a detailed account of the stages of the development of the nuclear industry. The detailed account of the industry gives a clear and empirical picture of the spread of nuclear technology since the beginning of the birth of the industry till today and should help to provide reliable prediction of the future of this spread, especially among Third World countries.

Early Years of the Development of a Nuclear Industry

Nuclear power has a short history but a spectacular impact on the life and future of mankind. The history of nuclear power goes back to the announcement in a letter published by Lisa Meitner and Otto Frisch of the splitting of the atom by a process of fission in 1939[16]. Otto Frisch and Rudolph Peierls, working at Birmingham University explored for the first time in a memorandum the possibility of producing an A-bomb. This memorandum led to the formation of MAUD (Military Application of Uranium Detonator), a group of British scientists charged with evaluating the feasibility of a uranium bomb. In April 1940, MAUD issued a report about military and civil application of nuclear power:

(16) 'Letter to the Editor', Nature, 11 February 1939, p.239.

(17) Gowing, M., Britain and Atomic Power, 1939 - 45 (New York: St. Martin's, 1964) Appendix 1.

"There must always be a very close relation between the exploitation of nuclear energy for military explosive purposes and for power production in peace and war. The development of one will have a considerable effect on the development of the other"[18].

The world's first nuclear reactor went operational on December 2, 1942 at Chicago University. It was operated by Fermi and marked the beginning of the nuclear age. This eventually led to the formation of the Manhattan Project and the development of the atom bomb.
Although nuclear power was recognized in several countries as a potential source of cheap electric power, the realisation of this power in practice required vast resources and advanced engineering and technological skills. From 1945 to 1950 armaments remained the main focus of nuclear development. In the USA responsibility for all matters of atomic energy development was transformed from the Army to the Atomic Energy Commission[19]. Britain started GLEEP (Graphite Low Energy Experimental Pile) in August 1947 following a similar development in the Soviet Union six

(18) Ibid p.435.

(19) Burn, Duncan., <u>The Political economy of Nuclear Energy</u>, Research Monograph No9, Institute of Economic Research, 1967, p.16.

months earlier. Canada joined the race in the same year by building a general purpose reactor.

By 1950 it had been decided in the USA and in Britain that the time was ripe for speeding up the application of nuclear energy to generate electricity. The US Atomic Energy Commission announced in 1950 a willingness to make study agreements with manufacturers, engineer contractors and utilities who were interested in studying the results of the Atomic Energy Commission's work on reactors. Potential designers, makers and users of nuclear power plants were allowed to evaluate various systems for this purpose[20]. A report of the US Atomic Energy Commission published in January 1953 indicated that

> "Four different industrial groups had told the commission that they saw attractive possibilities for utilizing atomic power on an economic basis in a few years"[21]

By February 1955, 19 groups had made such agreements, 12 had evaluated several reactor systems and three had undertaken substantial design and development programmes.
In early 1950s both the USA and the Soviet Union accelerated their research and development programmes to commercialize

(20) US Congress, Hearings on the Development, Growth and the State of Atomic Energy Industry Joint Committee on Atomic Energy (Washington D.C.; Government Printing Office, 1955) Pt I, P II.

(21) New York Times 29 January 1953.

nuclear power[22]. The US Atomic Energy Commission embarked on a five year experimental programme to build and develop five types of reactors which it selected as giving promise for civilian power application[23]. Four of those it selected were relatively small. One of these was the first Boiled Water Reactor (BWR). The fifth was a 60MW prototype Pressurized Water Reactor (PWR) to be built at Shippingport, Pennsylvania (the first true nuclear power plant) and operated on a utility grid[24]. Construction work began in September 1955 and it was commissioned in December 1957. The PWR had been developed since 1948 for use in submarines when the US Department of Defence asked the Atomic Energy Commission to produce a nuclear reactor for submarine propulsion. It was the only type of reactor the commission wanted to test which was ready for large scale production. Meanwhile, the Soviet Union built a 5MW Obninsk Light Water Reactor in 1954[25], and Britain commissioned a 70MW nuclear power station in October 1956.

By 1955 the US Atomic Energy Commission thought that several nuclear designs had reached the stage where it would

(22) De Leon, Peter., Development and Diffusion of Nuclear Power Reactors: A Comparative Analysis (Cambridge, MA: Ballinger, 1977).

(23) US Congress, Hearings on the Development, Growth and the State of the Atomic Energy Study, op. cit., p.97; US Congress, Peaceful Uses of Atomic Energy, Background Information for the Report of the Panel on the Impact of the Peaceful Uses of Atomic Energy, Joint Committee on Atomic Energy (Washington D.C.: Government Printing Office, Jan 1956) vol2, p.38.

(24) Ibid. p.10. US reactor was exclusively used for electricity generation.

(25) Veretennikov, Gennach., 'Peaceful Atoms in the Soviet Power Industry', Soviet News, 8 August 1984, p.8.

be useful to build large prototypes to be operated like the Shippingport reactor on the power supply grid of a utility. A power demonstration programme was introduced to encourage the building of these prototypes by private industry[26]. Under this programme the Commission could give assistance, waive charges for fuel use and give some assistance in research and development and training. Seven projects were under contract or being negotiated by the end of 1955. However, none of the plants was expected to be competitive with coal-based power plants.

The extent of the American experience and success up to 1962 was best accounted for in a an AEC report on civil nuclear power for US President Kennedy[27]. The report showed that there were 3PWR, 2BWR and one SCGM (Sodium Cooled and Graphite Moderated) reactors operational. Another 4 BWR, one HWR (Heavy Water and Moderated Reactor), one OCR (Organic Cooled and Moderated Reactor) and one fast breeder reactor were due for completion during 1963. 2 HCGR (Helium Cooled and Graphite Moderated Reactor) and one BWR reactors were planned to be completed after 1963. The report concluded that nuclear power was 'at the threshold of economic competitiveness with other electricity sources'[28] The light water reactor - BWR and PWR - had passed through the experimental and prototype stages. Full scale plants then operating, like Dresden, were producing electric power

(27) US Atomic Energy Commission, Civil Nuclear Power, A report to the President (Washington D.C.: US AEC, 1962) p.32.

(28) Ibid. p.34.

at 10 mills per kilowatt[29]. A large unit of about 500MW capacity could now be made. The report predicted the cost of such plant which could be completed by 1966 at $175 per kW and the initial cost of producing power at 6.2mills per kW could be reduced in a few years to 5.6mills or less per kW. Then the plant would be competitive with coal - fired power plant.

Meanwhile, Britain outlined the first nuclear power programmer of its kind in February 1955 to spend £300 million over the next ten years to build 12 nuclear power stations capable by 1965 of generating 1500 - 2000 MW (8 - 11% of electricity production) and in 1957 the programme was revised to 5000 - 6000 MW at a cost of £1460million[30]. The programme was based on a British model, a graphite moderated Magnox reactor at the Calder Hall plant which was built in 1953. The Magnox model was expected to be competitive with a coal-fired plant, following a successful operation of Calder Hall power station in 1956. But when the first plant of the nuclear programme was commissioned in 1962, the cost of the Magnox plant was 1d per kW compared with coal at 0.5d per kW. Burn explained that the British decision to go ahead with the programme gave the impression that Britain had a commanding lead compared with the USA when the Americans were experimenting with various prototypes before

(29) Ibid. p.58.

(30) Stewart, J.C., 'United Kingdom Programme', in OEEC, Industrial Challenge of Nuclear Power (Paris: Organisation of European Economic Cooperation, 1957) p.206; Cmd 9389.

they decided on the light water reactor[31]. The programme was also shelved to 5000MW only to be completed by 1968, one order per year, and the Central Electricity Generating Board did not want to commit itself to ordering even one station per year after 1964.

In the USA by early 1963, three plants with approximately the characteristics set out in the AEC report, had been ordered or planned, all PWR, from Westinghouse[32]. A year later General Electric took the nuclear energy industry along step over the threshold by important design changes which enabled it to make a dramatic reduction in the price of nuclear power plant when it quoted for the Oyster Creek plant[33]. At the end of 1963, General Electric obtained two major orders for major plants to be completed by October 1967 and November 1965 respectively, whose initial ratings were 515 MW and 500 MW at cost of $134 per kW which was 25% less than the cost estimate of the AEC report and at 640MW it cost $108 per kW, almost 40% below the 1962 forecast. General Electric could begin to make the enormous investment in nuclear power remunerative. The BWRs were now proved and reliable and several utilities had experience in using them. If their price could be brought down near to that of conventional power stations, many utilities would be ready to buy them. If a sufficient number of BWRs was sold then the price could be brought

<31> Burn, The Political Economy of Nuclear Energy, p.20.

<32> US Atomic Energy Commission, Annual Report 1964.; US Federal Power Commission, National Power Survey, voll, 1964.

<33> Ibid.

close to that of a coal-based plant and would reduce the cost of making plant and of fabricating fuel elements. The Oyster Creek price had been a good indication of the price a utility would have to pay for this type of reactor in 1964-65.

The experience of the development of the nuclear industry in the USA during the period of late 1940s and early 1960s seems to fit in well with the prediction of the product cycle theory's first stage which involves stimulus and unique response. The US civil nuclear power development, obviously derived some advantage from the fact that the nuclear industry was established there during the second world war for military purposes. The USA had spent $2200 million by 1946 and there were several production reactors and separation and enrichment plants in operation[34]. Expenditure continued to be enormous and during the 1950s continued to expand. The total expenditure by 1965 had reached $36650 *million of which three quarters* of the operating expenditure after 1953 was spent on the purchase of uranium, enriched uranium and plutonium and the development and manufacture of weapons. On the other hand, two thirds of the fixed investment of $8871 million was devoted to these purposes[35]. Reactor development took 16% of operating expenditure and below 7% of gross investment. The remaining substantial expenditure went on research and development. The last two items were of special value for

(34) US Atomic Energy Commission, Annual Report 1965.

(35) Ibid.

civil nuclear reactor development.

Undoubtedly the US position was favourable in every respect[36]. According to the product cycle theory the innovating country has the comparative advantage in terms of capital, skilled labour and research and development employed. Compared with Britain, the USA was in a favourable position in terms of these factors in the 1950s and early 1960s.

	US/Britain (1954)	US/Britain (1961)
1. Ratio of people employed in all nuclear activities	4.5:1	2.75:1
2. Ratio of scientists and engineers	5:1	4:1
	US(1965)	Britain(1962)
Expenditure on civil programme (Research & Development)	£1070m	£500m

Source: USAEC/UKAEA Annual Report

The first nuclear industry took shape because of the war and the USA had earliest experience with large reactors. The scale of the work allowed early research into a wide range of reactor design systems. Because of the abundance and low cost of fossil fuels in the USA, nuclear power has to be much cheaper than in Britain, a leading innovator in nuclear

(36) Ibid., US Atomic Energy Commission, Report to the President, op. cit., p.30; UK Atomic Energy Authority, Annual Report, 1962/66 p.2, 1957/58, pp.34-35.

development, to be competitive and economically attractive. It allowed enriched uranium to be made cheaply. The US consumption of electricity was seven times that of Britain by 1960[37]. In the USA 80% of electricity was supplied by steam electric power using coal, oil and natural gas. Most of the remainder was provided by hydro power plants. From 1950 US utilities were using large generating units and the USA had long pioneered the use of large units and high pressure from steam engines which rapidly increased in 1950s and 1960s[38]. Vernon wrote in 1977 explaining this phenomenon.

> "The original idea may be developed almost anywhere, but successful innovation depends strongly on the compelling character of the demand."[39]

The large production of enriched uranium for military purposes meant that the USA did not at any stage need to restrict itself to those reactors which did not need enriched uranium. Moreover, the major private corporations in the nuclear field had not only great experience but a large income from contracts with the US AEC. After 1962, the USA increasingly set the standards by which comparison of achievement in civil nuclear energy are based in Britain

(37) Burn, The Political economy of Nuclear Energy, op. cit., p.73.

(38) Ibid.

(39) Vernon, Storm over the Multinationals, op. cit., p.41.

and elsewhere[40]. In Britain the lack of standardized design 'prevented the industry from generating the competitive drive to win contracts abroad'[41]. Continental preferences outside France had moved in favour of American reactor types by the late 1950s and in France the attachment to the gas graphite system was based on a desire to avoid using imported enriched uranium.

The Growth and Emergence of an International Nuclear Industry

In the USA 26 new large light water reactors were ordered between September 1965 and November 1966, which was a vindication of the previous prediction of a large flow of orders of both BWRs and PWRs[42]. Several utilities had called for bids from manufacturers. General Electric had now obtained orders for 12 more BWR units, most of them larger than Oyster Creek and all of them reflecting further technological development[43]. Westinghouse had orders for nine more PWRs and two utilities had options on further large Westinghouse units which also included important developments on their pre Oyster Creek designs[44]. Combustion Engineering and Babcock and Wilcox had also

(40) Burn, the Political Economy of Nuclear Energy, p.73.

(41) Financial Times, 7 February 1967.

(42) US Atomic Energy Commission, Report to the President, op. cit., p.32.

(43) US Atomic Energy Commission, Annual Report, 1967; USAEC, Civil nuclear power, a report to the President, a supplement to the 1962 report, March 1967.

(44) Ibid.

succeeded in breaking into the business[45]. Many of the plants on order were to be operating commercially before 1970 or in early 1970, within 3½ or 4 years of the placing of the order. By the end of 1966 General Electric and Westinghouse were so heavily occupied that they were not ready to accept any major orders for delivering before 1972. It was estimated that 60% of generating capacity orders in the USA in 1966 had been nuclear[46] and that by the end of 1967 the USA had 20 times as much nuclear capacity on order as it had in operation[47].
With this flow of orders came the announcement of June 1966 that the Tennessee Valley Authority (TVA) had ordered two 1050MW BWRs from General Electric, a further landmark in the advance of nuclear power. It cost about 2.37mills per kW while a coal-fired station would cost 2.83mills per kW[48]. TVA's decision was generally believed to have a significant factor in leading several utilities to go nuclear[49]. As 1966 ended the US industry was preoccupied with building the plants on order.

The apparent success of commercial nuclear power in the USA boosted nuclear energy programmes around the globe.

(45) Ibid.

(46) Burn, the Political Economy of Nuclear Energy, op. cit., p.30.

(47) Flavin, Christopher., Nuclear Power: The Market Test, World Watch Paper No57 (Washington D.C.: World Watch Institute, Dec 1983) p.10.

(48) USAEC, A Supplement to the 1962 report to the President, op. cit.

(49) Perry, R.L. et al, Development and Commercialization of the Light Water Reactors 1946 - 1976 (Santa Monica, Calif.: Rand Corporation, 1977).

Britain and France had built successful prototypes of GCRs (Gas-Cooled Graphite moderated reactor) fueled with natural uranium while Canada was well along in developing its CANDU heavy water designs[50]. The French and British pursued reactor programmes designed to serve both military and commercial power requirements. Canada chose a civilian nuclear power programme to develop the economy[51]. There were comparatively few orders for nuclear plants outside the USA, although coal and oil prices were everywhere much higher than in the USA. The advantage of using nuclear power if it could be obtained cheaply would be greater. But most analysts concluded that economical nuclear power was at least several years away in all these countries[52]. In 1972 an authoritative report concluded

> "Aside from Great Britain and Canada, the success of nuclear power is the success of American light water reactors ... which overwhelm all markets where true competition exists"[53]

The Soviet Union programme lagged behind that of the USA, with only eight small nuclear plants operating by the late

(50) Stewart, 'United Kingdom Programme', op. cit., UKAEA, Annual Report 1963/64, op. cit.

(51) Mueller, P.G., On things Nuclear: The Canadian Debate (Toronto: Canadian Institute of International Affairs, 1977) p.5.

(52) Flavin, Nuclear power: The Market Test, op. cit., p.11.

(53) Bupp, Irvin and Derian, Jean-Claude, Light water: How the Nuclear Dream Dissolved (New York: Basic Books, 1978) p.8.

1960s[54]. Switzerland ordered two medium size plants from the US - General Electric and Westinghouse. Spain ordered one BWR to be built by General Electric. Another 400MW BWR (70% designed and built by Sweden) was to be built in Sweden and completed in four years at a cost of $170 per kW. In West Germany and Belgium there were several plans for constructing viable 600MW nuclear plants but no orders were made during this period. The decision to order nuclear plants in West Germany was postponed partly due to the rise in the cost of finance and mainly because the government subsidies to utilities to install coal-based stations to protect the coal industry[56]. Belgian plans were to build two 600MW stations. The cost of the American tender was $150 per kW while a Belgian license of Westinghouse's offer might cost 10% more. Three medium plants - the larger was 400MW - were ordered by Japanese utilities, two BWRs from General Electric and one PWR from Westinghouse.
In 1958 Britain sold a nuclear power reactor to Italy and Japan. No more were sold because of Britain's insistence on the need to pursue for the next 20 years her own reactor (Magnox) which was described as unsuitable for export[58]. Canada was successful in selling its heavy water

(54) '479 Atomic Reactors' The Economist, 21 June 1969, pp.48-49.

(55) Nuclear Engineering, Jan. 1966, p.41.

(56) Burn, the Political Economy of Nuclear Energy, op. cit., p.35.

(57) Ibid.

(58) Wilmshurst, 'The Development of Current Non Proliferation Policies', op. cit., p.22, Hansard, 10 July 1963, col 1415.

reactor (CANDU) to Third World countries such as India, South Korea and Argentina, and also to Italy[59].

Thus by the beginning of the mid 1960s, US companies aggressively marketed nuclear technology in Europe, Japan and some developing countries. The companies were assisted by the US government's 'Atoms for Peace' programme. One of the main aims of the programme was to provide abundant electrical energy to power-starved areas of the world[60]. The US target for the programme was Euratom following its recommendation calling for vast increase in Europe nuclear generating capacity and close cooperation with the USA. The USA concluded several bilateral nuclear agreements in the 1950s with Euratom countries and allies as well as with particular developing countries. More than a dozen countries bought American plants or signed licence agreements with US corporations. The US government provided financial subsidies through low interest Export/Import bank loans and guarantees of supply of enriched uranium and research and development. US direct subsidies to Euratom, known as Trojan Horse, through which US companies captured European markets, amounted to half its budget[61]. Today France, Japan and West Germany all build nuclear power plants based on US designs[62].

(59) Mueller, On Things Nuclear: The Canadian Debate, op. cit., pp.31-38.

(60) US Congress, nuclear proliferation factbook, op. cit., p.12; US Congress, Peaceful Uses of Atomic Energy, op. cit., p.38.

(61) Bupp & Darian, Light -water-, op. cit., chap.1, p.29; Perry et al., Development and Commercialization of Light Water Reactor, op. cit.; Walter & Lonnroth, Nuclear Power Struggle, op. cit., chap.1.

(62) De Leon, Development and Diffusion of Nuclear Power reactor, op. cit.

In the late 1940s, major atomic activities were limited to the USA, Britain and the Soviet Union. In 1965 there were 300 research reactors and 45 power reactors throughout the world compared with only 19 research reactors in 1953. These were located in Canada, France, Soviet Union, Britain and the USA[63]. In 1956 20% of the orders placed by utilities in the USA for new power plants were nuclear, but by 1966 nuclear power plants accounted for more than 60% of new orders. The pattern in the USA was a vindication of a worldwide trend towards nuclear fuel as one of the primary sources of energy to meet rapidly expanding demands for electricity. Construction of nuclear power plants would be concentrated in the industrially advanced countries, but some developing countries would see in nuclear power an attractive alternative to conventional plants using fossil fuels. Nuclear power is particularly attractive in areas where demand exists for a relatively large amount of electricity in a compact area and where load factors are high[64]. The late 1960s and early 1970s marked a great expansion of Third World nuclear power programmes. Nuclear power was welcomed as an alternative to imported fuel and as a way for developing countries to propel themselves into the

(63) Hall, John A., 'Atoms for Peace for War' Foreign Affairs, July 1965, pp.602-615; Walske, C., 'Proliferation and Electric Power' International Security, vol 1, No 3, 1977, pp.76-97.

(64) Willrich, Mason., 'International Control of Civil Nuclear Power', Bulletin of The Atomic Scientists, March 1967, pp.31-38.

20th century[65]. Exports of nuclear technology were vigorously promoted by the multinational corporations that dominate the industry and by government agencies such as the US Export/Import bank. The IAEA was influential in selling nuclear power in the Third World[66]. Sixteen developing countries had nuclear power programmes by the mid 1970s. Argentina, Brazil, India, South Korea and Taiwan are among the countries that pushed hardest.

By 1973 worldwide nuclear power capacity had risen to 43,000MW provided by 115 reactors compared with 5MW in 1955 and 5000MW in 1964[67]. The USA had half of the total world capacity and Britain one eighth. France and the Soviet Union had the equivalent of only three 1000MW nuclear power plants and Canada, Japan and West Germany only two each. But nuclear construction programmes were in full swing in half a dozen countries and a dozen more programmes were scheduled to begin soon. In the peak growth years of 1971-74, over 200 nuclear power plants were ordered worldwide, approximately doubling the number of planned reactors.[68] By the end of 1975, there were 149 nuclear power plants in 19 countries producing electric power and about 355 nuclear power plants with a total capacity of

(65) Katz J.E. & Marwah, Onkar., Nuclear Power in Developing countries (Lexington, MA; Lexington Book, 1982); Barber Associates, LDC Nuclear Power Prospects, op. cit.; Sardar, Ziaddin., 'Why the Third World Needs Nuclear Power' New Scientist 12 Feb 1981.

(66) IAEA Annual Report, various years.

(67) 'Coming of Nuclear Age', Scientific American, November 1964, p.56; IAEA Annual Report 1973.

(68) IAEA, Annual Report, various years.

220,000 MW were expected to be set up worldwide by 1980.[69] Six developing countries had acquired nuclear plants and 23 more were under construction or on the drawing board. World export of nuclear plant technology, fuels and services amounted to $36000 million. Two-thirds of this amount came from the USA. The USA built 70% of the world's reactors, exported nuclear fuel and reactors and captured two-thirds of export market share.[70] By then, however, West Germany, France and Canada were challenging the US lead and Japan and the Soviet Union were to enter. The West German-Brazilian deal was an example of the European threat to US domination.[71] Out of 29 worldwide orders for power reactors in 1978, the USA managed to obtain only two contracts.[72] The US share of the export market had fallen dramatically from 100% in 1972 to 50% in 1977 and to 14% in 1978. Furthermore, the American and Soviet Union monopoly of uranium enrichment business was eroded when many European countries, in order to free themselves of dependence on US sources and to avoid the harsh consequences of shortage of supply in the future, began construction of enrichment facilities like Eurodif, Urenco, using different techniques developed in the seventies, the 'centrifuge, 'nozzle-beck'

(69) IAEA, Annual Report, 1975; Atlantic Council, Nuclear Fuels Working Group: Nuclear Policy, (Boulder, Co.: Westview, 1976), p.7.

(70) 'Nuclear Trading-Go-Round' The Economist, 6 December 1975, p.74; 'US tries to clarify position on export materials', The Times, 21 April 1975.

(71) Lawrence, William W., 'Nuclear Futures for Sale: From Brazil to West Germany', International Security, Vol 1, No 2, Fall 1976, pp.147-166; 'Brazil Bitterly Resents Carter Adm. Effort to Kill WGer Deal' New York Times, 30 March 1977.

(72) 'World Nuclear Industries', Financial Times, 3 October 1978.

and 'laser'.[73]

Commercial Uranium Enrichment Suppliers (1977)

	Operational	Planned
US (3 plants)	17 230 tons/year	10 500 tons/year
USSR	3 000 tons/year	10 500 tons/year
Britain	500 tons/year	10 500 tons/year
Urenco	60 tons/year	800 tons/year
Eurodif	60 tons/year	10 300 tons/year

Source: Financial Times, 4 April 1977.

By the end of 1978, there were 400 research and experimental reactors of under 20MW in approximately 50 countries compared with only four countries operating research reactors in the early 1950s. In the commercial power reactor sector, there were in the USA 64 power reactors in operation, 72 under construction, 84 on order and 8 more on the drawing board while in the international arena there were 112 power plants in operation, 117 under construction, 60 ordered and 180 planned in 45 countries. In the 1950s only six countries operated power reactors.[74]

Though the 'Atoms for Peace' programme inaugurated the widespread diffusion of commercial nuclear power, for such power to become a reality a decade of costly technological development would be required. As a result an intense international competition emerged among the major industrial

(73) Lellouche, Pierre., 'France in the International Nuclear Energy Controversy: A New Policy under Giscard d' Estaing' Orbis, 23,4, Winter 1979, pp.951-965; 'Nuclear Power in France' Atom No 267, Jan 1979, p.22.

(74) Walske, 'Proliferation and Electric Power', op. cit., pp.96-97.

powers, France, Britain, Canada and the USA to win the valuable future market of nuclear export sales. This competition can be understood in the light of the separate paths of nuclear development chosen by the countries involved. From the mid 1950s to the late 1960s, Britain produced the world's largest installed nuclear generating capacity, but technological problems, combined with rising costs and poor long-range planning, slowly eroded the leading nuclear position held by Britain.[75] The British, unlike most other countries which based their programmes on US and Canadian reactor designs, relied entirely on indigenous design to serve military and energy purposes. At first France pursued a similar programme and also was unable to compete in the international reactor export market during the 1950s and 1960s. As a result, in 1969, it abandoned, like West Germany, its natural uranium power reactor for one fueled with enriched uranium.[76] In contrast with the British and the French, the Canadians were successful in marketing their heavy water moderated natural uranium fuelled reactor in the Third World. However, it became apparent that for some time the Third World would lack the technically trained manpower necessary to utilize nuclear power for electrical purposes. As a result many developing countries, in concert with the IAEA, embarked upon smaller scale nuclear research projects in order to acquire the skills needed for the implementation of full scale

(75) Burn, The Political Enemy of Nuclear Energy, op. cit., p.134.

(76) Nuclear Industry, 1969, p.22.

commercial nuclear power programmes. India's early acquisition of a skilled nuclear elite was a critical factor leading to its explosion of an atomic device in May 1974.[77]

The emergence of a world nuclear industry, the spectacular US nuclear growth and expansion and dominance of the export market demonstrate the sequence of the growth stage of the product life cycle; the original innovator is compelled by internal competition and market growth to turn to export and investment in relatively advanced countries. The US industry retained world market leadership and oligopolistic advantage by virtue of being the innovator, by development of economically attractive light water reactor technology, control of enrichment technology and production and availability of free supplies and finances. Eighty per cent of all reactors built or under construction worldwide were American or based on American designs, the light water reactor. During the period 1955 - 77, the US Export-Import Bank financed 45 out of 57 nuclear plants exported, worth $5 billion. The USA sold 57 out of 74 nuclear reactors exported worldwide during the same period, and controlled 83% of world enriched uranium production. By the end of 1975, however, the original American lead and advantage in the international nuclear industry began to be completely eroded.

(77) Jaipal, R., 'The Indian Nuclear Situation', International Security, Vol 1, No 4, 1977, pp.44-45.

The Demise of the American Nuclear Industry

The product cycle theory postulates that when the lead of the innovating country (or countries) becomes eroded, the product and process enter the final stage of the product cycle - 'maturity'. At this stage where standardization is fairly established in technological processes and products, technological flow is now less important. Competition is primarily on price and marketing grounds. West European countries have entered the marketing aggressively by offering package deals including enrichment and reprocessing facilities.[78] Moreover, the increasing competition between suppliers on the international nuclear market will lead to a greater spread of nuclear technology and materials especially in the less developed Third World countries. At this stage more countries can entertain the option of acquiring nuclear technology and skills.

By the end of 1978, the USA had won fewer export orders than before with all the contracts lost going to overseas manufacturers of American-based technologies, the West German and French corporations.[79] West Germany, France, Canada and Sweden became major manufacturers of nuclear power plants. Between 1971 - 77, of 19 export orders for nuclear power plants announced by these countries, West Germany won ten orders, France six, Canada two and Sweden

(78) See Baker, Stevens., 'Why not a Nuclear Fuel Cartel', Arms Control Today, vol 5, No 11, November 1975, pp.1-8.

(79) 'World Nuclear Industries', Financial Times, 3 October 1978.

one. The export thrust led by the French and West Germans stemmed from their declared intentions to increase their export market share of high technology equipment both for political and economic reasons.[80] Given the contingencies of the energy crises following the Arab-Israeli war of 1973, it was logical for them to concentrate on nuclear power. The French Prime Minister Jacques Chirac spoke in early 1975 as follows:

> "For the immediate future, I mean for the coming ten years, nuclear energy is one of the main answers to our energy needs"[81]

Nuclear power was then easier to develop in Europe than in the USA, given a strong tradition of government control of the utility industry and many links between government officials, banks and private corporations.[82] With the rapid growth of electricity demands and the relative scarcity of indigenous energy sources in Western Europe, few challenged the notion that nuclear power deserved a high priority.[83]

(80) See 'The Future for Nuclear Power', Financial times, 25 August 1982; Irvin C. Bupp 'The French Nuclear Harvest: Abundant Energies or Bitter Harvest?' Technology Review, November/December 1980.

(81) Quoted in Bupp & Derian, Light Water, op. cit.

(82) 'Nuclear Power in Germany', Atom, No 271, May 1979, p.24; Lellouche 'France in the International Nuclear Controversy', op. cit., pp.951-65; Walker & Lonnroth, Nuclear Power Struggles, op. cit., pp.54-66; 'World Nuclear Industries', Financial Times, 3 Oct. 1978.

(83) Bupp & Derian, Light Water, op. cit.; Perry et al., Development and Commercialization of Light Water, op. cit.; Walker & Lonnroth, Nuclear Power Struggles, op. cit., pp.30-31.

The strong West German and French nuclear programmes have meant offers to the relatively less developed countries not only of nuclear power plants but also of reprocessing facilities and enrichment services backed by favourable financial terms. Financial competition between supplier countries is quite significant in winning orders. All recent contracts for the construction of nuclear plants in developing countries had involved official export credit assistance from the supplier countries.

In fact, France's position and role in the international nuclear energy market had been consolidated with President Giscard's arrival in office.[84] This period which had seen the first major success of the French nuclear industry's exports efforts along with the launching of an ambitious domestic nuclear energy programme, showed France's impressive technological advances in key areas such as fast breeder reactor technology and reprocessing of spent nuclear fuel. France has emerged as the country holding the technological and economic edge, and this allowed it to have a major input in the development of a world nuclear order. It is the only country that can offer on the world market the totality of services in the nuclear fuel cycle,

<84> Lellouche 'France in the International Nuclear Controversy', op. cit., pp.951-65.

<85> Ibid.

<86> Walker & Lonnroth, Nuclear Power Struggles, op. cit., p.61; Bupp 'The French Nuclear Harvest', op. cit.; 'The Future for Nuclear Power' Financial Times, 25 August 1982.

enrichment 'Eurodif', nuclear power plants 'Framatone', reprocessing 'Cogema-Lahague', and fast breeder reactor 'Superphoenix'. Coupled with this new industrial potential the development of a foreign nuclear policy has given France a decisive international influence for the foreseeable future.

West Germany, on the other hand, was a latecomer to nuclear power development (1956) but one advantage of being a latecomer is the opportunity to profit from work that has already been done.[87] It took a major step towards dominating South America's nuclear energy market when Argentina accepted a West German bid to build its third nuclear reactor and help to supervise the construction of three more.[88] It also agreed to supply Brazil with uranium enrichment and reprocessing units worth $5 billion for the reactors that the Brazilians had bought from West Germany.

The Soviet Union, since the inauguration of the first nuclear power reactor in 1954, showed no commitment to rapid development of commercial power reactors because of availability of cheap fossil fuel reserves and concentration on weapons production. So the Soviet's first two large nuclear power plants did not come into operation until 1964. However by the late 1960s and early 1970s the Russians had entered a major commitment to the development of commercial

(87) See A. Gerschenkron, Economic Backwardness in Historical Perspectives (Cambridge: Harvard University Press, 1963); P. Govrevitch, 'The Second Image Reversed: the International Sources of Domestic Politics', International Organization, 32, 4, Autumn 1978, p. 885.

(88) 'Nuclear Power in Germany', Atom, No 271, May 1979; International Herald Tribune, 3 October 1979.

nuclear power reactors. The Soviet installed generating capacity increased from about 310MW in 1965 to 6200MW in 1975, generating 3% of total electrical capacity. The Soviet Union also increased its nuclear export activities dramatically after 1975 when it allowed the sale of nuclear power plants and components outside the Eastern Block and it has emerged as a significant force in the world nuclear fuel market, supplying 55% of EEC contracted enrichment services in 1977.[89] Soviet sales to Libya and China indicated that they aimed at the less industrial segment of the world reactor market.[90] The Soviet VVER 440 MW reactor was the only small light water power reactor in the market beside the Canadian CANDU heavy water reactor, since the 700 - 1000 MW reactors range marketed by major suppliers are uneconomic for electric power grids of all but the most advanced countries.[91]

The growth of the world nuclear industry continued to rise and by the beginning of 1979 there were 224 nuclear power plants in operation with a total capacity of 109000 MW worldwide.[92] There were seven developing countries

(89) Duffy, Gloria C., 'Soviet Nuclear Exports' International Security, 3,1, Summer 1978, p.104; Veretennikov, 'Peaceful Atoms in the Soviet Power Industry', op. cit., p.8.

(90) Duffy, 'Soviet Nuclear Exports', op. cit., p.93; Gallacher, Joseph., 'Nuclear Proliferation: The Magnox Revival' Arms Control, Dec, 1983, pp.223-35.

(92) Rosen, M., 'Nuclear Power in Developing Countries: The Transfer of Regulatory Capability', IAEA Bulletin, vol 21, No 2-3, June 1979, pp.2-12; Krymm,R. & Charpentier, J.B., 'Nuclear Power Development: Present role and medium term prospects' IAEA Bulletin, vol 22, No 2, April 1980, pp.11-22.

operating seven nuclear power plants whose combined capacity was 4000 MW. However the US nuclear industry suffered a dramatic decline not only in export markets but also in home market growth. This trend dated back to the slump in orders in the late seventies as a result of the falling growth rates in electricity consumption, long delays on environmental grounds, the Three Mile Island accident, the high cost of construction of new plants, and economic recession.[93] The nuclear power decline in the USA has been building up since 1973 when the Middle East oil embargo sharply increased the cost of generating electricity, slowed industrial growth and forced the Americans to abandon habits of a lifetime in order to conserve fuel. Before 1973, demand for electricity was growing annually at an average of 7.3%.[94] Most nuclear power plants were built during this rapid market growth. But since 1973 electric power use increased by only 2.5% per annum. In 1981, the demand for electricity was virtually unchanged. The US home market had reached the stage of saturation.

The four US nuclear giants were surviving on their order backlog and a fraction of export sales. Westinghouse has built 50 nuclear power plants in operation worldwide, 35 of 86 plants in the USA and 15 overseas and had a backlog of

(93) 'N. Plant Orders show 40% Cancellations Rate' Financial Times, 17 May1983; 'Is Nuclear Power finished in the US' US News and World Report, 29 Mar 1982, pp.59-60.

(94) Ibid.

(95) 'Can Nuclear Cinderella Go to Mr. Reagan's Ball', The Economist, 24 January 1981, pp.75-76.

59 orders, 21 units in the USA and 38 abroad till the end of 1984.[95] Its last domestic order was in 1977. It won only two export orders in 1979 (to South Korea). General Electric had 51 plants in operation worldwide, 25 of them in the USA and the rest abroad. It had a backlog of 33 orders and suffered 19 cancellations from early 1970.[96] Between 1972 and 1982, cancellations affected 100 out of 251 units.[97] According to the US Department of Energy about 45% of the 246,000 MW of nuclear power capacity ordered since 1972 has been cancelled for reasons of projected decline in demand for electricity, financial constraints on utilities owned by shareholders, regulatory uncertainties and delays at federal level, loss of nuclear power plant cost advantage over coal and the denial of state approval for construction, sometimes because of financial reasons.[98] No new commercial reactors have been ordered in the USA since 1978 and prospects for the domestic market in the future are slim.[99] However, by the end of 1985, the USA was operating 93 power reactors and cancelled 107 orders, and its share of nuclear electricity generating capacity was only 14% of total electricity generating capacity. It is a spectacular

(96) Ibid.

(97) 'US N-plant Orders show 40% Cancellation Rate', Financial Times, 17 May 1983; Atomic Industrial Forum 'Historical profile of US Nuclear Development', Jan. 1983.

(98) Ibid.; US Department of Energy, US Commercial Nuclear Power: Historical Statistical Outlook (Washington D.C.: Government Printing Office, 1982).

(99) 'Egypt delays Date for N-power bids after US Exim Bank Blow' Financial Times, 25 August 1983.

increase of nuclear electricity generating capacity share of total electricity generating capacity from 0.3% in 1964 to 14% in 1985.

The US nuclear industry may be struggling for survival but the influence of the atom remains strong elsewhere in the world. For a number of advanced countries nuclear power is a ticket to greater energy independence and national security. For the developing countries, the sight of a giant reactor going up can be a sign of industrial maturity and a source of national pride[100].

Nuclear power is already a major force in world energy today. It represents about 15% of world electricity production. In some countries such as France, Belgium, Taiwan and Sweden it ranges from 50% to 70%. France has the most ambitious nuclear industry of any country. It has 43 operating nuclear plants and is building 21 more. It also began the countdown for the operation of the first commercial fast breeder reactor 'Superphoenix', the very symbol of France's technological edge in the nuclear field.[101] Furthermore, it had made a breakthrough by the end of 1984, despite strong pressure from the US government, in winning contracts for the enrichment of uranium for US power utilities.[102] Gogema won orders from three US nuclear power facilities and paved the way for 20 more. Framatone

(100) Katz & Marwah, Nuclear Power in Developing countries, op. cit.; Sardar, 'Why the Third World Needs Nuclear Power', op. cit.

(101) 'A French Nuclear Backfire' Newsweek, 3 December 1984, p.43.

(102) 'France Wins Uranium Enrichment Contracts from U.S. Utilities', Financial Times, 14 November 1984.

has secured orders for nuclear plants from South Korea and South Africa and is bidding to win potential contracts with China, Egypt, Belgium, Finland and Turkey. Nuclear generated electricity has enabled France to have cheaper electricity compared with other European countries and to export electricity to six European countries.[103] West Germany has 20 reactors operating and 6 more under construction.[104] They provide 30% of total electricity generating capacity. Britain has 38 power reactors in operation and is building two more.[105] They provide 20% of total electricity generating capacity. Japan has 33 operating reactors and 8 under construction providing 26% of total electricity generating capacity.[106] The Soviet Union has completed construction of 50 nuclear power plants and is building 35 more, generating 11% of total electricity generating capacity.[107] The world share of nuclear power in electricity production continues to rise to 15%. The total number of nuclear power reactors producing electricity rose to 374 reactors in more than 26 countries with a combined capacity of 248,577 MW. An additional 151 power reactors

<103> 'A French Nuclear Backfire', Newsweek, 3 December 1984, p.43.

<104> 'Pulling the Nuclear Plug', Time, 13 February 1984, pp.8-19; 'World Atomic Power', Time, 12 May 1986, p.11.

<105> Ibid; Atom, No354, April 1986, p.19; HMSO, Britain 1986, An Official Handbook (London: HMSO, 1986) p.279.

<106> 'Pulling the Nuclear Plug', Time, 13 February 1984; 'Japan's Nuclear Power Programme', Atom, No 335, Sep. 1984, pp.10-13.

<107> Veretennikov, 'Peaceful Atoms in the Soviet Power Industry', op. cit.

with a planned capacity of 134,589 MW were under construction.[108]

By the end of 1985, eight developing countries, Argentina, Brazil, India, South Korea, Pakistan, South Africa, Taiwan and Yugoslavia had nuclear power plants in operation, a total of 23, with a combined capacity of about 12,928 MW[109], less than 3% of the developing countries' total electricity production. In addition, 15 plants of a total capacity of 9,563 MW were under construction in these eight countries and in Cuba, Mexico, the Philippines and China. In at least three other countries, Egypt, Libya and Turkey, plans are in the final stage for the construction of more power reactors. A further 22 developing countries were at an early stage of carrying out studies with the possible use of nuclear energy.IAEA monitors, by the middle of 1984, operations of 881 nuclear power plants, research reactors and peaceful atomic installations in 51 countries that have some or all of their nuclear facilities under international safeguards.[110] The USA provided 75 research reactors, several of them in the developing world, operating on enriched uranium which are in service in 35 countries

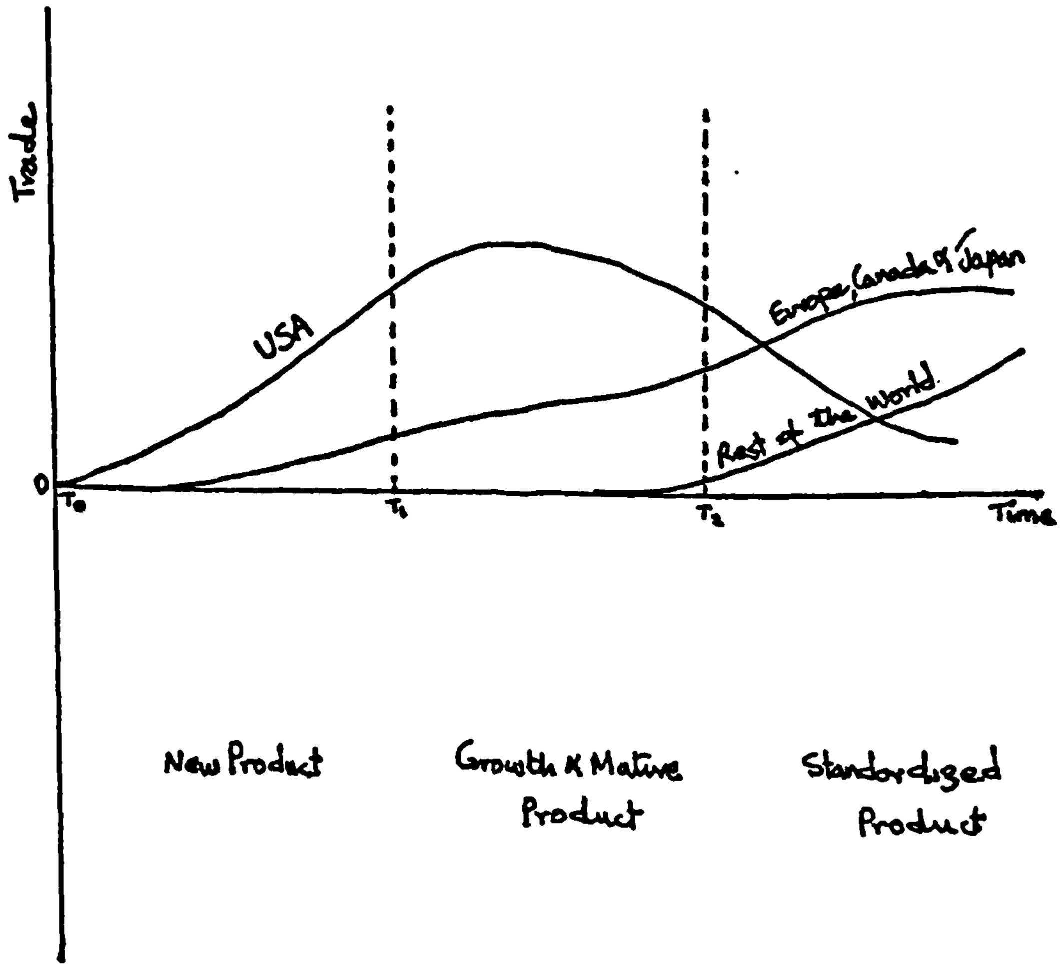
(108) Atom, April 1986, p.19; 'World Atomic Power', Time, 12 May 1986, p.11; 'World Nuclear Industry takes a Breather' Financial Times, 6 Mar. 1985.

(109) Laure, H.J. & Skjoedelrand, R., 'Nuclear Power in Developing Countries', IAEA Bulletin, vol 26, No 1, March 1984, pp.3-8; 'World Nuclear Industry takes a Breather' Financial Times, 6 Mar. 1985.

(110) Radio Free Europe Broadcast 30 July 1984.

worldwide.[111] The Soviet Union, France, Britain, West Germany and Italy built several atomic installations in many Third World countries. The IAEA predicts that there is a market potential for 100 power reactors in 25 developing countries for 200 - 500 MW reactor range compared to the present range of 600 - 1000 MW available in world markets.

International Product Cycle



<111> 'Atomic Angst', Wall Street Journal, 2 July 1981; 'French Nuclear Sale Angers Israel', The Guardian, 18 July 1980; US Congress, Export Reorganization Act of 1976, Hearings Before the Joint Committee on Atomic Energy, 94 Congress, 2 Session (Washington D.C.: Government Printing Office, 1976) vol 1, p.463.

The decline of the American nuclear industry's dominance and the dramatic emergence of the European and Japanese nuclear industries as major nuclear leaders worldwide and the French inroads on the American nuclear market provide compelling evidence that the international nuclear industry has already entered the maturity stage of the product cycle.

The US Deputy Energy Secretary described the US nuclear position as follows:

> "The United States no longer possesses the dominant influence in the international nuclear trade and in nuclear technology that it once enjoyed."[112]

At this stage growth is slowing and more attention is paid to improving efficiency and standardization.[113] France's single-minded pursuit of nuclear power and the unprecedented degree of nuclear standardization by concentrating on two designs, one of 900 MW and the second of 1300 MW, has enabled it to spend $6 billion on the most ambitious nuclear programme in the world today. Standardization has made it possible to have politically acceptable safety standards without changing design very often. Costs have also been

(112) US Embassy in London, Official Text, 9 August 1982.

(113) See Wells, The Product Life Cycle and International Trade', op. cit.,; Parry, T.G., 'The Product Life Cycle and International Product: UK Pharmaceuticals', Journal of Industrial Economics, 24, 1975/76, pp.21-8; Thomas, M.J., 'The Automobile Industry in the Product Life Cycle' Journal of Marketing, July 1979.

kept in check by consolidation of responsibility for building all nuclear power plants under one agency, Electricité de France. Nuclear power costs only 2.5 cents per kW hour to produce in France compared to 3.9 cents for coal and 8.4 cents for oil.[114] The director of IAEA explained the state of the global nuclear industry as follows:

> "The nuclear industry after a period of very rapid growth has entered a period of slower expansion. Several countries have already begun to use this 'breather' in order to devote more attention to simplifying regulatory procedures and standardizing nuclear plants. They are taking a serious look at the possibility of broadening the nuclear energy market through the inclusion of district heating and process heating schemes. Also, they are examining ways of further improving the efficiency and performance of power reactors. Information collected by the agency through the power reactor information system

(114) Corle, Remy., 'How France went Nuclear' New Scientist, 13 January 1983; Bupp, 'The French Nuclear Harvest', op. cit.; Bradford, Peter A., 'Reagan and Nuclear Power' Los Angeles Times, 6 June 1982.

(PRIS) shows a trend towards steadily improved plant reliability which is an important factor in the economics of nuclear power"[115]

The IAEA annual report for 1984 pointed out that 'experience of the operation of nuclear power plants worldwide in 1984 again confirmed that nuclear technology is mature'.[116] Total operation experience had reached 3470 reactor years by the end of 1984 and 31,800 MW capacity from 34 plants was added to worldwide capacity, an increase of 17%; this was the largest annual increase since the large scale introduction of nuclear power in the early 1970s. But on the construction side there were only 14 plants with a capacity of 11,300 MW, the lowest number since 1968. The trend continued during 1985. Outside the industrial countries no new nuclear power plant was connected to the grid and construction started on only one new plant. The report concluded:

> "Renewed interest in small and medium power stations, however, could lead to an expansion of the nuclear market, especially in developing countries."[117]

(115) IAEA Press Release, 24 September 1984.

(116) IAEA Press Release, 2 August 1985.

(117) Ibid.

In this period according to the product cycle theory, greater attention by the European nuclear powers will be directed to less developed countries, since Europe is approaching nuclear market saturation and less developed markets are approaching nuclear market size for introducing nuclear power reactors and growth.

The spread of nuclear technology and skills in the maturity stage favours the countries with a comparative advantage in terms of new products and processes, marketing skills and lower costs. The barriers to entry created by the previous American dominance in the technological and marketing skills of the industry have been continuously eroded since the mid 1970s. The nuclear technological and marketing skills which constituted the American lead and comparative advantage are transferable skills and the Europeans excelled through learning by doing [118] and by making innovations to meet the needs of their internal demand and Third World markets. The European nuclear industry is based on American design, technology and companies, with the exception of Britain. The American nuclear multinationals, Westinghouse, General Electric, Combustion Engineering and Babcock & Wilcox, built and licensed production of nuclear power plants in France, West

(118) De Leon, Development and Diffusion of Nuclear Power Reactor, op. cit.; Perry et al., Development and Commercialization of Light Water Reactor, op. cit.; Walker & Lonnroth, Nuclear Power Struggles, op. cit., pp.29-33; Pringle, Peter & Spigelman, James., The Nuclear Barons (New York: Holt, Reinhart & Winston, 1981) pp.277, 347-356; Carle 'How France went Nuclear' op. cit.; Bupp, 'The French Nuclear Harvest', op. cit.; Raz, B. et al, 'Technological Transfer: Developing Countries', Technological Forecasting and Social Change, Vol 24, No 1, Sep 1983, pp. 34-35.

Germany, Sweden, Spain, Belgium, Switzerland and Japan. One of the main shareholders of the French Framatone nuclear giant is Westinghouse. By the mid 1970s, however, the same companies, fed on American technology and money, began to compete with the American giants on their own ground and managed to get ahead of them in winning new orders at home and in the overseas markets, especially in developing countries. The comparative advantage in the international nuclear markets is moving in favour of the European and Japanese industries and later on, probably, of Third World industry, when the European advantage might become eroded. A recent study by the US Congress Office of Technology Assessment on the transfer of technology to six countries, Algeria, Egypt, Iran, Iraq, Kuwait and Saudi Arabia found that it is increasingly likely that countries such as India, Argentina and Brazil which have not endorsed the international non-proliferation rules would supply these countries with nuclear weapons components in the next ten years.[119] The transferability of nuclear technological skills to the Third World countries is possible and could be very fast and enormous at the maturity stage because of the increasing competition and supplies from European and possibly Japanese industries in the late 1980s when the electricity consumption demand of most developing countries reaches the required grid size.

(119) Radio Free Europe Broadcast, 9 September 1984; 'Superpower Go at: Keeping Nuclear Club Explosive', US News and World Report, 3 Dec. 1984, p.30.

The spread of nuclear power and research reactors with the associated technologies and materials to Third World countries in this period means the accumulation of nuclear technological skills through learning by doing.[120] The Third International Conference on Nuclear Technology Transfer held in Madrid in October 1985 concluded that despite the difficulties, very considerable success has been achieved in transferring nuclear power technology both to industrialized countries and some developing countries, and that the key to success was the determination of the countries to acquire nuclear technology, rather than benevolence in the part of the supplier countries.[121] Countries such as Spain, South Korea and Taiwan, for example, increased indigenous participation in the construction of nuclear power reactors from nill to nearly 90%. Commercial nuclear power programmes or research reactors and installations acquired by non-nuclear weapons states mean the starting step in a long process of the nuclearization of the country in question. Training nuclear scientists and engineers is as meaningful as a transfer of nuclear technology by way of the shipment of a nuclear power or a research reactor. The spread of nuclear information also opens up possibilities for grey marketeering on a

<120> Mayer-Wobse, Gerhard., 'Nuclear Cooperation in the Third World', Aussenpolitik, Jan. 1978, pp.65-74.

<121> 'Nuclear Technology Transfer', Atom, No 352, February 1986, pp.31-33.

global scale.[122] There have already been commercial sales of reactors and reprocessing and equipment to countries that are likely candidates for the nuclear clubs.[123] On the other hand, the possibility now exists for unofficial and unsanctioned transfer of such information from technologically developed countries to less developed countries.[124] There could be many motives for such activities, economic and political. There are a number of examples of such activities demonstrated by Pakistan, Libya, South Africa, Israel, Iraq, Brazil and Argentina in an attempt to acquire sensitive technology from the international markets through dummy companies, middlemen and secret agreements.

The mounting pressures of increased competition for nuclear export markets combined with increasing technological sophistication have led industrial countries into an international economic trap that has been set in motion by their willingness to trade off sales of nuclear reactors and associated technologies in the short term without facing the consequences of the worldwide spread of

(122) Dunn, Controlling the Bomb, pp.37-41.

(123) Barnaby, C.F., The Nuclear Arms Race, Peace Studies Papers No 4, School of Peace Studies, Bradford University, 1981), p.16; 'Eleven States could become Atomic Powers' Atlantic News, 7 May 1980.

(124) Dorian & Spector 'Covert Nuclear Trade and International Non Proliferation System' op. cit.; pp.29-66; Davenport, Elaine., Eddy, Paul, & Gillman, Peter., The Plumbat Affair (Philadelphia, PA: Lippincott, 1978); 'Bonn says Firm Illegally sent Pakistan Gear that can be used for Atomic Weapons' Christian Science Monitor, 19 December 1979; Wills, David., 'The Semi Secret Flow of Uranium, Scientists and Technology Around the World', Christian Science Monitor, 21 December 1981.

capabilities to produce nuclear weapons in the future.[125] Barnaby argues in this respect that

> "some countries are exporting nuclear equipment and material for narrow commercial reasons with little regard for the danger that equipment and material may assist the importer to make nuclear weapons. There is much money involved in the nuclear field and eight or nine significant national nuclear industries have been established in Japan, Europe and North America. These are competing for exports in a cut-throat way because most domestic markets are too small to sustain a national industry without massive government subsidies"[126]

Throughout the first half of 1976, disagreements persisted between France, West Germany and Japan, on one hand and the USA on the other.

<125> Anthony, Rowley & Pauline, Loong., 'The Politics of Nuclear Power', _Far Eastern Economic Review_, 10 October 1980, pp.48-50; Lellouche, 'France in the International Nuclear Controversy', op. cit., pp.951-965; Klaus, Gottstein., 'Nuclear Energy for the Third World', _Bulletin of Atomic Scientists_, June 1977, pp.44-48; Dunn, Controlling the Bomb, op. cit., chap.2.

<126> Barnaby, The Nuclear Arms Race, op. cit., p.12.

In 1976, France concluded a controversial agreement to sell nuclear power reactors to South Africa and an experimental reactor to Iraq. West Germany adopted a highly legalistic defence of the controversial deal with Brazil. Japan moved to develop its breeder reactor programme and commissioned its Tokai Mura reprocessing facility. This deterioration in intra alliance nuclear cooperation was exacerbated by the introduction in the USA of a series of legislations designed to establish legal criteria to regulate American reactor exports.[127] Moreover, the Canadian, French and West German industries have become sufficiently advanced to challenge the USA in reactor export markets while Britain missed the boat through a series of technological difficulties.

Several other West European countries had established nuclear component industries and were looking for export markets, at a time when US control over uranium enrichment and reprocessing was broken by Eurochemic and United Reprocessors in the reprocessing field and Urenco and Eurodif in the enrichment business and by the Soviet Union's sale of enrichment services to West Europe. Walker argued that producers of reactors must have new orders to remain efficient and competitive otherwise those lacking orders risk moving up a forgetting curve in which costs begin to mount, skilled manpower is lost, investment in new equipment

(127) US Congress, Nuclear Explosive Proliferation Control Act of 1976, S. 1439 (Washington D.C.: Government Printing Office, 1976).

and R & D can no longer be maintained so that there is an eventual collapse.[128] The US industry has been particularly affected because of the state of the home market and the need for foreign orders to remain in business. Home markets in other major Western suppliers are in a better shape which gives them additional incentives to compete aggressively abroad to remain in a leading position.

For the industrial countries, competition for the potential hundreds of billions of dollars in future export markets in the high technology nuclear industry cannot be easily resisted. For the developing countries, the promise of nuclear power and possibly the nuclear weapons offered by these technologies is also difficult to resist. The USA which had been the prime mover behind the reactor has nuclear cooperation agreements with 22 countries and potential agreements with five more.[129] By 1976, the USA had earned more than $3600 million from the sale of reactors and related equipment.[130] The French Atomic Energy Commission estimated that France's nuclear industry should run up exports worth about £1000 million a year throughout the 1980s.[131]. Other industrial countries now would like to get

(128) Walker, William B., 'Nuclear Non-Proliferation and the Present State of the International Nuclear Industry' in Simpson & McGrew, International Non-Proliferation System, op. cit., p.95.

(129) By the end of July 1955, the US had nuclear agreements with 27 countries, 'A World Survey of Nuclear Reactors' Atomic Industrial Forum, 7 August 1955.

(130) 'Nuclear Trading-Go-Round', The Economist, 6 December 1975, p.74; US Energy Research and Development Agency, US Nuclear Power Export Activities (Washington D.C.: Author, 1976), pp.10-18.

(131) '£1 bn worth of exports from N-Industry', Financial Times, 29 August 1981.

a share of the future international market for themselves, namely the West Germans, Belgians, Italians and Japanese. France and West Germany have already aggressively entered the nuclear marketplace and have not restricted themselves to reactor sales. In 1976, West Germany followed by France offered reprocessing facilities to developing countries such as Brazil and Pakistan.[132] Both saw penetration of Third World countries' markets as an imperative if they were to be competitive in the nuclear market. The logic of this competition has led the French and the West Germans to break the American dominance of the reactor market by undercutting the USA through the sale of sensitive technologies that the USA had refused to sell.

Large amounts of capital have been invested in the construction of nuclear power stations by the nuclear industries in the developed countries. In the USA, annual investment in nuclear construction rose from $2000 million in 1970 to $19,000 million in 1982. Spending on nuclear construction in 1983 was more than one-fourth of the annual investment in new plants and equipment of the US manufacturing sector and over three times that of the automobile industry.[133] The West German industry suffers from considerable overcapacity and Kraftwerk Union is suffering losses on nuclear power. Without new orders, the

<132> 'US Debates Risks in Export of Nuclear Fuel', International Herald Tribune, 16 June 1975; Baker, 'Why not a Nuclear Fuel Cartel', op. cit., pp.1-8.

<133> '1983 Annual Statistical Report', Electrical World, March 1983.

West German industry is expected to weaken rapidly.[134] The French Atomic Energy Agency has an annual budget of $1500 - 2000 million, and Electricité de France lost one billion dollars in 1982 and has accumulated a debt of $20,000 million. The French industry is geared to handle six new orders every year but the government has reduced nuclear power plants construction to two units in 1984 and 1985.[135] Framatone has quoted costs 20% to 40% higher should ordering be cut to two units per year. The American nuclear giant Westinghouse derives 35% of its revenues from overseas and was making only $30 - 40 million profits. General Electric was losing between $30 - 60 million, Combustion Engineering about $25 million and Babcock & Wilcox $15 million in 1981.[136]

For this capital expenditure to be amortized and for the losses to be reduced, a minimum number of orders of reactor units must find a market each year for these multinationals to remain competitive and stay in business. Because of limited domestic market, export markets must be found for a certain share of the total number of units produced. However, the only potential importers are the USA and developing countries. This is because major Western European countries generating nuclear power, France,

(134) Walker & Lonnroth, Nuclear Power Struggles, op. cit., p.66.

(135) 'Nuclear Power: Cooling Off', The Economist, 30 July 1983; 'A French Nuclear Backfire', Newsweek, 3 December 1984, p.43.

(136) 'Can Nuclear Cinderella go to Mr. Reagan's Ball?', The Economist, 24 Jan. 1981, pp.75-76; 'Experts See Decade of Weakness for US Nuclear Industry', International Herald Tribune, 31 May 1982.

Britain, West Germany, Italy, Sweden, Switzerland and Belgium, as well as Japan, tend to prefer to purchase products from their own national firms,[137] and in any case they are approaching market saturation. The US economy offers conditions of free competition, a large market and growth but in actual practice, it is hardly possible to compete with US industry in its own territory. However, France's inroad into the American enrichment market demonstrates the potentiality and difficulties.[138]

Nuclear Power in Developing Countries

On the other hand, there is a rapidly growing demand for nuclear energy from the developing countries. Today, Taiwan already produces 52% of its total electricity generating capacity from nuclear power and South Korea 18%.[139] By the end of 1975, out of 514 nuclear power stations in operation, under construction or contracted worldwide, 7 were in South and Central America, and 25 in Asian countries, excluding Japan and the Soviet Union.[140] Additional orders were placed by Iran and South Korea, not forgetting the controversial Brazilian deal. Moreover, the positions of the USA and the Soviet Union coincided in that

<137> 'Recession squeezes U.S. Nuclear Industry', Financial Times, 11 December 1981; Gottstein, 'Nuclear Energy for the Third World', op. cit., pp.44-48.

<138> Ibid.; Walker & Lonnroth, Nuclear Power Struggles, op. cit., pp.98-100; 'France Wins Uranium Enrichment Contracts from U.S. Utilities', Financial Times, 14 Nov. 1984.

<139> 'World Atomic Power', Time, 12 May 1986, p.11

<140> Gottstein, 'Nuclear Energy for the Third World', op. cit., p.44-48.

they took a negative view with regard to the exports of sensitive technologies, while the West Germans and the French were ready to export these facilities subject to appropriate international supervision. Third World countries wanted to take part in the peak growth period of the nuclear industry in the 1970s. Many have made it clear that they demand a share in the benefits of these modern technologies on the grounds of equity.[141] Nuclear energy is perceived as an aid to industrialization, a source of energy for remote areas lacking any other sources, a technique for desalting water and as an insurance when oil resources run out; or, even if not stated explicitly, as a way to keep the nuclear option open.[142] The economies of most developed countries are more or less strongly export-oriented so as to remain competitive and efficient in the domestic market, and they can not exclude the nuclear industry from exports.[143] The American and European nuclear markets are saturated and constrained by financial, political and environmental factors and their industries are suffering from considerable overcapacity. The amount of money spent and invested is astronomical in the USA and Europe, and, even more, the industry is heavily subsidised. With the current economic recession and decline of exports of manufactured products from the developed world, the industry remains one of the

(141) Ibid.

(142) Katz & Marwah, Nuclear Power in developing Countries, op. cit.

(143) Walker & Lonnroth, Nuclear Power Struggles, op. cit., p.81.

high technology exports to the developing world. The industrialized countries compete with each other in world markets though most of them are members of a common alliance. Within this framework they have been engaged in finding a peaceful new order in their mutual relations and their relations with the rest of the world. In the late 1970s applications of restrictive export policies by members of the Western alliance led to the cancellations of several orders with developing countries such as Pakistan, Taiwan, South korea, Iraq, Libya and Iran.[144] In 1975, six countries, the USA, Britain, West Germany, France, Canada and the Soviet Union met in London to discuss means of controlling the sale of nuclear technologies, development of safeguards to prevent the spread of nuclear weapons and later on agreed on a code of export behaviour and a trigger list.[145] In 1977, US President Carter proposed the INFCE study group as a peace conference to end the so-called war of plutonium and civil war among countries promoting specific non-proliferation policies. The conference which was later sponsored by the IAEA and attended by 62 countries, took two years and published guidelines.

Meanwhile the developing countries have been engaged in mutual nuclear cooperation such as Brazil-India,

(144) Eklund, Siguard., 'Two Decades of Work with the International Atomic Energy, Agency, Review of International Affairs, 5 February 1982, pp.12-20.

(145) Yaeger, Non-Proliferation and US Foreign Policy, op. cit., pp.414-15; UN, General Assembly, General and Complete Disarmament, Comprehensive Study on Nuclear Weapons, Report of the Secretary General (New York; UN, 1980), p.142.

Argentina-India, Argentina-Latin American countries, Yugoslavia-Non-aligned countries, Pakistan-China, Pakistan-Arab States, India-Arab States, Argentina-Arab States, South Africa-Israel-Taiwan.[146] Argentina agreed in March 1977 to provide Peru with a small 10 kW research reactor, and Argentina and Brazil cooperated in reprocessing technology. The Argentinian-Peruvian agreement is of particular interest because it represents the first major export sale of nuclear technology by Argentina. This cooperation has led in the last few years to the rise of a separate nuclear trading system between Third World countries, consisting of bilateral agreements for nuclear cooperation, exchange of information and materials transfer outside existing non-proliferation control.[147] This cooperation is growing every day in nuclear technology, materials and training, in order to avoid dependency and the consequences of possible sanctions imposed by Western suppliers.[148] Some countries of the Developing World, Pakistan, India, Israel, South Africa, China, Argentina, Brazil, South Korea and Taiwan, have continuously pursued nuclear independence by acquiring enrichment and reprocessing facilities and uranium, and by building their own reactors. On several occasions the USA, France and West

(146) Meyer-Wobse, 'Nuclear Cooperation in the Third World', op. cit., pp.65-74; SIPRI Yearbook, several years.

(147) Dunn, Controlling the Bomb, op. cit., chap. 2.

(148) 'Superpowers Goal: Keeping Nuclear Club Explosive', US News and World Report, 3 December 1984, p.30.

Germany cancelled agreements to sell sensitive technologies and materials to developing countries and put pressure on some of these countries to sign the NPT and accept full-scope safeguards.

In 1985, eight developing countries have 23 nuclear power plants in operation. In addition, 15 nuclear power plants were under construction in seven developing countries. Several other orders for power plants were under processing in three other countries.[149] These nuclear power plants in operation, under construction and contracts, will increase the nuclear generating capacity from the present 13,038 MW to nearly 25,000 MW by the 1990s compared with 380,000 MW worldwide. It is estimated that by the year 2000 another five to ten countries (17 to 22 countries in total) may have nuclear power plants in operation.[150] The main limitations to nuclear power development in the developing world, beside manpower, infrastructure and investment

(149) Laure, H.J., Bennett, L.L. & Sbjoeldrand, R., 'Nuclear Power in Developing Countries', IAEA Bulletin, vol 26, No 1, pp.3-8; IAEA Annual Report, 1985.

(150) Konstantinov, L.V. & Laure, H.J., 'General Energy Needs of Less Developed Countries and the Contribution Nuclear Energy can make to those Needs', Transactions, International Conference on Nuclear Power: A Global Reality, Proceedings of the Plenary Sessions, Nov. 11-16, 1984 (Washington D.C.: American Nuclear Society, 1985) vol 48, pp.165-173.

Nuclear Power in Developing Countries 1985

	Operation		Under Construction		Total	
	No	MW	No	MW	No	MW
Argentina	2	935	-	-	2	935
Brazil	1	626	1	1245	2	1871
China	-	-	1	300	1	300
Cuba	-	-	1	408	1	408
India	6	1240	4	880	10	2120
South Korea	4	2720	5	4692	9	7412
Mexico	-	-	2	1308	1	1308
Pakistan	1	125	-	-	1	125
Philippines	-	-	1	620	1	620
South Africa	2	1842	-	-	2	1842
Taiwan	6	4918	-	-	6	4918
Yugoslavia	1	632	-	-	1	632
	23	13,038	15	9453	38	22,491

requirements and assurance of fuel supply, is the small size of power grids and the unavailability of 200 - 400 MW nuclear power plants range, with the exception of the Soviet 440 MW model. The rule is that a single power unit should not exceed 10% of total generating capacity. At present 37 IAEA member states could accept units of 600 - 1300 MW while only 24 actually have operating plants. Some 15 countries (all developing ones) could use 200 - 600 MW reactors.

In the Middle East more than ten countries have expressed interest in developing nuclear power programmes. Iraq had made the most progress, until an Israeli air strike destroyed its experimental research reactor in 1981.[151] Iran is considering reviewing plans to set up nuclear power stations during the Shah's regime.[152] Turkey has declared a strong interest in setting up nuclear power generating capacity.[153] Several Arab states have received financial aid from the IAEA to investigate the possibility of setting up atomic industries.[154] They are Egypt and Iraq plus Algeria, Jordan, Lebanon, Morocco, Sudan, Syria, Tunisia and the United Arab Emirates. Libya is pressing ahead with similar plans despite considerable Western opposition.

The Soviet Union is emerging as an alternative supplier of nuclear technology, equipment and contracting skill. It has been commissioned to choose a site for Iraq's planned new power station.[155] It also signed an agreement with Libya about supplying a 440 MW plant and agreed to help

(151) IAEA Press Release, 9 June 1981; 'NYT Article Attempts to Separate Fact and Fiction Concerning Israeli and Iraqi Claims', The Times, 20 June 1981.

(152) Jane's Defence Weekly, 28 April 1984, p.635; 'Bonn denies building Atom Plant', The Times, 27 April 1984; 'Iran Seen Developing Atom Bomb', Washington Times, 25 April 1984.

(153) 'Egypt takes the Nuclear Option', Middle East Economic Digest, (MEED), vol 28, No 52, 21 Dec. 1984, pp.26-27.

(154) Ibid.; Laure, Bennett & Skjoeldebrand, 'Nuclear Power in Developing Countries', op. cit., pp.3-8.

(155) 'Soviet to Sell Atom Power Plant to Iraq', International Herald Tribune, 24 March 1984.

Syria to build a nuclear reactor.[156] However, Egypt is the Arab state with the most ambitious plans for construction of nuclear power stations.[157] It has turned the corner towards essential reliance on nuclear power for a large part of its energy needs. Egypt has given the go ahead to build the first nuclear power station at Eldabaa, West Alexandria. Egypt's long range plan is to build up to eight 1000 MW nuclear electricity generating units by the year 2005, meeting 40% of total energy needs at a cost of $36000 million.[158] The Eldabaa nuclear power station will have far-reaching implications for the region, especially for many Arab states and developing countries which are looking for nuclear power to meet their increasing energy needs, and, in the case of oil producers, to avoid over reliance on precious hydrocarbons for electricity generation.[159] Success at Eldabaa will persuade other Middle Eastern and other developing countries to speed up their nuclear power programmes. The total electricity needs in the Middle Eastern countries are expected to increase during the 1980s by at least 10% annually and if the demand for electricity continues to grow at the present rate, the region could

d(156) Jamahyryya Arab News Agency (JANA) News Bulletin, vol IV, No 33, 22 October 1984; Radio Moscow Broadcast, 31 October 1984.

(157) 'Egypt takes the Nuclear Option', MEED, vol28, No52, 21 Dec. 1984, pp.26-27.

(158) Ibid.

(159) MEED, 1 July 1982.

begin to run out of oil faster than expected.[160] The success at Eldabaa would be an added incentive for the developing countries to follow Egypt's lead.

Most of the Arab states and Israel have research reactors, atomic installations in operation, Egypt, Iraq, Libya, Algeria, Morocco, Jordan and Saudi Arabia, and hundreds of Arab and Israeli nuclear scientists and engineers have received and are receiving training in the West, the Soviet Union and in local institutions.[161]

Countries with 1000 MW+ Electric Capacity (1980)

Country	Capacity (MW)
Algeria	1826
Iraq	1200
Israel	2728
Kuwait	2810
Libya	1170
Morocco	1179
Saudi Arabia	2100
Syria	1084
UAE	1090
Egypt	5050

Source: Arms Control Dec. 1983 & OAPEC Bulletin April 1982

(160) The Arab Fund for Economic and Social Development (AFESD) predicted in the early 1980s that by 1990 energy consumption in member countries will increase from the equivalent of 1.9 million barrels a day to 7.9 million barrels a day. Other energy options are very limited and the nuclear option remains the most promising.

(161) US Congress, Export Reorganization Act of 1976, op. cit., p.463; Schelling, 'Who will have the Bomb?', op. cit., p.78.

Moreover, most Arab states and Israel have electric grids of 1000 MW and more and demand growth of 10% plus annually, a necessary requirement for establishing a nuclear power station. Today's nuclear market, more than ever, has developed a wide range of power reactors suitable for the needs of the small market segment, namely the British Magnox 3oo MW, Swedish Sectus 240 MW, West German KWU 200 - 400 MW BWR, French Technicatome 300 MW and Soviet VVER 440 MW. The nuclear industry's export-oriented designs have been dominated by 600 - 1000 MW reactors including the Canadian AECL CANDU and light water reactors supplied by KWU, Framatone, Westinghouse and General Electric.[162] These countries have the necessary requirement for the establishment of a nuclear programme. They are suitable markets for 300 - 600 MW reactor range, with the exception of Egypt. Egypt, by the year 2000, it is estimated will need 15,500 MW electricity generating capacity compared with the present installed capacity of over 5000 MW.[163] This means that in 20 years, consumption will triple. Nuclear power energy appeals to the Egyptians and perhaps to other Arab countries as the cheapest energy option available, especially when oil reserves run out and solar energy's wide application is still facing enormous technical difficulties and high costs. Lack of new sources of coal and hydro-power

(162) Gullache, Joseph., 'Nuclear Proliferation: The Magnox Revival', Arms Control, Dec. 1983, pp.223-35; Organisation of Arab Petroleum Exporting Countries (OAPEC) Bulletin, vol 8, No 4, April 1982.

(163) A statement by Kamal Hassan Ali, Egypt's Prime Minister and Minister of Foreign Affairs, before the People's Assembly, 16 February 1980 (Cairo: State Information Service, 1981) p.77.

is another problem.[164]

The international spread of nuclear power and research reactors, materials and other atomic installations and training of nuclear scientists and engineers and, perhaps, of sensitive technologies at a faster rate during the maturity stage of the nuclear industry product cycle has acknowledged implications for nuclear weapons proliferation. The widespread and transferability of nuclear technological skills through learning by doing, and materials at a faster rate at the maturity stage of the nuclear technology cycle is viewed as the link between nuclear technology spread and nuclear weapons capabilities proliferation. Israel and South Africa are widely suspected of either already possessing nuclear weapons or of being close to doing so.[165]

The source of Israel's weapons potential is a research reactor provided by France and the transfer of nuclear technological equipment and skills was motivated by France and the US desire to help Israel develop a nuclear research capability.[166] South Africa's source of an atomic bomb's potential material is highly enriched uranium obtained from

(164) 'Power and electricity in the Middle East', MEED, vol 26, No 40, 1 Oct. 1982.

(165) 'Ex-C.I.A. Aide says Johnson Quashed Israel A-Bomb Data', Washington Post, 2 Mar. 1978; UN, Study on Israeli Nuclear Armament, Study Series (New York: UN, 1982), p.22; UN, South Africa's Plan and Capability in the Nuclear Field, Study Series 2 (New York: UN, 1981), p.36; Lefever, Nuclear Arms in the Third World, op. cit., p.70; Weissmann, Steve & Krosney, Herbert., The Islamic Bomb (New York: Times Books, 1981), pp.106 & 109; Smith, Dan., South Africa's Nuclear Capability. (Oslo; World Campaign Against Military and Nuclear Collaboration with South Africa, 1980) p.11.

(166) Jabber, Israel and Nuclear Weapons, pp.20-24; Weissmann & Krosney, The Islamic Bomb, op. cit., pp.112-113; SIPRI yearbook, 1979, pp314, 316; Crosbie, Sylvia K., A Tacit Alliance: France and Israel from Suez to Six Days War, (Princeton, N.J.: Princeton University, 1974), pp.165-166.

technology developed with considerable assistance from West Germany.[167] India was the first Third World country to become a nuclear power by using materials provided by industrial countries, the USA and Canada, for a peaceful nuclear explosion in 1974.[168] Until the Indian detonation of 1974 there had never been any absolute link between acquisition of peaceful nuclear technology and development of nuclear weapons capability.[169] On the contrary, the economic considerations of weapons production had prompted the USA, the Soviet Union, Britain, France and China to acquire nuclear weapons capabilities through the construction of facilities to that end, not through diversion of weapons-grade material from an experimental or power reactor, Jaipal argued that India's early possession of a skilled nuclear cadre was crucial in its development of 'peaceful' explosion.[170] It was made clear by the Indian example that it is relatively easy for a dedicated and determined country to make nuclear weapons by diverting materials from nuclear power or research reactors to fabricate a nuclear explosive device and that there are few

⟨167⟩ Curevenka, Zdenek & Rogers, Barbara., Nuclear Axis: Secret Collaboration between West Germany and South Africa (New York: Times book, 1978), p.84.

⟨168⟩ Weinraub, Bernard., 'India becomes 6th Nation to set off Nuclear Device', New York Times, 19 May 1974.

⟨169⟩ Maddox, Prospects for Nuclear Proliferation, op. cit., p.10.

⟨170⟩ Jaipal, 'The Indian Nuclear Situation', op. cit., pp.44-45.

sanctions against doing so.[171] India was able to construct a modern reprocessing plant without outside help, based on domestic scientific and technological abilities and the available published literature. No significant sanctions were imposed following the peaceful nuclear explosion from either of the Superpowers.

The Chinese nuclear programme was indeed initially assisted by the Soviet Union in 1954 for peaceful purposes and, when Soviet help had been withdrawn in 1960, the Chinese proceeded with their nuclear weapons programme.[172] Eventually, China became the fifth and last declared nuclear weapons state in 1964.

To sum up, the application of the product cycle theory to the nuclear industry from its early development and growth in the USA and then worldwide when the USA began to lose its dominance and lead to West European industries and emerging Third World atomic industries, provides compelling evidence of the product cycle of nuclear technology. The experience of the USA and of the world nuclear industry is a clear vindication of the product cycle theory. The most important facet of nuclear proliferation in the Middle East is the maturity stage, when the innovating country loses the

(171) Meyer-Wobse, 'Nuclear Cooperation in the Third World', op. cit., pp.65-74; Marwah, 'India Nuclear and Space Programs', op. cit., p.118; Nye, 'The Political Solutions', op. cit., p.32; Nacht, 'The United States in a World of Nuclear Powers', op. cit., p.163; Department of Energy Authorization Legislation for Fiscal Year 1982, op. cit., p.204; Office of Technology Assessment, nuclear Proliferation and Safeguards, op. cit., p.102.

(172) Ibid.

original lead to less advanced countries. At this stage,[173] nuclear technology spreads to Third World countries at a faster rate than before, and exports of nuclear technology and materials from less advanced countries to advanced and less developed countries has a wider implication for nuclear weapons proliferation. Only during this stage can Third World countries entertain the option of acquiring nuclear technological skills through learning by doing. And only then would the link between nuclear technology spread and nuclear weapons proliferation be apparent.

(173) There have been numerous studies to test the product cycle theory during the maturity stage using similar methodologies and different industries; see Wells, The Product Life Cycle and International Trade, op. cit.; Parry, 'The Product Cycle and International Production: UK Pharmaceuticals', op. cit.; Thomas, 'The Automobile Industry in the Product Life Cycle', op. cit.; Hirsch, Location of Industry and International Competitiveness, op. cit.; Elgoraish, G.A., 'The Political Economy of the Multinationals: The International Automobile Industry', unpublished MA dissertation, University of Southern California, May 1981.

CHAPTER THREE

The Spread of Nuclear Technology in the Middle East

Introduction

Proliferation of nuclear technology in the Middle East goes back to the late 1940s and has passed through two distinct and important stages. The first stage extends from the late 1940s until the mid 1970s, and can be characterised by the persistent determination of Israel to pursue the path of acquiring a nuclear weapons potential, and the sensational attempts of some Arab states to obtain an atomic bomb and to launch a preventive strike against Israel's atomic installations. The second stage began after the Arab-Israeli war of 1973 and the subsequent energy crisis, and can be characterised mainly by a trend of a continuous nuclear activity by some Arab states to establish a nuclear industrial base through setting up civilian nuclear installations for peaceful purposes, and a persistent effort by Israel to deny the Arabs their developing nuclear capabilities while improving its own nuclear weapons potential. In between there were several unsuccessful attempts to create a nuclear weapon-free zone in the Middle East and to develop effective chemical and biological weapons by Egypt and Israel.

Israel's Nuclear Programme, phase I

The Israeli nuclear research programme dates back to the foundation of the state of Israel in 1948. Even as it came into existence, the new state of Israel looked forward to a future shadowed by a threat of a potentially unstoppable force. Ben Gurion and Weizmann, the first Israeli Prime Minister and Head of State respectively, from the very beginning launched a programme aimed at providing their military with the only tool capable of holding back the Arab states, the atomic bomb.[1] A department of isotope research was established in the Weizmann Institute in Rehovoth as early as 1949.[2] It was reported to include four laboratories dealing with applied nuclear physics, spectroscopy, electronics and nuclear magnetic resonance.[3] Large scale geological prospecting was initiated in the Negev Desert in 1949 to determine the size of phosphate deposits and uranium concentrates in them.[4] At about the same time, research on the production of heavy water began at the Weizmann Institute and it was officially stated that Israel had acquired its own heavy water production capacity on a pilot scale.[5] Hundreds of Israeli scientists and

(1) Bar-Zohar, M., Ben Gurion: A Political Biography, Part III (Tel Aviv: Am Oved, 1978), p.1400.

(2) A statement made by A. Eban on Nov.15, 1954, , in the first committee of UN General Assembly contained in official records of the General Assembly, Ninth Session, First Committee, 716 Meeting, pp.335-37.

(3) Tempo (Millan), 15 Dec. 1974.

(4) Eban statement of Nov. 1954, op. cit.; Jabber, Israel and Nuclear Weapons, op. cit., p.23; BBC summary of world news, 22 Dec. 1960.

(5) Eban statement of Nov. 1954, op. cit.; Crosbie, A Tacit Alliance, op. cit., p.114; 'Israel says it could Build Nuclear Weapons', Washington Post 3 Dec. 1974; US Atomic Energy, Annual Report 1966.

engineers were sent to Europe and the USA for further nuclear training.[6] About 250 Israeli nuclear scientists participated in US atomic energy research.

As early as 1953, a cooperation agreement was concluded between France and Israel and cooperation under that agreement is said to have begun in the same year.[7] The contents of the agreement have never been made public, but it was known that in 1957 France agreed to supply Israel with a 25 MW thermal research reactor using natural uranium at Dimona.[8] In 1961, the French President De Gaulle is said to have made it clear to Israeli officials that this assistance was limited to the construction and operation of the reactor.[9] Israel, like President De Gaulle, is obsessed with the idea of absolute independence and nobody is entitled to dictate its military or other activities. There had been special links and understanding between France and the new state of Israel, with the French equipping the Israeli Air Force with military aircraft, and a special exchange of military knowledge took place between the two countries. Moreover, the aggressive attitude of Egypt's President Nasser toward the French occupation of Algeria

(6) Jabber, Israel and Nuclear Weapons, op.cit., p.17; Yoram,Peri., 'Mushroom over the Middle East', New Outlook May 1982, p.41, US Congress, Export Reorganisation Act of 1976, op. cit., p.463.

(7) Jabber, Israel and Nuclear Weapons, op. cit., pp.20-21; Crosbie, A Tacit Alliance, op. cit., pp.152-69; Weissmann and Krosney, The Islamic Bomb, op. cit., P.112; Jerusalem Post, 16 November 1954.

(8) Goldschmidt, B., Le Defe Atomique, (Paris: Fayard, 1980), pp.205-6.

(9) De Gaulle, Charles., Memoirs of hope, (New York: Simon & Schuster, 1970), p.266.

could only have increased the French-Israeli cooperation. The Algerian National Liberation Front's appeal to Moscow and Peking for help, with Egypt's Nasser, considered the Soviet front man in the Middle East, could have made Israel the only counterforce to which the French could turn for support.[10]

Under the US 'Atoms for Peace' programme adopted by President Eisenhower, a US-Israeli agreement on nuclear cooperation for twenty years was signed on 12 July 1955. The USA provided Israel with a pool type research reactor (IRR-I) with a 5 MW capacity at Nahal Soreq. Until 1965 it remained under US inspection, then it was placed under IAEA safeguards after an agreement between the USA, Israel, and the IAEA on 18 June 1965. On 14 April 1975 the agreement between the USA and Israel was replaced by a similar agreement which was extended by a protocol of 7 April 1977.[12]

Initially, natural uranium supplies were reportedly obtained by Israel from a number of sources, mainly Western and African countries.[13] Later on, Israel is said to have

(10) 'French-Israeli Collaboration Stirs West', Christian Science Monitor, 31 December 1960.

(11) US Department of State, US Treaties and other International Agreements, vol 6, part 2, and vol 16, part 2, 1966 (Washington D.C.: Government Printing Office, 1956, 1966), pp.2641-2646.

(12) IAEA-UNFCIRC/84 and 249.

(13) Goldschmidt, Le De Fi Atomique, op. cit., p.206; Jabber, Israel and Nuclear Weapons, op. cit., pp.90-91.

devised its own method of extracting uranium from phosphate deposits in the Negev Desert.[14] Israel is also reported to have devised its own extraction processes which are specially applicable to types of phosphatic rocks unsuitable for the usual fertiliser production.[15] There are three phosphoric acid plants in Israel at present, two small plants in Haifa and a third large one in South Israel. Uranium available from the three plants would total about 100 tons per year.[16] Israel had also received some heavy water from the USA for research purposes and unsafeguarded; Norway provided the Dimona research reactor with deliveries of heavy water until 1970 when it stopped further deliveries.[17] Israel has had a fuel reprocessing facility of unknown status on a small scale at the Dimona research reactor for some twenty years.[18] It also has another reprocessing unit 'Hot Cell' at Nahal Soreq reactor built

(14) 'Better Prospects for Phosphate Production', Nuclear Engineering International, June 1980.

(15) Ketzinel, Z., 'Uranium Resources, Production and Demand in Israel', Proceedings of the Fourth International Conference on the Peaceful Use of Atomic Energy, Geneva, 6-16 Sep. 1971, vol 8, pp.113-119; 'Better Prospects for Phosphate Production', Nuclear Engineering International, June 1980; Eban Statement of Nov. 1954, op. cit.; Valery, Nicholas., 'Israel's silent Gamble with the Bomb', New Scientist vol 64, 12 December 1974, p.808.

(16) Releg, A., 'Room for only Two Power Stations on Israel's Coast', Maariv, 2 July 1975.

(17) SIPRI, Yearbook 1979, pp.315-316; Lod-Gaard, Sverre., 'Nuclear Proliferation: Critical Issues, Transfer of Technologies, Safeguards and Sensitive Countries', Bulletin of Peace Proposals, 12,1, 1981, pp.11-20.

(18) IAEA Bulletin, vol 19, no 5, 1979, p.2; SIPRI Yearbook 1979, pp.314, 318; Jabber, Israel and Nuclear Weapons, op. cit., p.49; Beaton, L., 'Does Israel Plan to Make Bomb', The Guardian, 28 December 1961.

with British and US help.[19] The UN General Assembly study on Israel's nuclear armament in 1982 reported that the Israeli reprocessing plant at Dimona has a capacity of 4 - 5 kilogrammes of plutonium metal per year.[20]

In the early 1960s there was growing concern over evidence that Israel with the help of France may be developing a capacity to produce atomic weapons.[21] The history of the secrets of the nuclear research reactor began substantially in September 1957.[22] In a report prepared by Mr. and Mrs. Leon Keyserling and issued by the Israel Board Association to help promote its campaign for American investment in the bonds of the new nation, it was stated that

> "Israel's scientists have been undertaking intensive study of the manufacture of heavy water and of the possible extraction of uranium from phosphates in the Negev".[23]

In 1960 the Egyptian intelligence agency publicly identified the Dimona facility as a nuclear reactor.[24] A US spy plane

<19> Ibid. p.43; US General Accounting office, Difficulties in Determining if Nuclear Training of foreigners Contributes to Weapons Proliferation (Washington D.C.: GPO, 1979), pp.18-21.

<20> UN, Study on Israeli Nuclear Armament, op. cit., p.12.

<21> 'US Fear of Israel having Atom Bomb', Daily Telegraph, 19 Feb. 1960.

<22> 'In the Nation: The Proof is Available to Israel', New York Times, 23 Dec. 1960.

<23> Ibid.

<24> Al Ahram, 13 June 1960.

with a special radiation detection device confirmed that report,[25] and, under pressure from US President Eisenhower, Israeli Prime Minister, Ben-Gurion, admitted the existence of the reactor which the USA had been misled to believe was a textile factory.[26] Another Israeli official denied reports that Israel might be developing a capacity to produce atomic weapons by saying that Israel had neither the means nor the intention:

> "We have been engaged in atomic research with France but this is concerned only with the use of atomic power for peaceful purposes. We have been conducting a joint project with France on developing isotopes and heavy water ... Under the Eisenhower 'Atoms for Peace' project, Israel received enriched uranium with which we are building a 1 MW swimming pool type of reactor".[27]

In the midst of the growing concern over reports that Israel might be developing a capacity to produce nuclear

(25) 'Industry Observer', Aviation Week, 13 July 1964.

(26) 'Israel admits Second Reactor in Negev', Daily Telegraph, 22 Dec. 1960; Finney, John W., 'US Misled at First on Israeli Reactor', New York Times, 20 Dec. 1960.

(27) 'U.S. Fear of Israel having Atom Bomb', Daily Telegraph, 19 February 1960.

weapons, Shimon Peres, Deputy Prime Minister of Israel, said, 'Israel will never introduce atomic weapons into the Middle East'.[28] The USA had confirmed that Israel was actively working towards the development of nuclear weapons at its reactor in the Negev Desert. Confirmation came reportedly from a Lockhead U-2 reconnaissance flight over the facility.[29] Israel, on the other hand, in an attempt to reassure the USA of her intentions to use atomic energy for peaceful purposes had quietly permitted American engineers to inspect the heavily guarded atomic reactor at Dimona.[30] Only two inspections were said to have been permitted, in 1964 and 1965, which were later denied by the Israeli Prime Minister Eshkol.[31] Robert Kennedy told the US Congress that Israel would be able to have a nuclear device by the end of July 1965 and an atomic weapon capacity by the end of the year.[32] His estimates were accepted by the US Atomic Energy Commission. The USA signed an agreement in 1965 that if Israel forewent the development of atomic weapons, the USA would come to Israel's rescue with the Sixth Fleet in case its security was threatened.[33] It was

(28) Giles, Frank., 'Israel: The old West or new East', The Sunday Times, 29 Mar. 1964.

(29) 'Industry Observer', Aviation Week, 13 July 1964.

(30) 'Israel lets U.S. Inspect Reactor', New York Times, 15 Mar. 1965.

(31) 'No U.S. Inspection of Dimona', Jewish Post Weekly, 8 July 1966.

(32) 'Israel on verge of Getting the Bomb', Evening Standard, 20 July 1965, p.7.

(33) 'U.S. Pledge of 6th Fleet Aid Reported', Washington Post, 29 May 1967.

believed that Israel, in response to Nasser's rockets programme, had been secretly working on nuclear weapons in self defence.[34] A Soviet newspaper accused Israel and West Germany in 1968 of jointly producing nuclear weapons, West Germany pumping money and brains into the project to evade the ban the West German nuclear weapons, at Weizmann Institute and Dimona reactor in the Negev.[35] The editor of Jane's All the World's Aircraft said Israel might become a nuclear weapons power, as after 1970, 'Israel will have suitable warheads of its own design available by 1970.'[36] Jane's report went on to say that at least one of the guided missiles under development for or by Israel was for nuclear weapons. The missile was built in France and the warhead developed at Dimona code-named MD 660 and called 'Jericho'. It had a range of 550 kilometers, the report claimed. The West German weekly magazine, Der Spiegel, declared in a detailed report that Israel had completed production of Hiroshima-size bombs, about six devices, with the enriched uranium obtained directly from France and the rest manufactured in its reactor deep in the desert.[37]

(34) 'Atoms and a Middle East Taskkewt', New Outlook, Mar/April 1966; Committee for Nuclear disarmament 'Keep Nuclear Weapons out of our Region', New Outlook, July/Aug, 1966; Livneh, Eliezer., 'Israel Must Come Out for Denuclearization', New Outlook, June 1966.

(35) 'Bonn is Accused of Aiding Israel with A-bomb', Philadelphia Inquirer, 1 March 1968.

(36) Jane's All the World Aircraft, 1968/69, p.1; 'What Kind of a Nuclear Rocket?', Jewish Observer and Middle East Review, 15 Oct. 1979.

(37) Der Spiegel, vol 23, No 19, 5 May 1969.

The response of Israel to all these reports about developing nuclear weapons remained the same from the early beginning of denial and non-confirmation. In December 1965 Israeli Labour Minister, Y. Allon, said, 'Israel will not be the first to introduce nuclear weapons in the Middle East'.[38] Moshe Dayan, Israeli Defense Minister, said after the 1967 Arab-Israeli war that 'Israel has no choice. With our manpower, we cannot physically, financially or economically go on acquiring more and more tanks and more and more planes. Before long you will have all of us maintaining and oiling tanks', amidst a report that he had ordered production of nuclear weapons.[39] Levi Eshkol, Prime Minister, said on October 3, 1968, that Israel knew how to produce an atomic bomb and was quoted as saying 'but it will be a long time before Israel could achieve production of the bomb'.[40] The Israeli daily paper, Jerusalem Post, commented that 'the fate of Czechoslovakia and Biafra had reinforced Israel's determination to have its own nuclear deterrent rather than count on others".[41]

In May 1969, Prime Minister, Golda Meir, said in an interview referring to the West German magazine report 'Israel has no nuclear bomb. Israel has no intention of

(38) Jewish Observer, 24 December 1965.

(39) 'How Israel got the bomb', Time, 12 April 1976, p.39; 'Israel said to plan to Make Atom Bomb', New York Times, 14 June 1967.

(40) 'Arab Capitals Show A-jitters', Christian Science Monitor', 10 Oct. 1968; 'Israeli Nuclear Deterrent urged by Jerusalem Paper', New York Times, 5 Oct. 1968.

(41) Jerusalem post, 4 October 1968.

using nuclear bombs', and described the report as 'absolute fiction'.[42] Yitzhak Rabin, Israeli ambassador to the US, said in New York in July 1970, 'Israel is not a nuclear country and Israel's policy remains not to be the first to introduce nuclear weapons into the area'.[43] However, he warned in a television interview in 1974 that the Israeli arsenal could inflict 'ten times more destruction on Arab cities' than the Arabs could inflict on Israel and that although Israel would not be the first to introduce nuclear weapons in the Middle East, it could not be the second.[44] The President of the state of Israel, Katzir, told New Scientist magazine that 'Israel has assembled all the knowledge and equipment to make nuclear weapons and that such a development is inevitable in Israel's policy.'[45]. He left no doubt that 'it has always been our intention to provide the potential for nuclear weapons development. We now have the potential. We will defend this country with all possible means at hand. We have to develop more powerful and new arms to protect ourself.' He reaffirmed that Israel could assemble nuclear weapons if there was a need for that: 'If the need arose, Israel could convert capability into fact in a short time, even a few days'. He

(42) 'Mrs. Meir denies A-bomb Reports', International Herald Tribune, 10/11 May 1969.

(43) 'Envoy to U.S. Denies Report that Israel has Atomic Arms', International Herald Tribune, 20 July 1970.

(44) Alsop, Joseph., 'An Israeli Threat', Washington Post, 7 Oct. 1974.

(45) Valery, 'Israel's Silent Gamble with the Bomb', op. cit., p.808.

explained that Israel's bombs were in the 'twenty kilotonne range' and indicated that the 'nuclear threat' was being used against the USA to ensure it 'does not desert Israel morally and diplomatically under any future pressure from the Middle East oil exporting countries'. With reference to Israel's huge and growing defence spending, which jumped from 16% of the Gross National Product (GNP) in 1959 to 24% of GNP in 1969 and that 2.4% of GNP spent on research and development and 45% of the science budget spent directly on weapons related research, he indicated that 'if there were more money available, we would increase defense research, not reduce it.'[46]

Prime Minister Rabin said once again in August 1975 in an interview with American ABC-TV, 'I have stated that Israel is a non-nuclear country. We will not be the first to introduce nuclear weapons into the area and in case there would be an overall settlement, that is to say a peace agreement we will sign every agreement about a non-proliferation treaty.'[47] Y. Shamir, Foreign Minister, told the UN General Assembly in September 1975 'Israel will not be the first to introduce nuclear weapons into the Arab-Israeli dispute'.[48]

On the other hand, there were reports by the end of 1973 that the US Secretary of State had ordered the Central Intelligence Agency to update a study made three years

46) Ibid.

7) 'Rabin Spells out A-bomb Tactics', Daily Telegraph, 13 December 1974.

l) A/35/PV. 15, p.27.

earlier of Israel's nuclear weapons capabilities after speculation about Soviet ships carrying arms to Syria and Egypt during the 1973 Arab-Israeli war; ships to Egypt were carrying what appeared to be nuclear weapons which led the USA to alert its forces worldwide on 24 - 25 October 1973.[49] The CIA was expecting Soviet deliveries to Egypt of SCUD ground-to-ground nuclear-capable missiles with a range of 100 miles. By the end of 1974, the CIA said in a secret report that Israel was continuing to make 'a large investment in a costly missile system designed to accommodate nuclear warheads'.[50] William Colby, the former Director of the CIA, told the US Congress at the end of 1975 that 'the US now believes that Israel possesses an operational nuclear capability.'[51] He left unclear the question of whether Israel actually possessed deliverable nuclear warheads in its arsenal or whether it had developed the technical and manufacturing capacity that would enable it to produce one in fairly short order. He repeated in an ABC-TV programme that his colleagues believed in 1968 that the likely case was that the Israelis were fabricating

(49) John, Howard & Newman, Barbara., 'How Israel got the Nuclear Bomb', Rolling Stones, No 253, 1 Dec. 1977, pp.38-39; Weissman & Krosney, The Islamic Bomb', op. cit., pp.120-3; Blechman, B.M. & Hart, D.M., 'The Political Utility of Nuclear Weapons: The 1973 Middle East Crisis), International Security, 7,1, 1982, p.145; 'Kissinger orders CIA Study of Israel's A Weapon Capability, Christian Science Monitor, 6 Dec. 1973.

(50) US Central Intelligence Agency, Report for the US Atomic Energy Commission, Prospects for Further Proliferation of Nuclear Weapons, DC NIO 1945/74, September 4, 1974, p.1; Smith, Hedrick., 'U.S. Assumes the Israelis have A-Bomb', New York Times, 18 July 1970; 'CIA concluded as early as '74 that Israel had produced nuclear weapons', New York Times, 27 January 1978.

(51) 'Near Armageddon: The Spread of Nuclear Weapons in the Middle East', Transcript of ABC-TV, 27 April 1981, pp.13-14; 'Israel has Nuclear Capability', Financial Times, 26 Nov. 1975.

nuclear weapons.[52] US Presidents Johnson and Nixon are said to have received intelligence assessments that Israel has the capacity to assemble an atomic bomb on short notice, and some believed that it has already done so.[53]

On January 26, 1978, the CIA released a memorandum dated August 4, 1974, entitled 'Prospects for Further Proliferation of Nuclear Weapons'.[54] It concluded that Israel had produced nuclear weapons: 'We believe that Israel has already produced nuclear weapons', based on 'Israeli acquisition of large quantities of uranium, partly by clandestine means; the ambiguous nature of Israeli efforts in the field of uranium enrichment, and Israel's large investment in a costly missile system designed to accommodate nuclear warheads.'[55]It gave weight to two previous suspicions that Israel might have obtained clandestinely both from a nuclear fuel plant in Apollo, Pennsylvania, USA, and from a ship carrying uranium ore, 200 tons of which disappeared from the ship bound for Europe in 1968.[56] Israel denied the CIA report '... there is no proof whatsoever', and repeated that 'Israel is not a nuclear power and that Israel will not be the first country in the Middle East to introduce nuclear arms into the region'.[57]

(52) Karnish, Arthur., 'CIA : Israel has 10-20 A-Weapons', Washington Post, 15 March 1976; ABC-TC, 'Near Armageddon', op. cit.

(53) 'US Suspicion of A-bomb Noted', International Herald Tribune, 20 July 1970; Burnham, D., 'Ex-CIA Man says Johnson hear in '68 Israel had A-Bombs', New York Times, 2 Mar 1978.

(54) US Central intelligence Agency, Prospects for Future Proliferation, op. cit.

(55) Ibid., p.1.

Phase II of Israel Nuclear Programme

The second stage of nuclear development in Israel began after the end of 1975 and concentrates mainly on improving Israel's nuclear weapons potential and denying the Arab states the possibility of developing their nuclear potential, and working on plans to build nuclear power stations. As early as April 1975, Israel announced plans to set up a 600 MW nuclear power station by 1985 as a result of President Nixon's promise to sell Egypt and Israel nuclear power reactors under strict safeguards.[58] Negotiations were completed in August 1976 on conditions that the new nuclear power plants were to be under IAEA safeguards and inspection and that any reprocessing of plutonium should be done outside the Middle East. Though the US refused to grant assistance to the Israeli nuclear power project unless it signed the NPT, Israel was going ahead with preparations to build an atomic power station despite the lack of US funding.[59] However, Israel built the first nuclear reactor

(56) Ibid; O'Toole, Thomas., 'Lost Uranium Mystery', Washington Post, 6 Nov. 1977; 'CIA Repeats Fears on Missing Uranium', Washington Post, 28 February 1978; 'Bomb-Rich Uranium Reported Lost', New York Times, 24 Aug. 1977; Shapely, Deborah., 'CIA Report says Israel secretly Obtained A-Matter', Washington Post, 28 Jan. 1978; Davenport, Eddy & Gillman, The Plumbat Affair, op. cit.

(57) 'Israel has A-Bomb for Years, claim CIA', The Guardian, 28 January 1978.

(58) Gwertzman, Bernard., 'U.S. Aide Lauds Safeguards in Israel-Egypt Reactor Deal', International Herald Tribune, 4 Aug. 1976; 'Israelis Planning A-Power Station within Decade', International Herald Tribune, 28 April 1975.

(59) 'Visit by Senators to A-Plant reportedly Blocked by Israel', International Herald Tribune, 9 Nov. 1976; 'Israel to Go Nuclear', Nuclear Engineering International, July 1980.

of its kind serving research purposes which began operating at Ben Gurion University's Department of Nuclear Engineering in Beersheba in June 1981.[60] It is being used for 'research on matters having to do with the development of new types of fuel'. Israel showed new interest in starting to build a 600 MW nuclear power plant by 1983 if it could find a country willing to supply the equipment.[61] Israel has plans to build three 1000 MW power reactors by the end of the century. During French President Mitterand's visit to Israel in March 1982, discussions were carried out about purchase of a 900 MW PWR from France to be installed by the end of the 1980s or early 1990s though no firm commitment was made.[62] The Israeli Energy Minister, Yitzhak Berman, said that 'there now has been progress between the companies and their governments aimed at finding a formula by which sales could be made to Israel without the latter signing the (NPT) treaty'.[63]

It is widely believed that Israel has the know-how and skills to build its own plant but the cost and time lag was estimated in 1980 at $2000 million over 10 - 12 years for each 1000 MW would be too high.[64] Once more France was

(60) BBC Summary of World Bulletin (SWB), 23 June 1981.

(61) 'Israel to Go Nuclear', Nuclear Engineering international, July 1980; 'Israel Hopes for Nuclear Power Station 1990', Financial Times, 11 Mar. 1982; 'Middle East Planners Push for Nuclear Energy Development', MEED, 21 Nov. 1975, pp.11-12.

(62) 'US Concern over French Nuclear Plant Talks with Israelis', Financial Times, 18 Mar. 1985.

(63) Nucleaonics Week, 13 May 1982.

(64) 'Middle East's Uneven Nuclear Progress', Financial Times, 16 June 1982; 'Israel Hopes for Nuclear Power Station by 1990', Financial Times, 11 Mar. 1982.

ready to provide Israel with two 900 MW power reactors costing $3000 million during the French Premier visit to Israel in November 1984. This was not dependent on Israel's signing of the NPT, but the USA persuaded France to drop these plans.[65] Israel's access to foreign nuclear technology has been curtailed by its refusal to sign the NPT. Israel was also reported to be researching on a new method of enriching uranium through the use of laser beams for isotope separation.[66] A supersonic molecular beam is passed through a magnetic field for isotope separation, a method of enriching uranium for use in nuclear power reactors and nuclear weapons.

Israel continued its longstanding policy of denial and non-confirmation of possessing nuclear weapons. Moshe Dayan made it clear that he wanted Israel to have an independent deterrent, free of American control, to balance what he called the increased buying of arms by the Arab states.[67] He said, 'Israel must have the bomb before the Arabs get it, it must not use it first', and that he believed 'we are capable of making the bomb now'. Five years later, he repeated the same claim that Israel was able to produce nuclear weapons in a short time and it should be ready to do

(65) Jane's Defence Weekly, 22 Dec. 1984; 'US Concern over French Nuclear Plant Talks with Israelis', Financial Times, 18 Mar. 1985.

(66) Gillete, Robert., 'Uranium Enrichment: Rumours of Israeli Progress with Lasers', Science, No 183, Mar. 1974, p.1172; 'Tel Aviv Student to Patent Nuclear Find', The Guardian, 14 Feb. 1979; Keeny, et al., Nuclear Power: Issues and Choice, op.cit., p.371.

(67) 'Dayan Calls for Israel A-Bomb', The Sunday Times, 14 March 1976.

so if the Arabs produced them first, 'We are not going to be the first ones to introduce nuclear weapons into the Middle East ... but we do have the capacity to produce nuclear weapons and if the Arabs are willing to introduce nuclear weapons then Israel should not be too late in having nuclear weapons too'. He went on to say, 'We have fought seven wars and we have never thought to resort to nuclear weapons. ... But things change aspect completely when one speaks of leaders of Iraq whose behaviour no one can foresee should they acquire possession of nuclear arms'.[68] Foreign Minister, Allon, said Israel should strive to create an atomic balance of terror with its Arab neighbours.[69] He repeated the longstanding declared policy statement of Israel that 'it will not be the first to introduce nuclear arms into the Middle East but also will not permit the Arabs to be the sole possessors of such weapons'.[70] The Tel Aviv newspaper, Ma'ariv, hinted at the end of 1976 that Israel was engaging in nuclear research for military as well as peaceful purposes 'Israel has much interest in developing atomic energy for peaceful purposes but political and security realities prevent her from turning her back on multipurpose nuclear research'.[71]

(68) 'Dayan says Israel can make Bomb', The Times, 25 June 1981; 'U.S. Blocks A-Plant for Israel', Daily Telegraph, 25 June 1981.

(69) 'Allon Reaffirms A-arms Policy', International Herald Tribune, 10 September 1976.

(70) Ibid.

(71) Ma'ariv, 5 November 1976, quoted in 'Visit by Senators to A-plant Blocked by Israel', International Herald Tribune, 9 November 1976.

The multipurpose research would be subject to Israel's often declared promise not to be the first nation to introduce atomic weapons in the Middle East. More recently, Yuval Neeman, Israeli Minister of Science and Technology, a leading nuclear physicist who has been a key force in Israel's nuclear programme, summarised Israel's nuclear weapons posture:

> "Right in the 1950s we felt that some day a nuclear threat might develop, not through the Arabs' own action but more in terms of their being able to buy or get atomic weapons. We felt Israel should take some steps to create the potential so if confronted, we would do it'[72]

But Israel 'stopped short of entering the club', he said, 'because we did not want to create a nuclear arms race in the Middle East'. 'If the Arabs get nuclear weapons', Neeman went on to say, 'then we will go nuclear'. But he added, 'I dispute the case of its inevitability. It is not inevitable, we have managed to keep it that way'.

Israel has persistently denied the Arabs' development of nuclear capabilities. The Israeli military correspondent of Ha'artez daily paper wrote,

(72) Radio Free Europe Broadcast, 21 February 1983.

'The moment the Arabs have a nuclear bomb, the strategic

> picture will change. We shall be required to alter our ways of thinking fundamentally. The Arab bomb will create new strategic risks .... Israel must make every possible effort in order to delay and stop every Arab progress in this area'.[73]

In 1979, in an article about activities of the Israeli secret service, Mossad, Parade magazine reported that nuclear programmes and scientist of the moslem countries would become targets for the secret service and that Mossad agents were determined to maintain Israel's superiority in the Middle East and to prevent the development in Islamic countries of any nuclear weapons.[74]

In June 1981, the Israeli Airforce bombarded and destroyed Iraq's 70 MW nuclear research reactor near Baghdad. A few days later, Israeli Prime Minister Begin, declared that

> 'Never again will there be another Holocaust. We shall defend our people with all the means at our disposal ... we shall not allow any enemy to develop weapons of mass destruction'[75]

(73) Quoted in 'French Nuclear Sale Angers Israel', The Guardian, 18 July 1980.

(74) Parade, July 1979.

(75) 'Israeli PM defiantly Justifies and says Israel would do it again if Necessary', The Times, 10 June 1981.

Israeli Army Chief of Staff, General Rafael Eitan said, 'Israel will not be able to tolerate the existence of nuclear weapons in the hands of those who seek its destruction'.[76]

Israel followed another route to stop the Arab states short of developing the nuclear option through adopting a new nuclear policy objective calling for political solution and a nuclear-free zone in the Middle East. Shimon Peres argued that 'from Israel's point of view, it is not a matter of finding technical solutions, but political ones to solve the problem. Before the end of the decade, several Middle Eastern countries will have nuclear power. That is why we must combine our efforts with those countries in the area to reach a global peaceful settlement before the Middle East finds itself sitting on an atomic volcano'.[77]

Shamir, the Israeli Foreign Minister, played a major role in initiating an agreement accepted in Israel by suggesting at the UN General Assembly that the Tlatelolco Treaty as a model for the Middle East but promised that 'Israel will not be the first to introduce nuclear weapons into the Arab-Israeli dispute'.[78] He marked this change of policy by voting for an Egyptian effort to free the region of nuclear weapons by creating a nuclear-free zone in the Middle East.

(76) 'Despite Raid Iraq Vows to Press Nuclear Program', Washington Post, 11 June 1981.

(77) 'Peres Criticises France over Iraq', International Herald Tribune, 27 December 1980.

(78) 'Nuclear Arms U-turn by Begin's Superhawk', The Observer, 26 October 1980; UN General Assembly, Resolution 35-147, 94th Plenary Meeting, 12 December 1980.

Meanwhile, new evidence began to emerge about Israel's nuclear weapons development. French General and Director of the French Strategic Institute, George Buis, said, 'Israel has been producing nuclear bombs, had the capacity to produce two nuclear bombs every year, at a steady rate, at least for ten years', and 'they are bombs designed for anti-city action, to be deployed on Arab capitals which surround it ... Israel has, in the first place, raw materials needed for the manufacture of atomic weapons from phosphates of the Negev Desert and Israel has the capacity to produce heavy water'.[79] He described the Dimona reactor in the following terms: 'this plant supplies nuclear fissile materials which can be used for manufacture of approximately two atomic bombs of 20 kilotonne each year'. The West German Stern magazine argued that Israel had had nuclear bombs since the early 1970s.[80]

In the first days of the 1973 Arab-Israeli war, when Egypt and Syria successfully launched their attack against Israel, Golda Meir, Israeli Prime Minister, was reported to have given the red alert for the Israeli secret atomic unit.[81] Thirteen bombs were alleged to have been taken out of their base in the Negev Desert and put on specially adapted bombers for 24 hours. A book describing Israel's alleged development of nuclear weapons called 'None will

<79> 'Israel making Nuclear Bombs', Financial Times, 27 October 1977.

<80> Stern report quoted in 'Israeli A-Bomb Report', The Guardian, 12 March 1980.

<81> Ibid.; 'How Israel Got the Bomb', Time, 12 April 1976, p.39-40.

survive us: The story of the Isreali A-bomb' had its publication banned by the Israeli military censor.[82] General George Kennan, former head of US Airforce intelligence said in a BBC-TV programme that he listened to a telephone conversation on October 10, 1973, of President Sadat of Egypt asking Brezhnev, Secretary General of the Soviet Communist Party, for help because of the Israeli nuclear alert and to a similar conversation between Golda Meir, Israeli Prime Minister, and Moshe Dayan, Defence Minister, on the second day of the war asking for permission to arm Jericho missiles at Dimona and was given the go-ahead.[83] One report said a US SR-71 Blackbird intelligence plane making a regular run over the Sinai Desert detected Israeli Jericho missiles with radioactive warheads.[84]

Aerospace Daily claimed that Israel had deployed a number of nuclear-tipped missiles in the Negev Desert and the Golan Heights 'intermediate range Jericho II missiles were mounted on erector trucks and supported by nuclear hardened underground facilities'.[85] The Soviet journal, US: Economics and Politics and ideology, wrote, 'Israel is striving to acquire nuclear weapons. Facts show it has

(82) 'Israeli Censor bans Book on Alleged Nuclear Arms', International Herald Tribune, 31 March 1980.

(83) BBC-TV 'Newsnight', 11 July 1985.

(84) Defense and Foreign Affairs Daily, vol X, No 116, 17 June 1981, pp.1-2.

(85) 'Middle East: Israel Deploying the Jericho II?', Aerospace Daily, 2 May 1985, p.2; 'Israel: Nuclear Missile Deployment', Jane's Defence Weekly, 14 Sept. 1985, p.511

already become a secret nuclear power'.[86] A UN study carried out by a group of experts on Israeli nuclear armaments concluded that Israel can make nuclear weapons within a very short time.[87] More recently, Israel admitted that about 85 krypton devices whose major function is to trigger nuclear bombs had been exported illegally to Israel between 1979 and 1983.[88] There were also reports that about 47 tons of depleted uranium had been sold by a Luxemburg company to Israel without prior notification of Euratom Authority which could have been used to make plutonium for atom bombs.[89]

For many years there have been repeated reports of Israeli-South African nuclear cooperation. On July 5, 1979, Professor Ronald Walters of Howard University in Washington delivered a statement to the UN security council committee on the subject of nuclear collaboration with South Africa and referred to a seminar held in London by five countries which 'illustrated the substantial rôle played by the United States, France, West Germany, the United Kingdom and Israel in the development of the military and nuclear weapons capability by the provision of special nuclear materials, nuclear facilities and equipment, related scientific and

(86) BBC, SWB, 16 October 1981; Radio Cairo quoted by BBC-SWB, 23 February 1980.

(87) UN, Study on Israeli Nuclear Armament, op. cit., p.22; 'Israel Could Produce 15-20 Nuclear Warheads,' Jane's Defence Weekly, 14 September 1985, p.511.

(88) 'Jerusalem admits Smuggling Charges', The Guardian, 14 May 1985; 'Israel Got U.S.-Made Devices', Washington Post, 14 May 1985.

(89) 'Uranium Agency Closes Loophole', The guardian, 12 July 1985; 'Israel's Uranium', Foreign Report, 18 July 1985, pp.3-4.

economic assistance directed towards these countries.'[90] It was also claimed that Israeli technology was exchanged for South African enriched uranium for use at the Israeli nuclear facility at Dimona.[91] Recently there was growing concern about possible cooperation between South Africa and Israel. Such concern became particularly persistent after the South African Prime Minister, John Vorster, visited Israel in 1976 and signed several cooperation agreements.[92] The South African-Israeli relationship goes back to 1953 when the Prime Minister of South Africa visited Israel. He was the first 'Western' head of government to visit Israel.[93] Economic collaboration has continued since then between the two countries and was formalised by the 1976 visit.[94] The development of the military alliance during the period 1976 - 1980 in conventional and nuclear collaboration has been fully documented by the UN Special Committee against Apartheid.[95] It is alleged that the device to be tested in the Kalahari Desert in 1977 was

(90) UN Security Council Committee on Nuclear Collaboration with South Africa, on July 5, 1979.

(91) UN Notes and documents No20/81, July 1981; UN documents A/AG.115L 396; Adams, J., The Unnatural Alliance: Israel and South Africa (London: Quartet books, 1984) p.166; Harkavy, Spectre of a Middle East holocaust, op. cit., p.78.

(92) 'The Israeli connection', The Economist, 5 Nov. 1977, p.87; Kim Willenson, Lloyd A. Norman, Scott. Sulvan and Milan J. Kubic, 'Israel: A Friend in Need', Newsweek, 12 Sept. 1977, p.44; Cervenka and Rogers, The Nuclear Axis, op. cit., pp.326-7.

(93) Husain, Azim., 'The West, Israel and South Africa', Third World Quarterly, vol4, No1, Jan 1982, p.69.

(94) UN notes and documents No20/81 July 1981 p.20.

(95) Ibid., UN General Assembly Committee on Apartheid document A/AC.1151L.396, 14 oct. 1974, p.7.

Israeli and that the two countries conducted a joint nuclear test in the South Atlantic in 1979.[96] There has also been speculation for years that Israel, South Africa and Taiwan are cooperating in the development of nuclear-capable cruise missiles.[97]

To sum up Israeli nuclear weapons development, there is no doubt that it has the technical ability to manufacture nuclear weapons: the Dimona reactor, reprocessing facilities, uranium enrichment capability using laser techniques and highly experienced skills. The unsafeguarded Dimona reactor is capable of producing enough plutonium for bomb production and has the means of separating plutonium from spent fuel. All these, beside a highly developed military industrial base, give sufficient credence to the belief that Israel possesses a substantial nuclear potential.

On the other hand, the declared Israeli nuclear deterrence remains that it should keep its nuclear capability secret and unknown and should keep the nuclear option open in case need arises to threaten or use its nuclear capability.[98] This ambiguity in the Israeli policy led to two main interpretations, the 'bomb in the basement' and the 'nuclear option' arguments based on beliefs either

(96) Raj, Christophers., 'Israel and Nuclear Weapons: A Case of Clandestine Proliferation' in Subrananyan, S. (ed), Nuclear Myths and Realities, (New Delhi: ABC Publishing, 1981), pp.114-18.

(97) Lodgaard, 'Nuclear Proliferation: Critical Issues', op. cit., pp.11-20.

(98) Evron, Y., The Role of Arms Control in the Middle East, Adelphi paper no 138 (London: International Institute for Strategic Studies, 1977) p.9; Dowty, Nuclear Proliferation, op. cit., pp.79-120.

that Israel has already produced nuclear weapons secretly or that it can fabricate nuclear weapons at short notice.[99] Though Israel has no known published national security doctrine, its defence posture was based on the need for a strong military posture in face of the Arab threat to Israel's survival. This concept of Israeli security led Israel to follow a policy of conventional deterrence against the Palestinians and regular Arab armies. In 1965 Abba Eban, Israeli Foreign Minister, explained this concept of deterrence: 'We want to create doubt and despair about the dream of eliminating Israel from the world's map'.[100] However, the concept of deterrence assumes a new dimension with the possibility of Israel's possession of a nuclear weapons capability. Moreover, the uncertainty surrounding the Israeli nuclear capability has some deterrent value.[101] This Israeli policy of ambiguity should provide Israel's adversaries with the least incentives to go nuclear by creating fear and despair in the Arab states about accepting Israel's peace terms.[102] This element of uncertainty in the

<99> Harkavy says 'All...assumptions' about Israel's nuclear weapons 'are open to serious questions because of technical factors that allow for variations in key parameters and because of any or all assumptions may be simply incorrect. So extreme caution should be exercised in drawing conclusions concerning Israel present and potential nuclear capability' in Harkavy, Spectre of a Middle East Holocaust, op. cit., pp.25-26.

<100> Quoted in Israel: A country Study, (Washington D.C.: The American University, 1979), p.251.

<101> Pry, Peter., Israel's Nuclear Arsenal, (Boulder, CO: Westview Press, 1984), p.109; Perlmutter, A. et al., Two minutes over Baghdad, (London: Valentine Mitchell, 1982), p.34.

<102> UN Study on Israeli Nuclear Armament, op. cit., p.19; Huweidi, Amin H., The Arab-Israeli Conflict between Conventional Deterrence and Nuclear Deterrence, (Beirut: Centre of Arab Unity Studies, 1983), p.130.

Israeli nuclear posture is associated with any nuclear deterrent threat; one can never be sure that the threatener will not carry out his threat. Also, Israel supplemented this policy of ambiguity with a determination to deny the Arab states the development of their nuclear capabilities.

This policy of ambiguity and denial could motivate the Arab states to speed up their activities to acquire nuclear capabilities. A number of scholars argue that uncertainty is undesirable for a deterrence policy as disclosure is a prerequisite for effective deterrence. Lawrence Freedman argued this point in more elaborate form:

> "The announced existence of the deterrent must precede those events which it is intended to deter. Israel could not allow herself the benefits of ambiguity. She would not be able to keep her weapons hidden until such time as the Arab armies were almost upon her; sudden claims about 'bombs in the basement' would not necessarily have the credibility to avoid disaster. Thus, Israel could not shift its nuclear strategy surreptitiously".[103]

(103) Freedman, Lawrence., 'Israel's Nuclear Policy', Survival, 17, May/June 1975, p.119; see Stone, Jeremy., 'The strategic role of the United States bombers' in Art, Robert J. & Waltz, K. (eds), The Use of Force, (Boston: Little, Brown, 1971), p.341; Gallois, The Balance of terror', op. cit., p.108; Brodie, Bernard., Strategy in the Missile Age (Princeton: Princeton University Press, 1959), pp.291-2; US Congressional Budget Office, Counterforce Issues for the US Strategic Nuclear Forces, (Washington D.C.: Government Printing Office, Jan.1978), p.3.

There is a wide consensus among experts that Israel has the technical ability to manufacture nuclear weapons based on conclusive evidence about Israeli technical, technological and economic abilities. There is no consensus that Israel has already produced nuclear weapons based on inconclusive and circumstantial evidence and there are disagreements about definitions of what constitutes a nuclear weapon or device in terms of Israel's ambiguous status.[104] The decision to produce nuclear weapons should be more appropriately addressed to the political and security circumstances of Israel rather than being based solely on technical and technological abilities.

Nuclear Development in Arab States: Phase I

The Arab states' sensational nuclear development during the period 1952 - 1974 was based on three responses to Israel's nuclear activities.[105] One was to call for the development of nuclear weapons of their own. The second was to warn Israel that her development of nuclear weapons would force out an Arab preventive war. The third was to look for a ready-made bomb to buy.

(104) Chari, P.R., 'The Israeli Nuclear Option; Living Dangerously', International Studies, 16 July/Sept 1977, pp.347, 349, 350; Dowty, Alan., 'Israel and Nuclear Weapons', Midstream, 22, Nov. 1976, pp.6-7; Mandelbaum, M., 'International Stability and nuclear Order' in Gompert, et al., Nuclear Weapons and World Politics, op. cit., p.68.

(105) Evron, Y., 'The Arab Position in the Nuclear Field: A Study of Policies up to 1967', Cooperation and Conflict, VIII, 1, 1973, pp.22-23.

EGYPT: Arab nuclear development began in Egypt in 1952 when Egypt signed an agreement with Britain to build a Latina type reactor during King Farouq's regime shortly before Nasser took power.[106] The agreement never materiallized. In 1955 a decree was issued for the creation of the Higher Committee for Atomic Energy which was converted into the Atomic Energy Organization in 1957. In the same year, the centre for nuclear research at Inchass was inaugurated and a radioisotope centre was established at Alexandria University.[107] In the early 1960s, experts of several nationalities were called to help prepare an atomic programme.[108] President Nasser expressed several times his concern that Israel was acquiring atomic military potential in collusion with France.[109] He warned that if Israel acquired the atomic weapon, so would Egypt. West German scientists, meanwhile, began discussions with the Egyptian authorities.[110] They were preceded by Canadian atomic scientists and Soviet scientists. The West German scientists were interested in plans to produce heavy water in Egypt and Egypt was mainly interested in building a medium size breeder reactor. The Atomic Energy Organisation

(106) Beaton, L., 'Nuclear Fuel-for-all', Foreign Affairs, vol 45, July 1967, p.665.

(107) 'UAR Reaction Widens Arab Nuclear Research', Christian Science Monitor, 29 Aug. 1961; Al Sharq Al Awsat, 15 March 1979.

(108) 'UAR striving to become A-Power', New York Herald Tribune, 17 Feb. 1961.

(109) 'Atomic Weapons and Middle East', Middle East Mirror, 21 AUG. 1965; 'Nasser would fight to prevent Israel making atomic bomb', Jewish Post Weekly, 25 Feb. 1966.

(110) 'UAR Striving to become A-power', New York Herald Tribune, 17 Feb. 1961; 'UAR Reaction widens Arab nuclear research', Christian Science Monitor, 29 Aug. 1961.

sent a mission to the West and the Soviet Union to prepare for the training of 200 experts in nuclear research.[111] The organization also supervised the construction of a Soviet built 2-MW research reactor at Inchass.[112] The radioisotope centre in Inchass accommodates a 2.5-van de Graaff accelerator and several laboratories for radioisotope production, nuclear fuel research and development, application of isotopes, electronic instruments and radiation production.[113] A National Research Centre for Radiation Research and Technology was established housing a 400,000 CI, CO-60 unit and electronic accelerator.[114] A Middle Eastern regional isotope centre for the Arab and the industrial fields.[115] The Arab league agreed to make Cairo the regional centre for IAEA programmes in the area.[116] A conference was held in November 1961 at the centre on protection from radiation and was attended by scientists from states of the Arab League and experts from some Mediterranean, African and Asian countries of the IAEA.[117]

(111) Ibid.

(112) Ibid.

(113) 'First Assessment of our Progress in Nuclear Development', Akhbar Sa'a, 16 Dec. 1964, pp.31-35; Europa Book, Middle East and North Africa, 1986, p.377.

(114) Ibid.

(115) 'UAR Reaction Widens Arab Nuclear Research', Christian Science Monitor, 29 Aug. 1961; White, Stanley., 'Status Symbols or Stimulus', Newscientist, 26 May 1966, pp.542-43.

(116) Ibid.

(117) Ibid; See Zahalan, A.B., Science and Scientific Policy of the Arab World, (Beirut; Centre for Arab Unity Studies, 1980), p.186.

Egypt signed a nuclear cooperation agreement with India on July 1962 'in the development of atomic energy for peaceful purposes', and Egyptian scientists would be trained in India and provided for the sale of radioactive materials and scientific equipment to Egypt.[118] At least eight Egyptian scientists were sent to India for further nuclear training.[119] A few months later, Egypt announced a plan to build a £30 million nuclear power station in the Nile Valley to be constructed and run by Soviet scientists.[120]

Egypt made no secret of its intention to equip its military rockets with nuclear warheads. In March 1963, Egypt claimed that it had completed preparations for arming its military rockets with a radioactive substance such as Cobalt-60 (Co-60) with West German help.[121] A year later, it announced a breakthrough in the field of light and easily mobile missiles containing limited quantities of radioactive material. The exploding of such missiles would produce the heat and blast effects of Hydrogen bomb but would have secondary radiation effects.[122] Nasser's nuclear programme, which aimed at inhibition of the State of Israel, was based on three operations: Cleopatra, IBIS and Strontium 90. Operation Cleopatra's purpose was to produce bombs of the

(118) Yusuf, Iran Ali., 'Nuclear Energy in the Muslim World', Pakistan Horizon Quarterly, vol XXXIV, No 1, 1981, pp.59-73; 'Nasser's Windfall', The Guardian, 6 Sep. 1962.

(119) Ibid.

(120) 'Russian Scientists to Work in Egypt', Daily Telegraph, 18 Jan. 1963.

(121) "Egypt's Nuclear Rocket Force 'Ready Soon'" Daily Telegraph, 20 Mar 1963.

(122) "Nasser's Nuclear Breakthrough" The Guardian, 4 May 1964.

Hiroshima type. Nasser considered the idea of procuring three to four Hiroshima size bombs from Britain to be brought illicitly by Royal Air Force officers for £8 million. Operation IBIS was concerned to produce small missiles with limited radioactive fall-out. Operation Strontium 90 was considered seriously by Nasser as a means of causing heavy losses in the civilian population by exploding a small package of toxic and cheap Strontium 90 in Israel.[123] Nasser depended for his programme on West German scientists and equipment. He said publicly that he would strike against Israel when prepared to do so and certain of success.[124] The rockets developed for Nasser's nuclear programme were called Al-Zafer, Al-Qahir and Al-Raid. The first two were single-stage rockets with a range of 235 and 375 miles respectively. The third was a two-stage rocket with a range of some 600 miles. Other attempts were made to mass-produce a fighter aircraft (HA-300) at Helwan, South of Cairo. The Egyptian rockets (a version of the German V-2 rocket) equipped with radioactive materials were dismissed by some experts. The project was not successful due to technical difficulties and sabotage. The rockets and planes were later developed by the Egyptian military industry and produced for the Egyptian Army.

(123) Ibid; Beaton, L., 'The Truth about Nasser's Bomb' Spectator, 8 May 1964, pp.625-26; Prittre, Terrence., 'Bombshop in the Nile: Target Israel', The ATLANTIC, Aug 1964, pp.37-40; 'The Fifth Nuclear Power?' The Guardian 4 May 1964.

(124) Jewish Observer and Middle East Review 23 Dec 1960; BBC-SWB, 27 Feb 1966.

Meanwhile there were reports that Egypt had obtained drawings of the mechanism of an A-bomb. It had tried to buy six versions of it from West Germany and intended to obtain from the same source a centrifuge mechanism for obtaining enriched uranium.[125] By the end of 1964, the Egyptian Atomic Energy Establishment invited tenders for a 150 MW nuclear power station to be built South of Alexandria and an integral desalinator unit supplying 4.5 million gallons of fresh water per day.[126] A second project discussed was the excavation, using nuclear explosives, of a canal 50 miles long from the Mediterranean to the Alqatara Depression in the Western Desert of Egypt to generate electricity.[127] In May 1965 Egypt signed an agreement with East Germany including an exchange of scientists, supply of equipment for developing atomic energy for peaceful purposes in the field of agriculture, industry and medicine.[128] Six months later, an Egyptian diplomat said Egypt and France would cooperate in the atomic field and Egyptian experts would visit the French atomic centre for training.[129] Alexandria University Nuclear Engineering Faculty began installation of a nuclear research reactor and equipment at its nuclear

(125) 'Nasser Thwarted Hopes' The Guardian, 8 May 1964.

(126) 'Egypt Plans an Atom-Dug Canal' New Scientist, 10 Sep 1964, p.617; African Institute Bulletin, Dec 1964, p.343. The plan to build 150-MW reactor was never materialized. It was abandoned in May 1965, see John K. Cooley, 'Cairo Assessing Nuclear Strength' Christian Science Monitor, 2 Jan 1975.

(127) 'Egypt Plans an Atom-Dug Canal' New Scientist, 10 Sep 1964, p.617.

(128) 'E. Germany to Aid Egypt' New York Herald Tribune, 8-9 May 1965.

(129) 'Atomic Cooperation' Middle East Mirror, 30 Oct 1965.

research laboratory financed by a quarter of a million Egyptian Pounds grant from Kuwait.[130] There were reports that Egyptian scientists were trained in the Trombay reprocessing facilities in India and that they were present at the testing ground when India exploded her atomic device.[131]

Haikel, editor of the Egyptian government official newspaper, Al-Ahram, wrote that Egypt might not be willing, for any reason, to start the entry of atomic weapons in the Middle East, but it was obliged to be able at any time to reach 'the reason for life itself'[132]. He claimed that Israel was approaching the possibility of producing an atomic bomb. The reasons he gave for Israel's atomic venture were living under military siege and depending on foreign arms and support. What he called 'psychological disposition of Israel's security'. There were other reasons such as the breaking of the arms embargo in 1955 as a result of the Egyptian-Czechoslovakian arms deal and fear of the Egyptian military superiority and the failure of 1956 Suez campaign which led to the construction of the Dimona reactor'[133] Nasser was quoted in 1960 and 1966 as saying

(130) Africa Institute Bulletin, April 1964, p.343.

(131) Jabber, Paul., 'A Nuclear Middle East Infrastructure, Likely Military Postures and Prospects for Strategic Stability' ACIS working paper No 6 (Los Angeles; Centre for Arms Control and International Security, University of California, 1978) pp.11-12, 42.

(132) 'Atomic Weapons and Middle East' Middle East Mirror, 21 Aug 1965, AL-Ahram, 15 Oct 1965.

(133) Ibid.

that if Israel proceeded with the production of an atomic bomb 'then I believe the only answer is preventive war'[134] and in such a war the Arabs' immediate objective would be to wipe out 'every thing that enables Israel to produce atomic weapons'. Ahmed Khalifa, an Arab scholar, called for a preventive war against Israel's nuclear development.[135] Egyptian vice president, Ali Sabri, said Egypt 'is not developing nuclear weapons and does not envisage doing so.'[136] He went on to say 'the choice is preventive war. Egypt agreed on inspection while Israel refuses'.

Egypt continued its declared intention of producing nuclear weapons. Nasser said at the end of 1964 that Egypt 'must enter the atomic and rocket field to deal with Imperialism for the sake of self reliance in arms and defence policies.'[137] Dr Abdul Qader Hatim, Deputy Prime Minister of Egypt, indicated in Tokyo that his country would arm itself with nuclear weapons if Israel did so 'we oppose nuclear weapons in principle but if the enemy gets them, we must counter his plan in self-defence'.[138] He continued by saying 'But we protect ourselves against invasions. That is

(134) Jewish Observer and Middle East Review, 23 Dec 1960; 'Nasser Would Fight to Prevent Israel from Making Atomic Bomb', Jewish Post Quarterly, 25 Feb 1966; Stephens, Robert., Nasser (Middlesex: Penguin, 1971) pp.316-317.

(135) Al-Hurria, 20 October 1960.

(136) Cooley, John K., 'U.A.R. Warns Against Israeli Nuclear Arms' Christian Science Monitor, 16 Jan 1967

(137) 'Nasser Insists U.A.R. take part in Rocket Race' New York Herald Tribune, 25 Dec 1964.

(138) 'U.A.R. Might Arm Itself with Nuclear Weapons' Middle East Mirror, 29 Jan 1966.

why we have the strongest army in the Near East and rockets and other military plans.' Egyptian UN representative, Zayat, said he was 'sure that Israel is developing nuclear weapons' and added that Egypt would resist Israel 'with every weapon available to us or which may be available to us.'[139] Dr Zayat, Deputy Prime Minister of Egypt, hinted that Egypt might seek atomic weapons if Israel acquired them 'if Israel obtained the atom bomb'.[140] President Nasser, in an interview with the New York Times about the Israeli nuclear capability, said 'if the Israelis produce an atomic bomb, we will also produce atomic bombs. We have the technicians capable of producing it. But naturally it is very costly. But if they will obtain the atomic bomb, we will obtain it, too'.[141] Haikel once again called upon the Arab nations to acquire their own atomic bomb or the capability of making one.'[142] He argued that 'there might come a time when Israel ... would depend upon an atomic deterrent' which 'the Arabs would not be able to match. Arab countries, therefore, must eventually have their own deterrent as the only guarantee of security and peace'. He described the path to the Arab bomb: 'what is required now is a single Arab organization under high supervision, 100 of

(139) 'Arab Capitals A-jitters' Christian Science Monitor, 10 Oct 1968.

(140) 'United Arab Republic May Seek Atom Bombs' The Times, 16 Jan 1969.

(141) 'Nasser Expects Atomic Protection' Jewish Observer and Middle East Review, 16 May 1969, p.7.

(142) Haikel, Mohammed Hassanein., 'the Bomb' Al-Ahram, 23 Nov 1973; 'Arab Nations Must Have Atomic Bomb' Daily Telegraph, 24 Nov 1973.

our scientists who are living among us or whom we have allowed to emigrate and 200 to 300 million pounds ($500 to $700 million) and no more'. He went further to describe the Arab atomic venture 'in the face of the atomic threat from Israel, the Arabs can obtain what they want from the Soviet Union. If the Soviet Union refuses, China might agree. And, if China refuses, the atomic bomb after all is not an impregnable hide out away from all hands and eyes'.
The Egyptian Foreign Minister, Ismail Fahmy, warned that 'if Israel explodes an atomic device, Egypt will obtain similar weapon or manufacture it. We have scientists capable enough to mount a reactor in this field and there is no scientific or technological barrier in our way.'[143] President Sadat promised in a number of occasions that 'if Israel intends to introduce nuclear weapons into the area, we, too, will find a way of acquiring such weapons'.[144] Similar statements were issued by General Al Gamassy, Egyptian War Minister.[145]

Iraq: Iraq's nuclear development goes back to the early 1950s when the Baghdad Pact established an atomic research laboratory in Baghdad in 1957 with British assistance.[146] Iraq also signed an agreement with the USA for the provision

(143) 'Middle East Planners Push for Nuclear Energy Development' MEED, 21 Nov 1975; 'Egypt to Get A-Bomb if Israel Explodes One' Washington Post, 1 May 1976, AL-AKHBAR, 18 June 1974.

(144) Foreign Broadcast Information Service, 18 Dec 1974; Middle East News Agency (MENA), 6 July 1977; Al-Anwar, 8 Jan 1975.

(145) Al-Hawadith, 23 Jan 1975.

(146) 'Baghdad Pact Countries Proposed Training Centre' The Times, 11 Jan 1956; The Times, 16 April 1957.

of an atomic library on October 1956 to Iraq. [147]An atomic energy commission was founded in 1956 and three years later a decree was issued that laid down the responsibilities of the research of the commission 'to be for industrial medical and agricultural purposes and keeping abreast of international progress in this field''[148] In April 1960 an agreement on atomic research was signed between Iraq and the Soviet Union.[149] A Soviet-built 2 MW research reactor which became operational in 1967 and a Cobalt Ray unit for treatment of cancerous diseases, was established with Soviet help eighteen miles South of Baghdad.[150] The Iraqi Prime Minister said the nuclear research reactor would be used for peaceful purposes.[151] The research reactor was built with a Soviet grant totalling about £2 million. It is capable of training 100 scientists at one time. A team of foreign nuclear scientists was advising the Iraqis on atomic energy projects and a programme was carried out to train Iraqiengineers at Soviet research reactor in Riqa [152]. A three months crash course was designed for training Iraqi scientists supervised by the Soviet Nuclear Physics

(147) New York Times, 21 March 1956.

(148) 'Atomic Reactor in Action Next Year' Middle East Mirror, 9 April 1966, p.17.

(149) Ibid; Beaton 'Nuclear Fuel-For-All' op. cit.

(150) 'Atomic Reactor in Action Next Year' Middle East Mirror, 9 April 1966, p. 17; Jabber 'A nuclear Middle Eat' op. cit., p.12.

(151) Russian Scientists to Work in Egypt', Daily Telegraph, 18 Jan 1963.

(152) Ibid; 'Iraq's Nuclear Arms Option' Washington Post, 27 April 1978; Branigan, William 'Iraq Build Up Stirs Concern' Washington Post, 8 Aug 1978.

Institute at the Lativan Academy of Sciences. Iraq alsobegan building an atomic research laboratory at the National Research Centre to undertake scientific research and investigate radioactivity in various parts of the country and to follow up scientific activity in the field of atomic energy in other countries.[153] The Iraqi Nuclear Research Institute which was founded in 1967 accommodates nuclear research reactor, radioisotope production facilities, research in nuclear and solid physics, analytical and radiochemistry, biology and agriculture, health physics and geology. Iraq, also, looked for Arab cooperation on nuclear research. Iraq was the first Arab State to sign an Arab League sponsored agreement for Arab cooperation on the use of atomic power for peaceful purposes.[154] Another two year agreement was signed between the Iraqi Atomic Energy Commission and the Soviet Union on the use of the atom for peaceful purposes.[155] Iraq also signed an agreement with Yugoslavia for the construction of power stations and a research agreement with India in March 1974.[156] The agreement with Yugoslavia for the construction of a nuclear power station has never materialized. It is clear that in

(153) 'How Iraq Lost its Nuclear Option' Foreign Report, 11 April 1979, p.2; 'Atomic Research Laboratory Planned' Middle East Mirror, 5 Nov 1966.

(154) Ibid; Iraqi Atomic Energy Commission, Peaceful Uses of Atomic Energy for Scientific and Economic Development, Proceedings of the First Scientific Conference of the Iraqi Atomic Energy Commission, held in Baghdad 7-12 April 1975 (Baghdad: Iraq Atomic Energy Commission 1975).

(155) 'Atomic Pact' The Guardian, 20 Jan 1971.

(156) 'Nuclear Trading-go-round' The Economist, 6 Dec 1975, p.74; Jerusalem Post, 22 Aug 1980.

the first stage of nuclear development that Iraq concentrated mainly on research and training and the use of nuclear energy for peaceful purposes such as agriculture and medicine.

Libya: Libyan nuclear development has been surrounded with controversy and speculation. Early Libyan nuclear development programmes were focused on persistent efforts to buy ready nuclear bombs.[157] These attempts are said to have begun in 1970 with the Libyan Prime Minster's visit to China.[158] He attempted to buy nuclear weapons but China declined. Other attempts were made in 1975 and 1978 and an Egyptian - Libyan one sponsored by the Libyan Prime Minister was made in 1977.[159] Libya's attempt to buy an atomic bomb from either China, the Soviet Union, Pakistan, India or from an international marketplace came to no result, because it seems unlikely that a responsible nuclear weapons power will be willing to sell or give up control of atomic bombs whatever the price, since such an act will, undoubtedly, have grave consequences on non-proliferation regimes and efforts.

(157) Cooley, John K. and Lisa. Kaufman, 'Deterring a Qaddafi Bomb' Washington Post, 23 Dec 1980; Foreign Report, 13 Aug 1980; 'Middle East's Nuclear Race', Foreign Report, 13 Aug 1980, pp.6 'Libyans Pay Dear for Going Nuclear', Observer, 18 Oct, 1981.

(158) Ibid; Foreign Report, 8 August 1978; Haikel, M.H., The Road to Ramadan (New York: Quadrangle/New York Times Book, 1975) pp.76-77.

(159) Ibid; Micallef, Joseph., 'A Nuclear Bomb for Libya', 'Bulletin of the Atomic Scientists, Aug/Sep 1981, pp.14-15.

In 1973 Libya formed an Atomic Energy Commission.[160] It signed a nuclear power research and equipment agreements with the Soviet Union in May 1975 for the peaceful utilization of nuclear energy which was preceded by an economic and technical cooperation agreement in March 1972.[161] A protocol for the construction of $300 million 440 MW VVER power reactor was concluded on August 1975 with the Soviet Union.[162] The reactor was supposed to have its cooling system built by Finland. Other agreements were signed with France, West Germany, Argentina, India and Sweden.[163]. In November 1974, a $83 million contract was signed with a West German firm for the construction of a heavy water production plant in Libya.[164] There are no further reports about this West German contract.

Nuclear Development in Arab States: Phase II

EGYPT: The Second stage of Egypt's nuclear development which began at the end of 1975 showed a marked change of policy towards the peaceful use of nuclear energy and the

(160) 'Pandora's Box: The Perils of Proliferation' The Middle East, Aug 1981, pp.6-12; OAPEC Bulletin, vol 8, no 4, April 1982.

(161) Libyan News Agency , 15 May 1975; SIPRI Year Book 1977, pp.34,40.

(162) Ibid; 'Libyan Nuclear Plant' Financial Times , 11 Dec 1976; 'Russia Signs Accords with Libya to Build Nuclear Power Plant' Wall Street Journal, 14 Oct 1978; 'Middle East Planners Push for Nuclear Energy Development' MEED 21 Nov 1975, pp.11-12.

(163) Ibid; Libyan News Agency, 31 July 1974.

(164) 'Pandora's Box: the Perils of Proliferation' The Middle East, Aug 1981, pp.6-12; 'Middle East Planners Push for Nuclear Development' MEED 21 Nov 1975.

creation of a Nuclear-Free Zone in the Middle East and the occasional threat to develop nuclear weapons in response to Israel's nuclear weapons potential.

First, the nuclear research centre at Inchass was organized into five sectors for heavy water, radioactivity, atomic geology, nuclear chemistry and atomic reaction including a cobalt unit. At least 400 nuclear researchers were employed.[165] A laboratory described as the biggest of its kind in the Middle East was built in Cairo University for the application of radiation technology.[166] A 400,000 cubic Cobalt source of gamma rays was installed in the laboratory, purchased from Canada under a nuclear cooperation agreement to launch the laboratory for industrial and medical uses.[167] A top level Council for Nuclear Development for All Purposes was introduced after President Sadat had said that if Israel obtained nuclear strike capabilities, then Egypt would follow suit.[168] The Higher Council for the Use of Nuclear Production was created by command of the President.[169] In 1974 US President Nixon offered to share peaceful atomic technology with both Egypt and Israel, an offer repeated by

(165) 'First Assessment of our Progress in Nuclear Development' Akhar Sa'a, 16 Dec 1964, pp.31-5.

(166) Al-Ahram, 21 October 1974; MEED, 25 October 1974, p.12.

(167) 'Nuclear Power in Egypt' Financial Times, 11 April 1975.

(168) 'Mr Sadat to Head Egypt's Nuclear Council' The Times, 9 Aug 1975, Al-Ahram, 8 Aug 1975.

(169) Ibid.

President Ford in 1976.[170] By mid 1976 the USA agreed to sell Egypt a 600 MW nuclear reactor and related technology and supplies worth $1,200 million financed with a long term loan, after Egypt consented to the IAEA enforcing safeguards.[171] The agreement ensured that the plutonium produced would be processed and stored outside Egypt. Westinghouse signed a letter of intent to sell Egypt a nuclear power reactor for electricity generation. Egypt began seeking IAEA approval for a peaceful nuclear explosion to dig a canal at the Alqatara Depression for a hydroelectric power station.[172] It renewed its nuclear cooperation agreement with India for the peaceful application of nuclear technology.[173] Egypt also approached France for help to upgrade its experimental research reactor at Inchass. The reactor was charged on enriched uranium supplied by the Soviet Union which lasted until the end of 1981. Egypt wanted to increase its capacity to 4 or 10MW to improve the scope of research and quality of experiments. It is believed that Egypt has a small reprocessing facility at Inchass with a capacity of 0.5 to 1 tons u/year which its

<170> Cooley, John K.,'Egypt Assuring Nuclear Strength' Christian Science Monitor, 2 Jan 1975; Boston Globe, Mar 1981.

<171> 'US Nuclear Power Plant Agreement' MEED, 7 Jan 1977; Gwertzman, Edward. 'U.S. Aide Lauds Safeguards in Israel-Egypt Nuclear Deal' International Herald Tribune, 4 Aug 1976; US Department of State Bulletin, L xxii, 1900, 24 Nov 1976.

<172> 'Egypt Plans Atom Blast to Dig Canal' International Herald Tribune, 25 May 1976.

<173> Jabber 'A Nuclear Middle East', pp.11-12.

<174> 'Egypt to Seek French Help in Increasing Power of Experimental Nuclear Reactor' The Times, 31 Dec 1976.

operation ability and current status is unknown.[175]

Egypt, meanwhile, began to realize that nuclear technology could help to meet the country's long term energy needs. The government set up a semi-autonomous nuclear material organization to be responsible for surveying mining and processing uranium and other materials.[176] Ground and air surveys showed the existence of large quantities of thorium in north Egypt.[177] There were reports that uranium deposits had been discovered near Aswan, Eastern Desert and Nile Valley. About 5,000 tons of uranium were also discovered in an area between Qina and Safajah.[178] Canada agreed to sell Egypt a large uranium processing unit.[179] There were other reports that Egypt had signed an agreement with Zaire in 1979 to allow Egyptian scientists to develop uranium deposits in return for providing security services.[180] A joint Egyptian-Zairean company was set up with finance from West Germany to market Zairean uranium overseas including 25% to Egypt.[181] In 1980, President Sadat turned to Peking to propose a vague nuclear collaboration programme with China to be elaborated as it progressed. He

(175) Lodgaard 'Nuclear Proliferation, Critical Issues', op. cit., pp.11-20.

(176) Al-Ahram, 30 December 1976.

(177) OAPEC Bulletin, vol 3, No 6, June 1977; Al-Ahram, 23 Oct 1981.

(178) Cooley, John K. 'Cairo Steers Clear of A-Race' Christian Science Monitor, 9 June 1969.

(179) MENA, 20 May 1980; BBC-SWB, 2 June 1980; 8 Days, 6 Feb 1982.

(180) 'The Middle East Nuclear Arms Race' Foreign Report, 13 Aug 1980, pp.1-6.

(181) Ibid.

offered to share Egypt's scientific knowledge with China and to send Egyptian scientists to work on China's nuclear programme.[182] The Chinese opted for limited collaboration without making firm commitments. In February 1981 a frame work agreement for the supply of two French 900 MW power reactors was signed with France. [183] Four days later, the People's Assembly in Cairo ratified the NPT paving the way for Egypt's nuclear power development.[184] Egypt had held up ratifying the treaty because of Israel's reluctance to do so. This was the main reason why an agreement in principle with US Westinghouse to build two nuclear power stations did not progress.[185]

Egypt's long term plan is to build up to eight 1,000 MW nuclear power plants by the year 2005, meeting 40% of total energy needs.[186] The cost of the programme is estimated at $36,000 million. Egypt's Deputy Prime Minister said Egypt was setting aside $500 million annually from oil revenues for the next twenty years to fund the nuclear energy programme. Several American, French, West German and Japanese nuclear giants began the race to win contracts for

(182) Ibid.

(183) 'Egypt Goes Shopping for Nuclear Power' MEED, 20/26 Feb 1981; 'France and Egypt Sign Nuclear Protocol' Financial Times, 13 Feb 1981.

(184) Egypt and the Treaty on the Non-Proliferation of Nuclear Weapons, Egyptian Foreign Ministry monograph (Cairo: State Information Service, 1981) p.76.

(185) 'Egypt Seeking Direct US Aid for Nuclear Plant Purchase' Nucleonics Week, vol 21, no 7, 14 Feb 1980, p.2.

(186) 'Egypt Wants N-Power Stations from UK' Financial Times, 18 Feb 1981; 'Egypt Set for Nuclear Power Deal', Observer, 15 March 1981; Egypt and the Treaty on the Non-Proliferation of Nuclear Weapons, op. cit., p.77; 'Nuclear Problems of the Middle East' Arabia and Gulf, 23 Jan 1978, pp.8-9; BBC-SWB, ME/6847/A/7, 6 Oct 1981.

the eight reactors. Motor Columbus won a contract for consulting work and site selection over 33 other bidders from different parts of the world.[187] Egypt signed four separate contracts with the US Energy Department for the supply of enriched uranium fuel for three power plants, the first of which is to be delivered in 1991 for the Eldabaa power station.[188] Two more agreements were signed with West Germany to establish a nuclear fuel reprocessing plant in Egypt, to double the capacity of the research reactor at Inchass and to provide the framework for the purchase of two 1,000 MW power reactors from West Germany.[189] By the end of 1984, the Egyptian People's Assembly had given the go ahead and a local consultant firm was called to start site designs for Egypt's first nuclear power station at El-dabaa, 160 kilometers west of Alexandria.[190] The US Export-Import Bank decided to back Westinghouse's bid to build the station by partly financing its bid.[191] Westinghouse is bidding in a consortium with its Spanish and Belgian subsidiaries and Japan's Mitsubishi Heavy Industries to build one unit, with the option of later building another priced at $1,250 million each. Its closest bidder is a Franco-Italian consortium led by France's Framatome which offered a two

(187) Nucleonics Week, 25 Mar 1982.

(188) Nucleonics Week, 27 May 1982.

(189) MENA, 28 April 1981, BBC-SWB, 12 May 1981.

(190) 'Egypt Takes The Nuclear Option' MEED, 21/27 Dec 1984; 'Egypt Wins Loan for Nuclear Plant' International Herald Tribune, 30 Oct 1985; 'Bonn Steps Up Effort to Win Egypt Nuclear Order' Financial Times, 6 Feb 1985.

(191) MEED, 14/20 Dec 1984.

unit package. Export credit agencies agreed to put up loan guarantees of $900 and $600 million respectively. Another bidder is West Germany's Kraft Verk Union which bid for one power reactor assisted by $559 million finance from the German government. By the end of 1985, Egypt seemed to favour the West German bid which stands at $1160 million compared with Westinghouse's of $1560 million and Framatome's of $2500 million (for two power reactors).[192]

Egypt's argument for nuclear power concentrates on the economic aspects. The Egyptian Electricity and Energy Minister argued that nuclear power is essential to fill the gap between electricity supply and demand by the end of the century, and that Egypt had reached the limits of its hydro-electric capacity.[193] Nuclear power appeals to Egypt as the cheapest option available and because it will generate saving by releasing more oil for export. Sixty per cent of Egypt's present electricity consumption is generated by natural gas and oil fired stations. By the end of the century, Egypt is expected to become a major civil nuclear power country in the Middle East.Egypt has nuclear cooperation agreements with the USA, France, Britain, Canada, Belgium, Switzerland, and West Germany, the major nuclear technology suppliers. Moreover, the Nuclear Engineering Department of Alexandria University has been developed and boosted to ensure necessary cadres to run the

(192) 'Kraft Wreck Favoured for Egypt Nuclear' Financial Times, 6 Aug 1985; 'Decision on Egypt Nuclear Deal Delayed' Financial Times, 18 Oct 1985.

(193) 'Egypt Takes the Nuclear Option' MEED, Vol 28, No 52, 21-27 Dec 1984, pp.26-27; The Middle East, March 1985, pp.30-31.

nuclear power stations.[194] Egypt hopes to find its nuclear power plants staff from an existing pool of about 3,000 science graduates each year. France has promised to train the personnel required for the first two plants.[195] Egyptian atomic scientists who emigrated in the 1960s and 1970s were asked to return home to participate in the nuclear programme. Field studies carried out by American and Egyptian experts indicated 7,000 sites in Egypt containing deposits of uranium and thorium.[196] Comprehensive satellite surveys confirmed the existence of 50 possible sites in which uranium production seemed economically feasible. Geological missions have discovered about 20 uranium 'veins' embodied in graphite boundaries along the Qina-Safajah highway. They are estimated to contain reserves of about 5,000 tons of uranium. Other studies indicate that the confirmed uranium reserves of Egypt amount to some 14,500 tons.[197]

Egypt's declared nuclear intentions and policies changed in tone and orientation from the previous ones. Sadat's fear of the Israeli nuclear capability without matching Arab and Islamic nuclear option in near future were major factors in his decision to go to Israel in search of

(194) BBC-SWB, ME/6847/A/7/ , 6 Oct 1981.

(195) 'Egypt Set for Nuclear Power Deal' The Observer, 15 March 1981; See Ma'ariv, 12 April 1981.

(196) BBC-SWB, 27 Oct 1981.

(197) Al-Ahram, 29 Aug 1981; Saleem, Mohammed El-Sayed., The Egyptian Atomic Programme, Study paper No 6, (Beirut: Centre for Arab Unity Studies, 1981); Mustafa, Adnan., 'The Status of Arab Nuclear Potential', Energy in the Arab World: Proceedings of the First Arab Energy Conference, Abu Dhabi, UAE, March 4-8 1979 (Kuwaiti OAPEC, 1980) Vol 3, pp.157-320.

peace in November 1977,[198] he put pressure on Israel to halt its activities concerned with the development of nuclear weapons. It is claimed that during peace negotiations with Israel Egypt proposed that both countries renounce nuclear weapons and limit conventional arms as part of the peace treaty.[199] Egypt's Deputy Prime Minister and Minister of Foreign Affairs told the People's Assembly on ratification of the NPT of the pressing need for Egypt to have access to nuclear energy in order to meet its needs in electric power by end of the century. This will not be feasible in the present international circumstances unless the treaty is ratified and the safeguards system of the IAEA accepted.[200] He stressed Article ' x ' of the treaty regarding withdrawal 'I wish to emphasize that withdrawal from the treaty is left to the discretion of the State Party to the treaty whose supreme interest have been jeopardised'. He argued that ratification of the treaty would induce Israel to accede to the treaty and refrain from manufacturing nuclear weapons. Ismat Abdul Majid, Foreign Minister of Egypt, told the NPT Third Review Conference in August 1985 that Israel might in fact have produced nuclear weapons, which poses a threat to the security of the Middle East region. He called upon Israel to sign the NPT and to establish a Nuclear-Free Zone in the Middle East.[201] He

(198) Perlmutter, et al., Two Minutes Over Baghdad, op. cit., p.34; 'The Middle East's Nuclear Race' Foreign Report, 13 Aug, 1980, pp.1-6.

(199) Gwertzman, Bernard., 'Egypt Said to Urge Arms Curb in Pact' New York Times, 8 Nov 1978.

(200) Egypt and the Treaty on the Non-Proliferation of Nuclear Weapons, op. cit., pp.93, 73, 76.

(201) Al-Ahram, 31 Aug 1985.

stressed that Egypt's ambitious nuclear programme is for the generation of electricity because of insufficient energy alternatives to oil and hydropower. An Egyptian scholar, Abdul Mon'eim Said, argued that the response to Israeli nuclear weapons should be to regain strategic balance with Israel in conventional arms as an important step towards building a nuclear capability.[202] He added that the military establishment sees the need for development of mass destruction weapons. This need was expressed earlier by General Al Gamassy, Egyptian Defence Minister and by President Sadat.[203] A former Egyptian ambassador called on the Arab nation to acquire nuclear weapons in response to Israeli nuclear weapons and argued that the Arab Nation has financial, scientific, and manpower resources to produce these weapons.[204] Amin Huweidi, former Egyptian Defence Minister and Chief of Intelligence, argued for development of a credible conventional deterrent as a primary step up the ladder towards the development of nuclear weapons.[205] This conventional deterrent, during the Israeli nuclear monopoly, should include conventional weapons and chemical and biological weapons of combined forces of the Arab states. On the other hand, the editor of the Egyptian magazine, Akhbar Sa'a, argued against the development of nuclear weapons; the enormous risks involved, constitute a

(202) Al-Ahram, 4 September 1984.

(203) Lief, Louise.'Egypt Reviews its Stance as Middle East Nuclear Arms Swell' Christian Science Monitor, 18 Aug 1980; Akhbar Al Usbu, 14 Oct 1976; Al-Ahram, 25 July 1975; Al-Usbu Al-Arabi, 2 July 1977.

(204) Al-Ahram, 31 July 1985.

(205) Huweidi, The Arab-Israeli Conflict, op. cit., p.229.

threat to the security of a region already bound to explode.[206]

Egypt played an active role in laying down the basis and principles which guided the UN in the negotiations which led to the NPT of 1968 and many disarmament conferences, as well as the three NPT Review Conferences.[207] It also made leading efforts towards the establishment of a nuclear-free zone in the Middle East and Africa.[208] The main motive behind Egypt's efforts towards disarmament is concern over the arms race in the Middle East and its dangers and economic burdens.[209] Since the mid 1960s, Egypt maintained the policy of signing and ratifying the NPT if Israel agreed to do so. Nasser said Israel was acquiring nuclear weapons and that Egypt would be willing to sign a non-proliferation treaty 'we agreed about the safeguards of the UN but Israel refused'.[210] He repeated the same statement in 1969 '.... we have signed the Non-Proliferation Treaty while they [Israelis] refused to sign it. The United States and the Soviet Union guarantee that all the countries that sign

(206) Gendil, Mohammed W., 'Israel and Atomic Bomb' Akhar Sa'a 4 Sep 1985, p.445.

(207) Egypt and the Treaty of Non-Proliferation of Nuclear Weapons, op. cit., p.71; Al-Ahram, 31 Aug 1983; See UN Treaty on the Non-Proliferation of Nuclear Weapons (New York: UN, 1969).

(208) Al-Ahram, , 31 Aug 1985; 'The Role of Egypt in the Establishment of a Nuclear-Free Zone' Al-Ahram, 20 September 1984; UN, Report to UN Secretary General About Views of Arab States on Nuclear-Free Zone in the Middle East, S/11778, A/102211 and add/ and 2, 28 July 1975.

(209) Ahmed, Abdul Atti M., President Sadat and Disarmament Issues (Cairo: Al-Ahram Centre for Political and Strategic Studies, 1978) Chap 2.

(210) 'Nasser Afraid of Israel's Atom Potential' Jewish Post Weekly, 13 May 1966; 'Egypt Fears Israeli Nuclear Potential' DENS No 23509, 6 Feb 1967.

the agreement will be safe from any atomic threat'.[211] Egypt told the UN General Assembly that Israel's refusal to become a Party to the NPT 'has left Egypt with no choice but to stop short of ratifying the Treaty.'[212] Egypt signed in 1968 to ratify 'the moment Israel accedes to it and becomes a Party thereto.'[213] Egypt finally ratified the NPT in february 1981 without Israel's acceding to the treaty.

To sum up, Egypt's nuclear development during the first and second stage has remained limited in terms of nuclear facilities if not in terms of experience and skills.[214] Egypt has an unsafeguarded 2 MW nuclear research facility and several other atomic installations in operation since 1961 and the existence of laboratory or small scale reprocessing facility of unknown status with design capacity in range of 0.5-1 tons of depleted uranium per year is assumed.[215] Egypt's declared intentions, despite ratification of the NPT and ambitious plans for nuclear power plants and efforts for the establishment of a Nuclear-Free Zone in the Middle East and Africa remain: 'If Israel obtains a nuclear strike capability, Egypt will follow

(211) 'Nasser Expects Atomic Protection' Jewish Observer and Middle East Review, 16 May 1969, p.7.

(212) Al-Ahram, 19 June 1974; 'Egypt to Get A-Bomb if Israel Explodes One' Washington Post, 1 May 1976; Freedman 'Israel's Nuclear Policy' op. cit., p.116.

(213) UN Treaty on the Non-Proliferation of Nuclear Weapons, op. cit.

(214) Egypt has, at least, 45 nuclear scientists in Canada, 200 in Chicago, see 'Nuclear Power Stations in Egypt' Al-Arab, 30 Jan 1985; US Congress, Export Reorganization Act of 1976, op. cit., p.463; Impact International, 15,5, 8-21 March 1985.

(215) SIPRI, Yearbook 1979, p.318; Frank, Lewis., 'Nasser's Missile Program' Orbis, Vol 11, No 3, Fall 1967, p.746.

suit'. At the first stage of its nuclear development, Egypt attempted the direct and unconventional routes to obtain a crude nuclear capability and at the second stage, it seems, it opted for the indirect long term planning of acquiring advanced nuclear technological skills and meeting its increasing energy needs.

IRAQ: The second stage of Iraq's nuclear development began in earnest at the end of 1976 when France's Supreme Council for Nuclear Exports met to consider the sale of an experimental reactor to Iraq. The deal involved a research reactor and quantities of enriched uranium.[216] The French-Iraqi agreement of 1976 provided Iraq with a complete nuclear research training centre including a 70 MW Osris reactor, a smaller 800KW Isis type reactor and training of the Iraqi personnel required for the running and maintenance of the two research reactors. Both reactors were to be fuelled with 92% enriched uranium. France was to supply Iraq with 72 Kilogrammes of such enriched uranium and 12 kilos of this enriched uranium were shipped to Iraq by July 1978. The Iraqi Nuclear Research Centre, built with French help, was capable of training 600 nuclear scientists and engineers at one time. The French-Iraqi deal was beset by many difficulties and problems from the very beginning. In April 1979 saboteurs bombed an industrial plant in La-Seyne-Mer, France, where components for the Iraqi experimental

(216) 'France May Give Iraq a Reactor' Daily Telegraph, 16 Nov 1976; 'Iraq Nuclear Breakthrough: French provide Uranium and Experts' Afro-Asian Bulletin, No 67, 4 Aug 1978; 'The Middle East's Nuclear Race' Foreign Report, No 67, 4 Aug 1980; 'Iraq's Nuclear Arms Option' Washington Post, 29 Feb 1978.

reactors were being built.[217] Iraq's nuclear programme was again impaired in June 1980 when an Egyptian scientist heading the Iraqi nuclear research centre was murdered in Paris.[218] He had been recruited by Iraq to head its nuclear research programme in 1975. Three months later, Iranian bombers destroyed parts of the building housing the Iraqi nuclear research centre, though in October 1980 former Iranian President Beni Sadder said the raid on the Iraqi reactor was carried out by mistake.[219] Then in June 1981, Iraq's nuclear research reactor Osiraq was completely destroyed by Israeli warplanes.[220] Iraq immediately declared its intention and determination to rebuild Osiraq and Saudi Arabia promised to cover all expenses involved.[221] It was also reported that France would supply Iraq with similar nuclear research reactor.[222] No firm indication had been given by France by the end of 1985 on building the reactor and it now seems that it will remain so as long as the war continues between Iraq and Iran. Israel won its bid to prevent temporarily a substantial spread of nuclear

(217) 'Bombs Damage French Reactor Deal' International Herald Tribune, 7/8 Apr 1979; Field, Michael., 'Reactors for Iraq Sabotaged by Israeli Agents' Daily Telegraph, 14 May 1979.

(218) 'Blow to Iraqi Bomb' The Guardian, 20 June 1980.

(219) 'Iraq Making Plutonium, Say French' Daily Telegraph, 20 Jan, 1981; 'Iran Bombs Nuclear Site In Baghdad' International Herald Tribune, 1 Oct 1980; 'Baghdad Blocks Inspection of its Nuclear Reactor' Washington Post, 7 Nov 1980.

(220) 'Reactor Bombed by Israeli Jets' The Times, 9 June 1981.

(221) 'Iraqi Leader Says Raid Will Not Stop Program' Washington Post, 13 June 1981; Jonathan, Kindell, 'Iraq A-Bomb Ability Seen by '85' International Herald Tribune, 16 June 1981; David, Ottaway, 'Saudis offer financing for Iraqi Reactor' Washington Post, 17 July 1981.

(222) UN Chronicle Record of the News, Nov 1981, pp.5-11.

technology to Iraq.

Meanwhile Iraq continued to cooperate on nuclear research with Italy, Brazil and the Soviet Union. In 1980 Italy sold Iraq a radiochemistry laboratory 'hot cell' and trained at least 15 Iraqi nuclear scientists and engineers.[223] Iraq signed a 10 year agreement with Brazil for peaceful cooperation in the nuclear energy field providing cooperation in 'appraising reserves and prospecting, exploiting and benefiting from uranium' and provides for Brazil to supply Iraq with 'slightly enriched' uranium to power Iraq's nuclear reactors and for the exchange of technical teams.[224] There were a number of reports that Portugal had sold to Iraq 250 tons of processed uranium 'yellow cake' and China 120 tons and Libya 200 tons of uranium.[225] A Brazilian newspaper reported that eight tons of uranium were shipped to Iraq out of a total 80 tons ordered by Iraq purified at the Sao Paulo Institute for Radioactive Research.[226] Other reports said Iraq bought from Brazil uranium dioxide which turns into plutonium when it decays. The Soviet Union signed an agreement with Iraq

(223) 'Iraq Buys Nuclear Technology' The Guardian, 19 Mar 1980; 'Italy Said to Give Iraq Nuclear Aid' Baltimore Sun, 18 Mar 1980, p.1; 'The Middle East's Nuclear Race' Foreign REport, 13 Aug 1980, pp.1-6.

(224) 'Brazil-Iraq: Nuclear Accord signed' Strategic Latin American Affairs, 7 Feb 1980; 'Brazil and Iraq Nuclear Deal' Financial Times, 9 Jan 1980.

(225) 'Portugal Confirms Sale of Uranium to Iraq' Financial Times, 28 Mar 1980; 'Portugal to Unenrich Uranium to Iraq' Washington Post 17 July 1981; 'China Ready to Supply Uranium to Iraq' International Herald Tribune, 28 Jan 1981; US Congress Senate Foreign Relations Committee, Hearings on the Israeli Air Strike, June 18, 19 and 25, 1981, 97th Congress, 1st Session (Washington, D.C.: Government Printing Office, 1981), p.46.

(226) 'Uranium for Iraq Embarrasses Brazil' The Guardian, 18 June 1981.

to build its first nuclear power station marking the celebration of the 25th anniversary of the First Economic Cooperation Pact between the two countries.[227] The Iraqi Atomic energy Organization concluded a contract with the Soviet Nuclear Energy Export Establishment to carry out the first phase of a study to choose a site for a nuclear power plant as part of a large scale development plan to develop alternative sources of energy, including nuclear energy.[228] The plan aims at developing Iraq's infrastructure for the nuclear programme. More recently Iraq announced that it would build more than one nuclear reactor for peaceful purposes.[229] At least 40 Iraqi nuclear scientists have been trained in nuclear power subjects in the USA and scores of others were receiving training in West Germany and Sweden.[230] According to a study of the US General Accounting Office in 1979, Iraq received from the USA a nuclear library, one of many sent to 62 countries.[231] There were other reports saying that Iraq bought Iran's share in the French lead uranium consortium Eurodif.[232] Iraq also was reported to have bought uranium from Niger and West

(227) 'Soviet to Sell Atom Power Plant to Iraq' International Herald Tribune., 24 Mar 1984.

(228) 'Nuclear Power Contract with USSR' BBC-SWB, ME /W 1278/A1/2, 13 Mar 1984.

(229) Middle East News Letters: Gulf States, 16 June 1986.

(230) US Congress, Export Reorganization Act of 1976, op. cit., p.463; 'Atomic Angst', Wall Street Journal, 2 July 1981; Congressional Research Service, Hearings on Israeli Air Strike, op. cit., p.8.

(231) US General Accounting Office, Difficulties in Determining if Nuclear Training Foreigners Contributes to Weapons Proliferation, op. cit.

(232) 'Murder in Paris' Foreign Report, 25 June 1980.

Germany.[233]

Iraq's nuclear intentions and policies can be described as a firm and persistent determination to acquire a nuclear potential since early 1975. Saddam Hussein, President of Iraq, was reported to have declared in September 1975 that the acquisition of nuclear technology by Iraq was 'the first Arab attempt towards nuclear arming although the officially declared purpose of the construction of a reactor was not nuclear weapons'[234] The Iraqi Oil Minister told the Organization of Arab Petroleum Exporting Countries (OAPEC) meeting in November 1976 that 'Iraq intends to use nuclear technology for peaceful purposes. The production of the bomb should be a project in which all Arab states should participate.'[235] At the meeting of the Arab League in 1977, Na'im Haddad, a senior member of Iraq's ruling Revolutionary Command Council stated that 'the Arabs must get an atom bomb. The Arab countries should possess whatever is necessary to defend themselves.'[236] The Iraqi ambassador to Brazil on the occasion of signing a nuclear cooperation agreement between the two countries, in September 1977, said 'if our enemy, Israel, is close to building an atomic bomb or already has one, what prevents us from developing the same capacity?'[237] Saddam Hussein, in an interview with an

(233) 'Iraq Reportedly Was Stockpiling Uranium' International Herald Tribune, 19 June 1981; 'The Middle East's Nuclear Race' Foreign Report, 13 Aug 1980; 'Reign of Terror Holds Back Iraq's Nuclear Future' New Scientist, 28 Aug 1980.

(234) Al-Usbu Al-Arabi, 8 September 1975.

(235) Al-Qabas, 30 Nov 1976.

(236) Kandell 'Iraq A-Bomb Ability Seen By '85' op. cit.; Branigan 'Iraq Build Up Stirs Concern' op. cit.

Arab newspaper, in Paris, said 'any state which wants to use the atom for military purposes should reach a special scientific and technological level in all fields, not only in the nuclear field'[238] He also told the Press in London that the Arabs would be able to use atomic weapons and that 'whoever wants be our enemy can expect that enemy to be totally different in the very near future'[239] Iraq's official newspaper, Al Thawra, wrote 'the Iranian people should not fear the Iraqi nuclear reactor which is not intended to be used against Iran but against the zionist enemy.'[240]

Following the Israeli bombing of Iraq's nuclear research reactor in June 1981, the President of Iraq called on all peace loving countries to help the Arabs get atomic weapons to counter Israeli nuclear power.[241] He told the Iraqi National Assembly of Iraq's quest to obtain nuclear weapons for the Arab Nation. He contended that the Arab quest for an atomic bomb was 'rational, a remedy to an existing situation in Israel'. He went on to say 'any country with a positive international responsibility toward peace and humanity must tell the Arabs: Take arms with which

(237) Cited in Iraq and Atom (2) Policy Background Paper, published by Information Department, Embassy of Israel, London, 10 June 1981, p.2.

(238) Al-Watan Al-Arabi, Jan 1980; 'President Denies Iraq has Atom Bomb Programme' The Times, 22 July 1980.

(239) Ibid.

(240) Al-Thawra, 4 October 1980.

(241) 'Iraq Calls for Arab N-Weapons' Financial Times, 24 June 1981; 'Iraq Seeks Help to Build Atom Bombs' The Times, 24 June 1981; 'Iraq Seeks Aid Getting Atom Weapons for Arabs' Washington Post, 24 June 1981.

you can face the Zionist atomic threat and stop the Zionist entity from using atomic bomb against the Arabs.' Saddam Hussein, current President of Iraq, was in charge of the negotiations for the Iraqi nuclear installations[242] when he was Deputy Chairman of the Revolutionary Command Council during the period 1969-1979. He told a Lebanese magazine in 1975 of the first Arab attempt designed to obtain nuclear armament![243] Then in 1976 he boasted to a visiting French official, 'our long term plan is to establish an Islamic hegemony in the Middle East. We plan to establish a core of nuclear scientists and lend them out to Arab countries who agree with our political philosophy'[244] Following the statements made after the destruction of the Iraqi nuclear research reactor, Iraq's declared policy experienced a shift. It denied the previous statements about the intention to acquire nuclear weapons and began to emphasize the peaceful uses of nuclear energy. More recently, President Saddam Hussein stressed the role of nuclear energy as the only source of energy which can compete with oil and Iraq's determination to establish a nuclear infrastructure as part of large scale development plan to develop alternative energy sources.[245]

To sum up, the Iraqi nuclear development activities have been persistent and varied for the last thirty years.

(242) 'The Secrets of Osirak' The Sunday Times, 14 June 1981, pp.17-18.

(243) Al-Usbu Al-Arabi, 8 Sep 1975.

(244) 'The Secrets of Osirak' The Sunday Times, 14 June 1981, pp.17-18.

(245) BBC-SWB, ME/W 1278/A1/Z, 13 March 1984.

Although Iraq has no power reactor, no research reactor of a considerable size in operation, and no reprocessing or enrichment facilities, there are scores of reports arguing that Iraq was about to acquire a nuclear weapons potential before the bombing of Iraq's experimental reactor by Israeli war planes in June 1981. This is based on the size of the research reactor (70 MW) and the 12 Kilogrammes of enriched uranium and hundreds of tons of uranium bought by Iraq from several countries and the Italian 'hot cell' simulators which can re-process depleted uranium[246]. Iraq's most important nuclear asset is that it has developed considerable nuclear research skills and stockpile of fissile materials. More recently, it is claimed that Iraq has built a secret factory for production of substantial quantities of chemical weapons in Samarra, Southern Iraq.[247] Iraq's declared intentions and policies aim at developing advanced nuclear technological skills and peaceful uses of nuclear technology. It seldom admitted the intention of acquiring a nuclear weapons capability, especially after the destruction of its reactor by Israeli war planes. Iraq's nuclear quest has been coloured by the Arab and Islamic nations sentiment and brotherhood and the desire for Iraqi regional leadership and influence. Iraq's main aim appears

(246) 'Fall Out From the Raid on Iraq' Science Vol 213, No 4503, 3 July 1981; 'Was Iraq Really Developing a Bomb' New Scientist, 11 June 1981; Burt, Richard., 'Iraq said to Get A-Bomb Ability With Italy's Aid' New York times, 18 Mar 1980; Koven, Ronald., 'Iraq Said to Block Nuclear Inspection' International Herald Tribune, 11 June 1981; Feeldman, Israeli Nuclear Deterrence, op. cit., PP 75-78; Winkler, 'Israel's Preventive Strike', op. cit., p.838; Rowen and Bordy 'The Middle East' op. cit., p.207.

(247) BBC, Panorama 'The Secrets of Samarra', 27 October 1986.

to be to build up a base of nuclear technology and supplies of nuclear materials which will give it independence from its suppliers and enable it to continue its programme with Arab, Islamic and probably Third World help, if not alone.

LIBYA: The second stage of the Libyan nuclear development goes back to the Libyan-Pakistani connection and contacts which are thought to have begun in 1974 with the visit by Qaddafi, Libyan Leader, to Pakistan during the second summit of the Organization of Islamic Conference, and to have been finalized during Libyan Premier Jalloud's visit to Pakistan in 1978.[248] Libya, it is claimed, offered financial aid in return for a possible Pakistani bomb. There were a number of reports about the Pakistani connection with the assumed Libyan nuclear weapons programme concerning millions of dollars and tons of uranium bought from Niger.[249] There were also unconfirmed reports that Libya tried to set up a dummy company in West Germany while shopping for nuclear equipment similar to what Pakistan had done previously in west Germany to help in buying sensitive technologies.[250] The Pakistani-Libyan nuclear contacts came to no

(248) Foreign Report, 9 Aug 1978, pp.2-4; 'The Middle East's Nuclear Race', Foreign Report, 13 August 1980; ABC-TV 'Near Armageddon' op. cit; 'Libya's Arms Depot' Newsweek, 19 July 1981; Al Qabas, 30 August 1978; BBC-SWB, 24 Jan 1981; Gwardet 'Is Qaddafi Financing Pakistan's Nuclear Bomb?' op. cit.

(249) Ibid; 'Pandora's Box: The perils of proliferation' The Middle East, Aug 1981; 'Niger Stops Uranium Sale' MEED, 6 Feb 1981; Weissman and Krosney, The Islamic Bomb, pp53,65.

(250) 'Libyan Aid Suspected' The Sunday Times, 25 November 1979; Levin, Hoag., Arab Reach (London; Sidgwick and Jackson, 1983) p.175.

substantiated results. Libya also went to India to buy a nuclear bomb.[251] India declined the offer. Then Libya demanded that India transfer the technological details for quickly building a nuclear bomb from scratch. India refused. All the Libyan attempts to buy a nuclear bomb in India and Pakistan have failed as they did with China because of the grave consequences of such an act on the supplier country and to the international non-proliferation regimes and efforts. In March 1976, France agreed to supply Libya with a 600 MW nuclear power station. But this agreement never materialized due to American political pressure on France to drop the nuclear deal.[252] Libya signed an agreement with the Soviet Union in 1976 for building a 10MW research centre at Tajora.[253] Moscow undertook to train personnel for the centre. An agreement on uranium prospecting was signed with France in December 1973 and a similar agreement involving the extraction and purification of uranium was signed with Argentina in 1974.[254] Sweden stated its readiness to set up a nuclear research centre and in April 1975 and India said it was prepared to sell Libya a reactor and to staff any plant it

(251) 'Middle East Planners Push for Nuclear Energy Development' MEED, 21 November 1975; 'Libyans Pay Dear for Going Nuclear' The Observer, 18 October 1981; Foreign Report, 9 August 1981, pp.2-4.

(252) SIPRI, Yearbook 1976, p.43; 'France is to Build Libya Atomic Plant' New York Times, 23 Mar 1976; 'Rumours of Libyan Atomic Quest Raise Fears' Washington Post, 30 July 1979.

(253) 'Libyan Nuclear Plant' Financial Times, 11 Dec 1976; Micallef, 'A Nuclear Bomb for Libya' op. cit., pp.14-15; BBC-SWB, SV/ W 114/1, 19 Dec 1980.

(254) 'Qaddafi's Move Spark New Nuclear Fears' International Herald Tribune, 21 Jan 1981.

might acquire.[255]

Meanwhile Libya concentrated more on nuclear training in Europe, the USA, and the Soviet Union. It also sent Libyan scientists to Argentina and India for training.[256] There were at least 145 Libyans studying nuclear physics and engineering in Europe and about 200 in the USA in 1976.[257] It is argued that Libya has the largest per capita enrolment of nuclear engineering students in foreign universities of any country in the world.[258] According to the Institute of International Education there were 2120 Libyans enrolled in US universities in 1982-83 and 1710 in 1983-84,[259] and about 1,000 in Canada in 1983.[260] Many of these Libyans are believed to be engaged in studies related to nuclear weapons.

> "At last count there were 200 Libyan students in the United States and between 200 and 300students in Europe studying nuclear engineering. The number in

<255> 'Panadora's Box; The Perils of Proliferation' The Middle East, Aug 1981, pp.6-12.

<256> Libyan News Agency, 31 July 1974; MEED, 21 Nov 1978.

<257> JANA News Bulletin, Vol 11, No 2, 5 Feb 1982; US Congress, Export Reorganization Act of 1976, 7 Dec 1978, p.550; 'Libya Keeps its Nuclear Option Open', The Middle East, Sep 1984; 'Libya Bidding to Join Nuclear Club Scientists Warn' Nature, Vol 276, 7 December 1978, p.550.

<258> Wills, David K., 'On the Trail of the A-Bomb Makers' Christian Science Monitor, 30 Nov, 4 Dec 1981.

<259> Chronicle of Higher Education, 4 Nov 1983, p.21.

<260> McBridge, James R., 'Libyan Students Question Reveals Policy Vacuum, Coherent Policy on Foreign Students Needed' Canadian Bureau for International Education, International Education Forum, Mar 1984.

> the Soviet Union is believed to be even larger. The total figure is many times the number that could be realistically absorbed by a civilian nuclear program. In addition, the Libyan government has openly tried to recruit Arab students working in the United States to participate in a weapons development program."[261]

In 1977 Libya began recruiting hundreds of nuclear scientists and engineers by establishing what it called the Department for the Encouragement of Arab Experts.[262] This was an organization set up by Libya to attract Arab scientists and engineers throughout the world to come to work in Libya for lucrative contracts. Libya hosted a £120,000 nuclear technology conference at Crado, Italy, where more than 70 international scientists discussed the problems and prospects of nuclear technology in developing countries.[263] Twenty Libyan scientists took part in the conference. A seminar on new sources of energy in the Arab world was held in Tripoli in 1983. It recommended seeking the aid of friendly developed and developing countries in

(261) Micallef 'A Nuclear Bomb for Libya' op. cit., pp.14-15.

(262) Perera, Judith, Can the Arabs Win the Nuclear Race, Arab Papers No 12 (London: Arab Research Centre, 1983) p.40; 'Panadora's Box: The Perils of Proliferation' The Middle East, Aug 1982, pp.6-12.

(263) 'Libyans Pay Dear for Going Nuclear The Observer, 18 October 1981.

the production of heavy water and fissile materials, and the creation of an Arab fuel cycle by setting up an Arab Agency for Nuclear Energy and an Arab Bank for Energy to finance nuclear energy and uranium exploration.[264] Another seminar was held in 1984 in Tripoli on the use of research reactors and applied sciences in association with IAEA.[265] The seminar was attended by 50 researchers and scientists from 24 countries. A Nuclear Engineering Department was set up at Al Fatih University in Tripoli in 1974 and became a Faculty of Nuclear and Electronic Engineering in 1978.[266] In 1982, 12 students graduated and 110 new students enrolled. The Faculty included four departments for computing, nuclear engineering, materials sciences and engineering technology. It has radiation and nuclear chemistry laboratories and has access to the Soviet-built nuclear research centre at Tajura which houses a neutron generator and a 10 MW research reactor.

Libya began a serious search for uranium. Prospecting has been focused in Southern and West Libya. Libya's intervention in Northern Chad was thought to be motivated by the existence of uranium reserves in that country.[267] The Aouzou strip of North Chad was seized in mid 1975 in large measure because of the reported presence in the area of

(264) JANA News Bulletin, Vol III, No 6, 26 Jan 1983.

(265) JANA News Bulletin, Vol IV, No 33, 22 Oct 1984.

(266) JANA News Bulletin, Vol II , No 6, 30 April 1982; 'Libya Keeps its Nuclear Options Open' The Middle East, Sep 1984.

(267) 'The Middle East's Nuclear Race' Foreign Report, 13 Aug 1980, pp.1-6; Perera, Can the Arabs Win the Nuclear Arms Race, op. cit., p.40; Micallef, 'A Nuclear Bomb for Libya' op. cit., pp.14-15.

sizeable uranium reserves.[268] Libya claimed that the strip was seized to reclaim its territory.[269] Until 1955 the strip was recognized as part of Libya under a Franco-Italian agreement signed in 1935 when Libya and Chad were under Italian and French control respectively. However, in 1955, the strip was ceded to French by the Libyan Monarch in a Franco-Libyan Treaty of 1955. Libya is believed to have purchased up to 1,200 tons of uranium from Niger.[270] Niger admitted the sale of, at least, 300 tons to Libya.

Finally, The Soviet Union, by the end of 1984, agreed to assist Libya in building its first nuclear power station consisting of two reactors with an overall capacity of 880 MW.[271] It is claimed that the nuclear power stations will save 315 million barrels of oil when it becomes operational. The Libyan Nuclear Energy Minister stated that the Libyan nuclear power programme aimed at using atomic energy for peaceful purposes.[272] He estimated that Libya will need 6,000 MW of electricity generating capacity, compared to the present consumption of 3,800 MW in 1982, of which 20% will be provided by nuclear power by 1995.[273] Some three to four

(268) Arnold, G., 'Is Uranium at the Heart of the Libyan-Chad Dispute' New African Development, Vol II, No 3, 1979, p.910.

(269) Jamahirya Review, No 38, July 1983, p.13.

(270) Foreign Report, 25 Dec 1981; Giradet 'Is Qaddafi Financing Pakistan's Nuclear Bomb?' op. cit.; 'Niger Stops Uranium Ore Sales' MEED, 6 Feb 1981; JANA News Bulletin, Vol II, No 56, 13 April 1982; 'Islamic Bomb for Sale' Time, 24 Dec 1979; Kaylord, Robert., 'Niger Tells of Uranium Sales to Libya' International Herald Tribune, 13 April 1981.

(271) JANA News Bulletin, Vol IV, No 33, 22 Oct 1984; BBC-SWB, 31 Oct 1984; International Herald Tribune, 22 Oct 1984.

(272) JANA News Bulletin, Vol IV, No 33, 22 Oct 1984.

(273) Ibid.

nuclear power plants producing 1200 MW should be installed by then on present plans. These plants will be used to generate electricity and to desalinate water. The Libyan Minister of the Atomic Energy Ministry (called secretariat in Libya) which was established in 1981;[274] argued for the need of nuclear energy for economic reasons by saying

> 'Oil will not last more than 70 or 80 years at the most, so we have to prepare ourselves for a new source of energy. The most promising source is nuclear energy: accordingly we are preparing our technicians, engineers and scientists, building our research centres and nuclear power plants and conducting research on other energy alternatives - solar energy, wind energy and biomass"[275]

More recently, Libya tried to buy nuclear technology from Belgium worth $5 billion through the Belgian nuclear giant Belgonuclearie which has served as a nuclear consultant for Libya for 11 years and advised the Libyan authorities on nuclear programmes.[276] The deal never materialized because of strong American pressures on the Belgian government not to go ahead with its plan to sell nuclear technology to

(274) 'Libya's Nuclear Programme' The Middle East, Feb 1982, p.47.

(275) Ibid.

(276) 'Belgium Waves on Nuclear Plant' MEED, 2 Dec 1984; ' US Said to Stop Libya Nuclear Deal' New York times, 21 Nov 1984.

Libya.[277]

Libya's declared intentions and policies have been persistent in their determination to acquire the nuclear option. It began with the short and unorthodox route to acquire a nuclear bomb through purchase or even theft,[278] and ended up with building its nuclear technological base.[279]

Libya, through open nuclear assistance from Belgium, Argentina and the Soviet Union, will be able to create a nuclear infrastructure and, through economic assistance, oil and arms supply has repeatedly tried to induce several countries to supply it with nuclear technology.[280] At the beginning of 1975 Qaddafi said

> 'Some years ago we could hardly procure a fighter squadron. Tomorrow we will be able to buy an atomic bomb with all its parts. The nuclear monopoly is about to be broken.'[281]

Once more he told a Lebanese newspaper that 'one of the goals of the Arab city of scientists' he was planning 'would be to turn Libya into a nuclear power, so that in the future

(277) Atlantic News, 1 February 1985.

(278) Micallef, 'A Nuclear Bomb for Libya' op. cit., pp.14-15; 'Writer Reports Libya A-Bomb Bid' Washington Post, 16 April 1979; 'Islamic Bomb for Sale' Time, 24 Dec 1979.

(279) Spector, L., Nuclear Proliferation Today, (New York: Vintage Books, 1984) pp.149-164.

(280) Ibid, p.162.

(281) 'Rumours of Libyan Atomic Quest Raise Fears' Washington Post, 30 July 1979, quoting Al-Sahafa Newspaper.

the strength of a nation would not be measured in the numbers of aircraft it possessed but in the number of atom bombs it had.'[282]

Ahmed Shahati, Libya's Head of Foreign Liaison Bureau (Minister of Foreign Affairs) indicated to Jeremy Stone, head of the Federation of American Scientists, that Libya was hoping to obtain a nuclear bomb by saying 'they would seek all weapons with which to defend themselves.'[283] Qaddafi denied in a radio interview in January 1981 reports about Pakistani-Libyan cooperation to manufacture an atomic bomb.[284] However, he stressed on the right of small states to use atomic energy for peaceful purposes only. Following the destruction of Iraq's nuclear reactor by Israel, Qaddafi was reported to have resolved that he would make Libya the foremost nation in the nuclear field.[285] It is claimed that Qaddafi announced this decision to his five most important assistants at a secret meeting held near Benghazi on June 10,1981.[286] He told them of his determination to use all Libya's financial resources to acquire nuclear weapons and give his country an unchallengeable position of superiority in the Arab world by reviving the Pakistani link and acquiring enrichment technology. The Libyan Atomic Energy

(282) Al-Anwar, 13 Jan 1975.

(283) Berry, Adrian., 'Soviet Deal Could Give Libyans 20 A-Bomb a Year' Daily Telegraph, 7 December 1978.

(284) BBC-SWB, 21 January 1981; 'An Interview with Gaddafi' Time, 8 June 1981.

(285) JANA News Bulletin, Vol 1, No 80, 12 June 1981; 'Libya Nuclear Dreams' Foreign Report, 9 July 1981.

(286) Ibid; Cooley, John K. and Lisa Kaufman, 'Deterring a Qaddafi Bomb' Washington Post, 23 Dec 1980.

Minister was reported to have been sent to Pakistan on the same day to urge the implementation of an agreement signed between the two countries in April 1980. Qaddafi commented on the Israeli air raid on Iraq's nuclear research reactor.

> 'The Arabs are justified in destroying Israel's atom bomb plant at Dimona after Sunday's raid by Israel on Iraq's nuclear reactor near Baghdad. If Israelis consider the presence of a nuclear reactor in the Arab homeland is in conflict with their security, then the existence of Israel is in conflict with the security of the Arab nation....After the Israeli raid on the Iraqi nuclear reactor, the Arabs have no choice but to destroy the Israeli nuclear plant at Dimona which produced atom bombs following the precedent set by the Israelis themselves. The destruction of the Israeli nuclear reactor therefore becomes a legitimate act.'[287]

He also told Libyan students meeting in February 1982 'Atomic know-how should be for everybody and not limited to a few countries.'[288] A year later he told a women's

(287) JANA News Bulletin, Vol I, No 80, 12 June 1981.

(288) JANA News Bulletin, Vol II , No 24 , 11 Feb 1982.

military college gathering 'the Israelis now possess nuclear warheads and if we do not destroy the Israeli nuclear reactor, it will destroy us and the whole Arab nation.'[289] More recently, he told the Libyan General People's Congress (parliament)

> 'The Israelis attacked the Iraqi nuclear reactor, yet, even if they were in Baghdad, Tripoli , Tunis, Rabat or Jeddah, these reactors would have been attacked because Israel is determined to stop the Arabs from entering the nuclear age ... [the Israelis] are developing weapons to destroy the Arabs.'[290]

He revealed that Israel has begun to develop nuclear weapons which could reach 4 000 kilometers and hit any Arab country. At a banquet honouring the late Indian Prime Minister, Indira Gandhi, in Tripoli, in April 1984, Qaddafi said 'The Zionist camp has become more dangerous after the announcement by the Israeli scientists that they have produced 200 nuclear warheads in the Dimona nuclear station in the Negev Desert. This is a highly dangerous new threat to Arab existence from the Gulf to the Atlantic.'[291] By the end of 1984, he asserted in an interview with the American ABC-TV that

> 'We have got the right to acquire nuclear technology for peaceful

(289) JANA News Bulletin, Vol III, No 57, 27 June 1983.

(290) JANA News Bulletin, Vol IV, No 18, 17 Feb 1984.

(291) JANA News Bulletin, Vol IV, No 27, 9 April 1984.

> purposes used by all other countries in the world for we have no aggresive intentions. We call for the destruction of weapons of nuclear destruction in order not to cause a catastrophe to humanity.
> [292]

He also told an Italian newspaper 'The Arab Nation will not accept the existence of a nuclear armed hostile camp in its heartland'. [293]

In more than 10 years Libya has acquired considerable nuclear facilities and resources including a research centre with a small research reactor, a stock of uranium and a growing number of scientists and engineers and has plans to build large nuclear power plants. However, it has no reprocessing or enrichment facilities.

Libya's declared intensions and policies remained persistently to acquire the nuclear option starting with the short-cut route and ended with building up its technological infrastructure through intensive training and purchasing nuclear research and power facilities for peaceful purposes and stockpiling of uranium. As a result, Libya's nuclear programme is now following two seperate routes. Basic research faciliteis and power plants are

(291) JANA News Bulletin, vol IV, No 27, 9 April 1984.

(292) JANA News Bulletin, vol IV, No 51, 7 December 1984.

(293) JANA News Bulletin, vol IV, No 54, 14 Dec 1984.

being bought from the Soviet Union. But at the same time Libya is looking to new Third World nuclear suppliers such as Pakistan, India and Argentina in mastering the nuclear fuel cycle. Libya is also trying to develop its own independent nuclear capabilities. According to a report prepared by Libya for OAPEC it was claimed that the aim of this programme was to build a human resource base capable of working consistently in nuclear technology, research and development.[294] Nuclear technology is now part of the curriculum in some secondary schools, in the first year of engineering courses and at vocational training institutes at Ben Walid, Hun and Garablli in Libya.'[295] By developing a competence in nuclear technology Libya is at least keeping its nuclear option open.

SYRIA: The Syrian nuclear development programmes is less intensive compared with the Egyptian, Iraqi and Libyan programmes. In 1976 a Syrian Atomic Energy Commission was established.[296] Two years later a number of Western firms were contacted to conduct feasibility studies for possible nuclear power plants.[297] Four European companies were shortlisted in 1980 to do a pilot study on a 1200 MW nuclear power station complex,

(294) 'Libya's Nuclear Programme' The Middle East, Feb 1982, p.47; 'Libya Keeps its Nuclear Option Open' The Middle East, Sept 1984, p.49.

(295) Ibid.

(296) 'Middle East Nuclear Facilities' The Middle East, Aug 1981, p. 9; Al-Kifah Al-Arabi, 18 Jan 1982.

(297) 'Syrians Seeking Bids on Nuclear Technology Feasibility Study' Nucleonic Week, Vol 19, No 8, 23 Feb 1978, p.2; '2 Arab Nations to Build Nuclear Plants' International Herald Tribune, 17 June 1981; The Guardian, 16 June 1981; 'Belgians Deny Nuclear Contract' MEED, 10 July 1981.

but the contract was never awarded. In addition, Syria asked the French to supply nuclear technology.[298] No progress seems to have been made. In 1978 the Syrian President turned to India for help in obtaining nuclear technology.[299] Syrian nuclear plans focused on establishing a nuclear infrastructure. The Syrian Energy Minister asked for feasibility studies for extracting uranium from Syrian phosphates reserves and building nuclear power plants.[300] There were reports that a Belgian nuclear engineering consultant Belgatom and a Swiss firm Electro Watt planned to build Six 600 MW nuclear power plants and train Syrian technicians.[301] The Syrian Energy Minister announced at the First Arab Nuclear Conference held in Damascus in June 1981 that Syria was considering building two 600 MW nuclear power plants. The first of which would be operational by 1991 to meet the growing demand for energy.[302]

Meanwhile, the establishment of a nuclear research centre in Damascus was initiated.[303] By May 1983, the Syrian News Agency (SANA) reported a protocol had been signed between Syria and the

(298) Al-Sayyad, 24 July 1978.

(299) Al-Ba'ath, 23 April 1978; Newsweek, 3 April 1978; Foreign Report, 31 Jan 1979.

(300) Al-Thawra, 17 Nov 1979; OECD, Nuclear Energy Agency and the International Atomic Energy Agency, Uranium Resources, Production and Demand (Paris: OECD, 1983), p.208.

(301) 'Belgians Deny Nuclear Contract' MEED, 10 July 1981, p.35; MEED, 28 Oct 1983.

(302) Ibid; 8 Days, 27 June 1981, The Guardian, 16 June 1981; Business Week, 14 April 1980.

(303) MEED, 28 Oct 1983.

Soviet Union to build Syria's first nuclear power station.[304] In December 1984, the Soviet Union finally agreed to help Syria to build Syria's first nuclear power station, the Syrian Electricity Minister said following a visit to the Soviet Union.[305] More recently, a Syrian official of the Atomic energy Commission held talks with Belgian companies about the construction of 6 nuclear power stations costing $3600 million by 1991.[306] With Soviet assistance Syria opened the Centre for Nuclear Energy Studies and Nuclear Research in Damascus. There were unconfirmed reports that Syria tried to obtain nuclear weapons from India and the Soviet Union.[307]

Syria's declared nuclear intentions and policies focused on two issues: first, acquiring nuclear weapons either by themselves or provided by the Soviet Union or friendly countries in response to Israel's acquisition of nuclear weapons and the building of a nuclear power base to generate electricity to reduce the high cost of importing oil. Syrian President Assad said in an interview in 1976.

> 'It seems Israel is on her way to
> the acquisition of nuclear weapons.
> We are faced with two alternatives:

(304) SANA News Bulletin, 23 May 1983; BBC-SWB, 31 May 1983.

(305) SANA News Bulletin, 11 Dec 1984.

(306) Ad-Dastour, Vol 15, No 384, 15 July 1985.

(307) Newsweek, 3 April 1978, p.4; Foreign Report, 31 Jan 1979; Al-Difaa Al-Arabi, Aug 1978.

> To prevent Israel from such an acquisition or to acquire or try to acquire nuclear weapons ourselves. It seems that the second alternative is the more promising one for the Arabs.'[308]

In 1977, he repeated the same warning 'if Israel possesses this weapon, then we will possess it, too'.[309] In September 1984, the Syrian Defence Minister, Mustafa Tlass, confirmed in an interview with the West German magazine, Der Spiegel, the Soviet promise to provide Syria with nuclear weapons in the event Israel deploys atomic weapons 'we are convinced that Israel has nuclear weapons at its disposal. The Americans have paved the way for the Israelis. They work very closely together on atomic technology.'[310] If Israel should deploy nuclear weapons, he added 'the Soviet Union has assured us that under such circumstances that it will place atomic weapons at our disposal capable of responding to a devastating blow.'[311] He made similar statements in interviews with Syrian and Kuwaiti newspapers,[312] confirming the Soviets' nuclear guarantees to Syria. More recently the Syrian Deputy Prime Minister and Minister of Defence, General Tlass, said that his country has Soviet guarantees, providing it

(308) Cairo Radio Service, 17 Dec 1976.

(309) Damascus Radio Service, 27 April 1977.

(310) Der Spiegel, 11 Sep 1984 reported by Reuters, 11 Sep 1984.

(311) Ibid.

(312) Tishrin, 5 Aug 1980; Al-Qabass, 6 Oct 1980; see New Outlook, July 1985, p.23.

with nuclear weapons to confront the 'Zionist' threats of the use of this kind of weapon.[313] He believed that Israel's hint of the use of nuclear weapons 'is one of the methods of frightening and exporting of terror to the Arab people in a direct manner' but that 'does not rule out the possibility of Israel's acquisition of nuclear weapons or impossibility of use, especially the adventurist and expansionist leaders of the 'enemy' have enough motives to do so.[314] Moreover, the Syrian Energy Minister declared that 'Syria is planning to build a nuclear power plant to generate electricity and reduce the high cost of importing oil.'[315] Syria's nuclear power programme is argued to fill the gap between electricity supply and demand by 1991.[316] Syria has strong economic reasons for building nuclear power plants to generate electricity. Its oil reserves are small and the country can expect to become a net importer of oil by 1990. Moreover, conventional power plants expansion is limited by small oil reserves and the hydro electro supply on the Euphrates Dam has reached maximum utilization.[317] Nuclear power can help in recovering of heavy oil using the Enhanced Oil Recovery System which can provide new oil reserves and generate electricity.[318]

Syria's quest to acquire a nuclear capacity at present

(313) Al-Ittihad, 3 Oct 1985.

(314) Ibid.

(315) The Guardian, 16 June 1981.

(316) MEED, 28 October 1983.

(317) Ibid.

(318) 'Nuclear Engineers Turn to Oil Prospecting' New Scientist, 9 July 1981.

seems quite limited. It has no research or power reactor operating and no reprocessing or enrichment facilities. However, it has been active in training its nuclear scientists and engineers in France, the Soviet Union and at Damascus University. It has ambitious plan to build a 1200 MW nuclear power station complex by 1995. But whatever the political and military implications of its nuclear development programme, Syria has plausible economic reasons for going nuclear to meet an increasing electricity demand from its limited resources. Within the present plans to build nuclear research reactors and power plants and training nuclear scientists and engineers, Syria will be able to keep the nuclear option open. Moreover, Syrian leaders in several occasions expressed the desire to acquire nuclear weapons and claimed vigorously that Syria has Soviet nuclear guarantees and assurances to provide it with nuclear weapons if needs arise in the face of the Israeli nuclear threat.

GULF STATES: Following the Arab-Israeli war of 1973 and the subsequent oil crisis, Saudi Arabia, with Libya, Iraq, Kuwait and other Gulf states turned to France for help in developing a nuclear technological base and infrastructure. During this period, because of growing dependence on uncertain oil supplies combined with price rise effects on national balances of payments, it created 'an emerging pattern of arms sales used to secure government-to-government contracts for long term oil supplies'.[319] This state of affairs included transfer of highly advanced weapons and training of personnel in exchange of secure

<319> 'The Mideast: The changing shape of Arms and Oil Supplies' Businessweek*, 27 Oct 1980.

oil supplies and civil construction, especially with European countries such as France and Italy. This emerging pattern also included transfer of nuclear technology to oil-rich Arab countries.

Saudi Arabia signed an agreement for the peaceful utilization of nuclear energy with France in July 1975.[320] At the same time, talks began between Saudi Arabia, Kuwait and Bahrain about possible plans for buying nuclear reactors.[321] By the end of 1977, France agreed to supply Saudi Arabia with a 2 MW research reactor at Dhahran and other projects towards establishing the nuclear power generating capacity 'to satisfy the Saudi government's desire to initiate itself in nuclear technology.'[322] West Germany agreed in October 1978 to supply Saudi Arabia with technology for a nuclear energy project and exploration of raw materials.[323] In 1979, the Saudis began establishing an atomic research centre described 'as the first step towards a nuclear industry ... envisaged to be one of the largest in the World' and laying the foundation for an independent nuclear industry.[324] In 1981, Britain signed a £200 million agreement with Saudi Arabia to build laboratories for the huge atomic centre at King Abdul Aziz University called Lab Zero including a nuclear complex.[325]

<320> SIPRI, Yearbook 1977, p.41; MEED, 28 Nov 1977; 'Middle East Planners Push for Nuclear Energy Development'MEED, 21 Nov 1975, pp.11-12.

<321> Ibid.

<322> MEED, 28 Nov 1977.

<323> Financial Times, 25 Oct 1978.

<324> 'UK Close to Nuclear Lab Deal with Saudis' The Observer, 11 Oct 1981; Sardar, Ziauddin., 'The Day the Saudis Discovered Technology' Newscientist 21 May 1981, p.482; Levins, Arab Reach, op. cit., p.291.

<325> 'UK Close to Nuclear Lab Deal with Saudis' The Observer, 11 Oct 1981.

Negotiations were kept secret as the Saudi project leader explained, 'when nuclear research is mentioned it always raises the question of atomic weapons.'[326] The new complex would give Saudi Arabia a cadre of scientists trained in all sources of energy other than fossil fuels. The Saudis were, also, interested in buying a French research reactor using highly enriched uranium. However, they were persuaded to consider a US 45 MW research reactor using slightly enriched uranium.[327] It seems that the Israeli air raid on Iraq's nuclear reactor forced the Saudis to play down the nuclear part of the centre.
The British agreement included supplying Saudi Arabia with the necessary technology, laboratories for fission and fusion research, solar energy, electronic accelerators to produce neutron sources, medicine isotope facilities and high energy physics and a training programme for 600 Saudi scientists in Britain.[328]

The Saudis formed Science Transfer Associates, a new global enterprise which hires European, American and Asian technical experts required to design, build and operate the atomic centre.[329] An Italian firm, La Societa Italiana Costa Ruzione and Montaggi, was awarded a £195 million contract to build a nuclear reactor on the Read Sea coast.[330] Another power reactor was to be built on the Arab Gulf. Saudi Arabia showed interest in buying a

(326) Ibid.

(327) Ibid.

(328) Ibid.

(329) Levins, Arab Reach, op. cit., p.291.

(330) Ibid.

Canadian CANDU heavy water reactor and uranium from Niger.[331] The Nigerien and Canadian Energy Ministers visited Saudi Arabia. Saudi Arabia was giving Niger £30 million worth of aid, equal to 70% of Niger's foreign assistance in 1981.[332] Another feature of Saudi nuclear development is the fact that wealthy Saudis were purchasing large companies which have nuclear connections and expertise. Wallace Corporation, a Saudi controlled company, formed in 1977 a subsidiary specialized in installing massive systems of piping, shielding, instrumentation and other complex equipment used inside nuclear reactors. Ghaith Pharaon, a Saudi businessman and major shareholder of Wallace Corporation, has become an American nuclear equipment baron.[333]

There were several reports about a Pakistani connection to the Saudi nuclear development programme.[334] It was reported that as early as 1973, Saudi representatives met in Paris with Pakistani, Libyan and Iraqi envoys to explore the creation of a Pan-Islamic atomic weapons development programme proposed by Pakistan which has been one of the closest allies of Saudi Arabia and was one of the earliest and foremost eager supporters of King Feisal's Pan-Islamic Movement in the 1960s. That led to the creation of the Organization of Islamic Conference in Jeddah in 1971. The second summit of the Islamic Organization was held in Lahore, Pakistan, in 1974.[335] It was reported that Bhutto, Prime

<331> 8 Days, 6 February 1982.

<332> 'Kuwait's Nuclear Prospects' Foreign Report, 4 Feb 1982, p.6.

<333> Levins, Arab Reach, op. cit., p.242.

<334> Ibid; Salamat. Ali., 'Zia's Search for Parity' Far Eastern Economic Review, 16 Jan 1978; 'Saudi Arabia Offer $800 m to Help Finance Pakistan Nuclear Programme' The Sunday Times, 18 Jan 1981.

<335> Europa, Middle East and North Africa, 1986 (London: Europa, 1986) p.229.

Minister of Pakistan, said 'there must be an Islamic bomb' and convinced the oil-rich Arab countries that Israel had a nuclear weapons capability and persuaded them, Saudis, United Arab Emirates and Libyans, to channel financial resources into the Pakistani nuclear programme, called 'sword of Islam.'[336] Bhutto argued that the USA would not supply the Arab states with nuclear know-how, but, given the funds, Pakistan could supply them with nuclear technology. It was claimed that the United Arab Emirates financed a small spent fuel reprocessing plant capable of producing plutonium in Pakistan.[337] It was also claimed that Saudi Arabia had offered Pakistan $800 million to help Pakistan to make the bomb.[338] Saudi Arabia promised to finance the replacement of the Iraqi nuclear reactor destroyed by the Israeli air raid in 1981. In addition, there were reports that Saudi nuclear financing had been extended to Bangladesh and Taiwan.[339]

There was a large uranium search programme during the early 1970s which led to the discovery of uranium deposits in the Southern part of Saudi Arabia .[340]

Saudi Arabia's declared nuclear intentions and policies seemed to remain with developing a nuclear technological base for the peaceful utilization of atomic energy. The Saudi Defence Minister said in January 1982 that 'Saudi Arabia will never

<336> Salamat, Ali., 'Zia's Search for Parity' op. cit.,; CBC-TV Evening News, 11 June 1979; Weissman and Krosney, The Islamic Bomb, op. cit., pp.62-65.

<337> Ali, 'Zia's Search for Parity' op. cit.

<338> 'Saudis Offer to Help Zia Build H-bomb' The Sunday Times, 18 Jan 1981.

<339> Nucleonics Week, 18 June 1981.

<340> Mustafa, A. and Jasim , Abdul Karim. 'Arab Uranium Sources Overview' Al Mustaqbal Al Arabi', Vol 4, No 32, Nov 1981.

use nuclear energy to make nuclear weapons' because this entails 'more dangers than blessing' and that 'the Kingdom would employ nuclear energy merely for peaceful purposes', including industrial and agricultural projects.[341] He indicated that Saudi Arabia would obtain the most up-to-date equipment in the world.

Kuwait's nuclear development programme began shortly after the Arab-Israeli war of 1973 by seeking French help to develop a nuclear technological base with Saudi Arabia , Libya and Iraq. The Arab attitudes towards nuclear development by late 1973 seemed to have undergone a sudden change from interest to determination due to a number of reasons. First, the oil embargo and subsequent price increases led to a sudden rise of the Arab world power. Second, previous unsuccessful attempts by Egypt, Iraq, Libya and Syria to secure direct Soviet nuclear assistance and guarantees and even buying a ready made bomb, triggered determination to acquire nuclear technology from Europe (mainly France). Third, Bhutto's persistent effort to persuade Arab states to participate in his Pan-Islamic 'bomb' raised the interest and expectation of oil-rich Arab states to seek independent nuclear capabilities.

In July 1975, Kuwait signed an agreement with Britain on cooperation for the peaceful utilization of nuclear technology.[342] It also began preparing long term plans for the possible establishment of nuclear power reactors by 1985. Contacts were made with West Germany and Canada. Kuwait's

(341) 'Arab States Interested in Reactors' Financial Times, 27 Jan 1982; 'Saudi Nuclear Pledge' The Guardian 25 Jan 1982; Perera, Judith., 'The Nuclear Industry: Where Do We Go From Here' the Middle East, Aug 1977, pp.20-31.

(342) SIPRI, Yearbook 1977, P 40.

nuclear plan was to produce 3600 MW of electricity and the first plant of 600 MW was to have begun operating by the mid 1980s.[343] However, Kuwait decided to begin with a £350 million 50 MW training reactor which will be able to desalinate 2 million gallons of fresh water a day. The Kuwaitis argued that a nuclear power reactor would only be economically feasible as a regional project for the Gulf States as a whole.[344] Long term nuclear power plans were postponed. However, early in 1982, Kuwait began serious negotiations with Canada to obtain a nuclear power plant and with Niger to buy uranium during visits made by Nigerian and Canadian Energy Ministers to Kuwait.[345]
The Kuwaiti Trading, Contracting and Investment Company owned one third of a new $40 million uranium venture in Niger, Societe Miniere de Tassa N'taghalgue, one of the largest mining companies in Niger.[346] France's Cogema company owns one third of this mining venture. France was competing with Canada to sell nuclear reactors to Kuwait and other gulf States.

Another feature of Kuwaiti nuclear development is concerned with acquiring companies with nuclear connections and expertise. The most dramatic example was the Kuwaiti purchase of the largest single investment made by Arab states in the USA. In

(343) Al-Ghanem, Abdulla., 'Kuwait Needs Nuclear for Desalination and Power' Nuclear Engineering International, Mar 1977, pp.35-37; 'Middle East Planners Push for Nuclear Energy Development' MEED, 21 Nov 1975; 'Kuwait's Nuclear Prospects' Foreign Report, 4 Feb 1982; Perera 'The Nuclear Industry: Where Do We Go From Here' op. cit.; 'Nuclear Problems of the Middle East' Arabia and Gulf, 23 Jan 1978, pp.8-9.

(344) Ibid; 'Middle East's Uneven Nuclear Progress' Financial Times, 16 June 1982.

(345) 'Kuwait's Nuclear Prospects' Foreign Report, 4 Feb 1978, P 6; 'Reactors for Gulf' The Guardian, 26 Jan 1982; 8 Days, 6 Feb 1982.

(346) 'Kuwait's Nuclear Prospects' Foreign Report, 4 Feb 1982, p.6; Europa, Africa South of the Sahara, 1986, op. cit., p.721.

December 1981 Kuwait bought all Santa Fe International holdings for $2500 million.[347] What is more important is the fact that when negotiations were taking place between Kuwait and Santa Fe, Santa Fe acquired an American company called C.F. Braun for $29 million. Braun is involved in designing, building and customizing nuclear reactors and is heavily involved in the most sensitive part of the nuclear fuel cycle. It is one of a handful of American firms that design special plutonium reprocessing facilities required by the US Defense Department. Kuwait became the sole owner of the C.F. Braun company, one of the crucial corporate components in US military atomic programme which, as described by a report of the US Congress Office of Technology Assessment, 'would be of use to any nation [which] wishes to produce nuclear weapons.'[348]

Although Kuwait had definite nuclear development plans for the 1980s and 1990s, no immediate decision was taken to implement these plans. However, the size of the electricity generating grid would probably limit establishment of large nuclear power stations in the foreseeable future. Further attention would more likely be paid to nuclear research, training and the search for uranium and cooperation in joint projects with other Arab states, especially the Gulf States of the Economic Cooperation Council. Kuwait has financed phosphate plants in Jordan and agreed with Tunisia to pay $40 million for building a uranium-from-phosphate extraction plant which could provide Tunisia with 120

(347) 'Nuclear Proliferation Fear Over Kuwaiti Takeover' Financial Times, 25 Nov 1981.

(348) Kuwait News Agency (KUNA), 20 Nov 1981.

tons of uranium by 1984.[349]

Kuwait is thought to have been involved in setting up a joint Kuwaiti-Tunisian nuclear research centre in Tunis with French help.[350]

Other Gulf Arab States showed an interest in nuclear development programmes. In 1980 France concluded a protocol agreement to help the United Arab Emirates to launch a nuclear energy programme by supplying the necessary equipment, installations and nuclear fuels.[351] In February 1982 the French Foreign Minister confirmed this agreement. The United Arab Emirates announced at the First Arab Nuclear Energy Conference in Damascus in June 1981 that it intended to have a nuclear power station in operations by 1991.[352] In September 1981 it also announced an agreement with the IAEA for cooperation in the nuclear field including the establishment of a research reactor and providing isotopes for the United Arab Emirates University and training six physics graduates in nuclear physics in advanced countries.[353] The United Arab Emirates Electricity Minister stated that his country was planning to use atomic power to generate electricity by 1990.[354] However, it appears at the present that no nuclear progress has been made in the United Arab

(349) Gulf Times, 27 April 1982.

(350) KUNA, 18 March 1982.

(351) MEED, 1 March 1982; 'France to Aid UAE in Nuclear Program', International Herald Tribune, 8 March 1980.

(352) MEED, 1 March 1982.

(353) IPS, 6 Sep 1981.

(354) '2 Arab Nations Plan to Build Nuclear Plant' International Herald Tribune, 17 June 1981.

Emirates. The most likely prospect for nuclear progress in nuclear research and nuclear energy is through the plans of the Gulf Economic cooperation Council to establish a joint power station and a nuclear research centre in Bahrain.

MOROCCO: Morocco signed an agreement with France in June 1976 to supply it with its first nuclear power plant.[355] King Hassan of Morocco said in 1976 when he began to consider buying 1000 Mw nuclear power stations from France to be operational by 1993 that he wanted nuclear energy exclusively for non-military use: 'We will not enrich our uranium for any military purposes but only for civilian uses.'[356] Morocco has proven reserves of phosphates estimated at 50 billion tons, and it is the largest exporter of phosphates in the world.[357] In June 1977, what King Hassan called 'the contract of the century' was concluded between Morocco and the Soviet Union for the development of Morocco's phosphates industry.[358] The deal which was described as the largest the Soviet Union had ever concluded with a Third World country was worth $2 billion for the production of 9 million tons of phosphates per year. In 1978 Morocco began looking at its phosphate industry as a future uranium industry. US Westinghouse held talks with Moroccan officials about the possibility of

<355> Financial Times, 23 June 1983.

<356> 'Morocco Will Allow UN Check Up if It Can Buy Reactor' International Herald Tribune, 27 / 28 Nov 1976.

<357> Ibid; 'Panadora's Box: The Perils of Proliferation' The Middle East, Aug 1981, pp.6-12; 'The Quest for Arab Uranium' The Middle East, Oct 1982, pp.74-75.

<358> 'USSR Tracks Phosphate' Mining Journal, Vol 293, No 7510, 27 July 1979, p.70; Arab News, 9 June 1977; Arab Report and Memo, 8 Feb 1978.

constructing a plant to extract uranium from phosphates.[359] Morocco, also, began showing interest in going nuclear based on arguments of being heavily dependent on oil imported from the Soviet Union, Saudi Arabia and Iraq.[360] Morocco's plans for the extraction of uranium were designed to produce 284 tons of uranium oxide per year by 1984, increasing to 2000 tons per year by the year 2000.[361]

France has a long history of involvement in uranium exploration in Morocco, beginning between 1946 and 1947 when France's Atomic Energy Agency carried out prospecting and also between 1951 and 1953 with the Moroccan Department of Minerals.[362] This was followed by a joint Moroccan-American-French consortium, Sonarem, for the exploration of uranium between 1953 and 1956. In 1970 a regional survey was carried out with UN assistance and in 1974 exploration intensified, including several companies from Western Europe and Japan.[363]

Moreover, in 1978 Morocco ordered a research reactor from the USA. An agreement was signed with the US General Atomic Company in June 1980 including the sale of a 100 KW Triga reactor and fuel supply for the research reactor and training of

(359) Middle East Newsletter, 10 Feb 1979; The Middle East, April 1978.

(360) Arab Report and Memo, 8 Feb 1978.

(361) The Middle East, April 1978; MEED 14 May 1982; 'Nuclear Power Stations Proposed' MEED, 2 Oct 1981 p.28; 'Interview with King Hassan of Morocco' Al-Alam, 21 April 1977.

(362) Ibid; The Middle East, April 1978.

(363) Fakihani, Abdul Hag., 'Development of Renewable Sources of Energy in Morocco', in Energy in Arab World, Proceedings of the Second Arab Energy Conference, op. cit., pp.391-413; MEED, 12 Feb 1982.

personnel.[364] The agreement was seen in Morocco as of specific importance to the future nuclear development in the country.[365] The reactor was installed at Rabat University. In 1985 the Moroccan House of Representatives approved the establishment of a national centre for nuclear energy sciences and technology.[366] In 1981 Morocco declared plans for the construction of its first 600 MW power reactor, scheduled to be operational by 1993, using local uranium, and four other additional plants by the year 2000 with IAEA help.[367] Meanwhile, it concluded a nuclear cooperation agreement with France for the conduct of a feasibility study on the construction of a 600-1000 MW PWR reactor to be carried out by Framatone.[368] The deal also included the development of uranium extraction from phosphates worth nearly $5 billion.[369] A uranium extraction unit was established in 1980 at Safi to produce 200 tons of uranium oxide and 350 tons by 1984. A second unit was to be established by 1987 to produce 220 tons of uranium oxide in Safi.

ALGERIA: Algeria has nuclear development plans and has extensive nuclear research facilities. It signed an agreement with France in 1981 to purchase an Orbis type reactor.[370] French Technicatome

(364) MEED, 20 June 1980.

(365) Maghreb Arab Press, 13 Sep 1980.

(366) Impact, Vol 15, No 15, 9-22 Mar 1985.

(367) MEED, 2 Oct 1981, p.28.

(368) Nucleonics Week, 15 Feb 1981; Nucleonics Week, 10 Dec 1981.

(369) Financial Times, 27 Jan 1981.

(370) MEED, 30 Oct 1981,P 9; 'Middle East's Uneven Nuclear Progress' Financial Times, 16 June 1982.

firm was to install the small research reactor at a new nuclear research centre at Ain Dussera.[371] Algeria has a nuclear research centre operating since 1958 housing six departments for energy conversion, development of fundamental techniques and advanced techniques, development of materials, health and safety and solar equipment.[372] It conducts research in renewable sources of energy including nuclear physics, solid and electronic physics and ore processing. It has two Van de Graff accelerators of 3 Mev and 2 Mev and one Sames accelerator of 600 Kev. The centre has a total staff of 600 researchers. It planned to build a new nuclear research and development complex by 1983 and to increase the number of researchers to 2000 by 1990 using local technological capabilities. In 1980 Algeria began a five year feasibility study on what part nuclear power could play in the future, and announced plans to launch a nuclear power programme which would provide 10 per cent of Algeria's electricity by 1990.[373]

Uranium exploration began in 1969 and present assured reserves are estimated at 26,000 tons.[374] Development of uranium extraction is mainly carried out by Sonarem and Cotecna of Switzerland.[375] The contract was signed in 1977 between Algeria

(371) 8 Days, 7 Nov 1981.

(372) Europa, The Middle East and North Africa, op. cit., P 295, Shihab Eddin, Adnan and Rashid, Yousef., 'Cooperative Development of Nuclear Energy in the Arab World' in Proceedings of Second Arab Energy , op. cit., pp.415, 51.

(373) Nucleonics Week, 12 March 1981.

(374) OECD/ IAEA, Uranium Resources, op. cit., p.208.

(375) 'Hoggar Uranium Contractors' Mining Journal, vol 293, No 7507, 6 July 1979, p.14.

and these companies for extraction of uranium. More recently Algeria signed an agreement with Belgium including prospecting and refinement of Algerian uranium.[376]

The Algerian nuclear development programme is best described in Decree 76 issued by the Algerian ruling political party in 1976.

> "Algeria aimed at the establishment of nuclear industry. Nuclear power should be built in the very near future with an effective utilization of known uranium mines in Algeria. Installation of nuclear power plants may, as described in Decree No. 76, pave the way for Algeria's industrial core towards rapid development and effective technological change. Nuclear research and developmentcentres should be supported in order to back the above mentioned tasks and move toward an integrated transfer of nuclear technology."[377]

Algerian nuclear policy and intentions were described by late President of Algeria, Boumediene, when he said in 1974 ' ... nor will Israel gain any thing by threatening another war, may be a

(376) Ibid.

(377) Algerian National Liberation Front, National Declaration: Decree No. 76, 1976, pp.243-64.

nuclear one. If the matters reach such a point, Israel will not be the only power capable of using nuclear arms.'[378] So it appears that Algeria's nuclear development programme, during its long history of nuclear research and prospecting for uranium, focused on establishing an independent nuclear technological base for peaceful uses of atomic energy. However, by pursuing the long step by step towards establishing solid technological base, Algeria would be able to keep its nuclear option open in the future.

TUNISIA and JORDAN: Tunisia has drawn up plans for building a 15 million Tunisian dinars nuclear reactor at Gabes.[379] It is expected to have a 50 MW capacity and to produce 20,000 cubic meters of desalinated water per day by 1990. Tunisia has had a research institute operating since 1969 dealing with nuclear physics and engineering. Tunisia, like Morocco, is an important phosphate exporter, was able to export 4 million tons of phosphate in 1981 making it the sixth largest in the world.[380] In April 1982 a French firm won a $32 million contract to provide processing technology, engineering and equipment for uranium extraction from phosphates in Tunisia.[381] The production unit which will be built at Gabes where there are also two state controlled phosphates plants, was expected to produce 120 tons of

(378) Al-Ray Al-'Aam, 12 December 1974.

(379) Europa, The Middle East and North Africa, op. cit., p.750 (15 Million TD: £13.6 million, exchange rate of May 1985).

(380) 'Tunisia: Phosrock Plans and Products' Mining Journal, Vol 297, No 7611, 3 July 1981, p.4.

(381) Ibid; Tunis Arab Press, 3 April 1981.

uranium by 1985.[382] More recently, Kuwait signed an agreement with Tunisia for the first 120 tons of uranium to be produced at the Gabes plant.[383] Kuwait began carrying out plans with Tunisia and France for the establishment of a nuclear research centre in Tunis. Tunisia held talks with Italy in 1976 for training of Tunisian nuclear scientists for any future nuclear programme in Tunisia.[384]

Finally Jordan, which has no nuclear research power reactors and a limited chemical radioactive laboratory including an accelerator at Jordan University, played a dramatic role in one of the most bizarre business deals in the history of the nuclear industry.[385] A little known Jordanian company, United Trading, was appointed to act as managing contractor for four nuclear power stations in China worth about $7000 million. It has no experience of nuclear power work. Three of the power stations will have two 900 MW units each and the fourth a single 900 MW reactor. Western nuclear contractors held talks with the Jordanian company. Although the deal is still facing problems of financial arrangements, it remains one of the most spectacular successes in the history of the nuclear industry for a small unknown Third World company.

Jordan has huge phosphate deposits estimated at 3 billion tons. Uranium mixed with phosphate is estimated at 200,000 to

(382) Gulf Times, 6 May 1982; Europa, The Middle East and North Africa, op. cit., p.749; Perera, Can the Arabs Win the Arms Race, op. cit., p.23.

(383) Gulf Times, 27 April 1982.

(384) MEED, 12 Nov 1976.

(385) 'Jordan and China Syndrome - a Nuclear Fairy Tale' MEED, 7 Sep 1984, pp.22-24; 'The Harsh Realities of a Nuclear Fairy Tale' MEED, 16 Nov 1984, p.19.

300,000 tons. France indicated an interest in developing Jordan's uranium resources when these discoveries were made in 1975.[386]

Jordan has an Atomic Energy Commission overseeing research facilities at Jordan University, including a 5 million electronic volt Van de Graff accelerator bought from the USA, a present from West Germany in 1979.[387] It has plans to establish a radiation shield round the accelerator at Jordan University, and atomic research laboratories at Yarmouk and Jordan Universities and the Royal Science Society.[388] At least 13 nuclear scientists and engineers received nuclear training during 1983 at Jordan University.[389]

Arab and Islamic Nuclear Cooperation

Arab states nuclear development has an element of Arab regional cooperation and Islamic collaboration. To begin with, Arab states nuclear cooperation goes back to the time when the Arab League adopted a form of regional nuclear cooperation pact in 1965.[390] Iraq was the first Arab state to sign this agreement for Arab cooperation for use of atomic power for peaceful purposes in August 1965. This was followed by a

<386> 'Middle East Planners Push for Nuclear Energy Development' MEED, 21 Nov 1975; MEED, 12 March 1976.

<387> Jordan Times, 2 Feb 1979.

<388> Report, Energy Department, Ministry of Industry and Trade, Amman, Jordan, Aug 1984.

<389> Ibid.

<390> Middle East Mirror, 4 Aug 1965, p.17; President Nasser of Egypt proposed establishment of an Arab atomic agency at Arab League Summit in 1964 (Al-Kifah Al-Arabi, 18 Jan 1982).

proposal made by Rear Admiral Lewis Strauss, former chairman of the US Atomic Energy Commission to build nuclear power and desalination stations at the Gulf of Aqaba on the Red Sea to generate electricity and produce fresh water in 1968.[391] Egypt and Libya studied plans to build a nuclear power station related to the Libyan programme for a desalination plant in the late 1960s.[392] Algeria and Tunisia have plans for a joint research reactor as well as Kuwait and Tunisia.[393] The Arab states have been making use of the Middle East Regional Isotope Centre for the Arab countries in Cairo which has been in operation since 1963 to train specialists in the application of isotopes in medicine, agriculture and industry. The first Arab nuclear physics conference was held in Egypt in 1968 and attended by 226 nuclear scientists from the Arab world.[394]

Arab regional cooperation in the nuclear field has been growing since the early 1970s when a number of Arab conferences were held for Arab mineral resources, energy and nuclear power. Arab regional institutions expressed interest in promoting activities suitable for the development of an Arab nuclear energy model.[395] These institutions are the Industrial Development Centre for the Arab states (IDCAS), The Arab Mining Company of the Arab League,

(391) 'Atom for Water for Peace' Christian Science Monitor, 29 Mar 1968, pp.1-2; See US Congress, Construction of Nuclear Desalting Plants in the Middle East, Hearing Before the Senate Committee on Foreign Relations, 90 Congress, 1 Session (Washington, D.C: Government Printing Office, 1967), p.3.

(392) 'Egypt-Libya a Plan for Atom Power Plant' The Times, 13 April 1972.

(393) Haqiqa, 22 Feb 1985; 'Middle East Planners Push for Nuclear Energy Development' MEED, 21 Nov 1975, pp.11-12.

(394) Zahlan, Science and Scientific Policy of the Arab World, op. cit., p.186.

(395) Sayegh, Y., 'Arab Development, Achievements, Issues, Expectations', Oil and Arab Cooperation, Vol 1, No 1, Summer 1975.

the Organization of Arab Petroleum Exporting countries (OAPEC), the Arab Fund for Economic and Social Development (AFESD), and the Kuwait Fund for Arab Economic Development.

The first step in Arab cooperation in the field of radioactive material exploration came through the Arab conferences for mineral resources organized by the Industrial Development Centre for the Arab states. The first conference, held in Baghdad in 1972, called for Arab cooperation in training, standardization of mineral resources maps, industrial coordination and marketing and finance.[396]

The second conference held in Jeddah recommended

> 'All efforts must be made in the scientific field and the necessary financing must be procured in order to make available nuclear energy to the Arab countries. This is considered essentials for the Arab countries to keep pace with the world development in energy resources.'[397]

The third conference held in Rabat, Morocco, was devoted to the establishment of the Organisation of Arab Mineral Resources in Rabat and development of intra strategy for development of Arab mineral resources. The formation of the Arab Mining Company in

(396) IDCAS, 'Follow-Up of the Implementation of the Recommendations of the First Arab Conference for Mineral Resources', Baghdad, 17-23 February 1972.

(397) IDCAS, 'Nuclear Minerals and Their Role in the Arab Countries', Background Papers: The Second Arab Conference for Mineral Resources, Jeddah, 2-8 November 1974, pp.37-42.

Amman, Jordan, marked the first step toward the realisation of this strategy. The Arab Mining company which began operation in 1974, contributed to several numeral projects such as the Potash project in Jordan, lead and copper projects in Morocco and uranium exploration and production. It owns a one third interest in a Somalian uranium venture worth $19.6million which began operation in 1981.

The Arab desire to acquire nuclear energy was apparent in the Rabat Declaration of 1977 and the resolutions of Third Arab Conference for Mineral Resources.[398] The Rabat Declaration marks the first step in technological progress in the Arab world. It strongly recommended the establishment of three Arab nuclear centres in the Arab world, one at the middle and one at each end (Egypt, Morocco and Iraq) to carry out training and research and development of nuclear energy. Each centre should be equipped with a 50 MW reactor. It also recommended the establishment of a nuclear fuel cycle regional centre in collaboration with the IAEA.[399] OAPEC and AFESD, subsequently, planned the main objectives and organized the First Arab Energy Conference, which was held in Abu Dhabi in March 1979. The conference stressed efforts to develop non-conventional sources of energy such as solar and nuclear energy at each country level and at the Pan Arab level. It recommended the establishment of an Arab Energy Commission and Energy Committees at the national level.[400] A

(398) Ibid; Centre for Application of Science and Technology, The Conference of Ministers of Arab States Responsible for the Application of Science and Technology to Development, Rabat, 16-25 Aug 1976, Science and Technology in the Development of the Arab States, (Paris:UNESCO, 1979).

(399) Ibid.

(400) OAPEC Bulletin, Vol 5, No 4, April 1979.

second conference was held in Qatar in March 1982 which focused on the need for an integrated Arab nuclear energy programme to include intensive training and research and development activities as part of the development plans.

> "The Arab countries should cooperate to obtain self-reliance in acquiring nuclear technology benefiting from the Indian and Pakistan experience. All acknowledged the critical significance of the NPT which should definitely be adhered to but should not form an obstacle to the transfer of nuclear materials and technology for peaceful purposes"[401]

The most recent conference was held at Algiers in May 1985. The conference recommended that increased attention be paid to uranium prospecting, research and development in prospecting and recovering radioactive materials, to be carried out by the Arab Organization for Mineral Resources.[402] It also called upon Arab states to make the necessary preparations for the introduction of nuclear power plants and to coordinate their activities in this respect, especially small size reactors suitable for the Arab

(401) OAPEC Bulletin, Vol 8, No 4, April 1982, p.1; see Organisation of Arab Petroleum Exporting Countries, and Arab Fund for Economic and Social Development, Energy in the Arab World, Proceedings of the Second Arab Energy Conference, Doha, Qatar, 6-11 Mar 1982 (Kuwait: OAPEC, 1983) Vol 3.

(402) OAPEC Bulletin, Vol 11, No 6, June 1985, p.45.

countries. A few days following the Israeli air raid on Iraq's nuclear reactor in June 1981, the First Nuclear Energy Conference was held in Syria to identify ways of coordinating among Arab states in nuclear energy planning and securing the necessary reserves of nuclear fuel through the establishment of a Pan Arab fuel cycle through formation of joint committees to undertake studies for the fuel cycle and promoting cooperation in the fuel cycle with friendly advanced countries.[403]
The conference stressed investment in exploration and production of radioactive materials in the Arab Phosphate producing countries in extraction of uranium from their phosphate industries and marshalling of highly qualified and specialized manpower at all levels to be able to administer and manage future Arab nuclear power installations.

By the end of 1981 there were at least 47 organizations, institutions and regional committees in the Arab world dealing with energy issues and engaged in research and development and training.[404] Of these 21 were concerned with solar energy and six with atomic energy. There are 50 Arab universities with 1.4 million students in 1980, 30,000 Phd holders, 40,000 research workers, 324

(403) OAPEC Bulletin, Vol 7, No 7, July 1981; 'Libya's Nuclear Programme' The Middle East; Feb 1982, p.7; OAPEC Bulletin, Vol 7, No 11, Nov 1981; Arab Nuclear Power Conference, Damascus, 15-19 June 1981.

(404) OAPEC Bulletin, Vol 7, No 11, Nov 1981; Anabtawi,Samir., 'Arab Institutions of Higher Learning' in Ibrahim, Ibrahim. (ed) Arab Resources: The Transformation of a Society (Washington, D.C.: (Croom Helm,1983); Zahlan, A.B. Technological Dimension of Arab Unity (Beirut: Centre for Arab Unity Studies, 1981) p.107; Zahlan, Science and Scientific Policy, op. cit., p.27; UN. Economic Commission for Western Asia, Natural Resources, Science and Technology Division 'The Status of Science and Technology in the Western Asia Region' in Zahlan, A.B. (ed) Technology Transfer in the Arab World (Oxford; Pergamon Press, 1978) pp.51-94.

scientific research institutions and 42% of all graduates specialized in science and technology in the Arab world. Samir Anabtawi, a leading Arab education scholar, described this situation 'in terms of high level manpower resources, the number of universities, the size of research and development pool and the number of Phds, the Arab world today is at a considerably greater advantage than modern Japan was in its early years.'[405] The number of scientists and engineers in the Arab world per 100,000 population in 1977 was 800 compared with 1,000 in Latin America and 2,875 in developed countries.[406] Expenditure on research and development in the Arab world in the early 1970s was 0.3% of GNP compared with 2% in the developed world.[407]

Secondly, there are 14 national energy committees in 14 Arab states and atomic energy commissions in Jordan, Algeria, Syria, Iraq, Kuwait, Libya and Egypt.[408] There are nuclear physics and engineering departments at the national universities of Egypt, Syria, Libya, Iraq, Saudi Arabia, Jordan, Tunis, Morocco and Algeria. There are energy research and mineral exploration (Uranium) departments in Jordan, Algeria, Saudi Arabia, Sudan, Syria, Somalia, Iraq, Kuwait, Libya, Egypt and Morocco. The regional

(405) Anabtawi, 'Arab Institutions of Higher Learning' op.cit.

(406) UN, ECWA, NRST, Division 'The Status of Science and Technology' op. cit., pp.51-94.

(407) UNESCO, Science and Technology in the Development of the Arab States (Paris: UNESCO, 1977) p.175.

(408) OAPEC Bulletin, Vol 11, No 5, May 1985; Mustafa, A., Arab Nuclear Energy: A New Factor for Survival (Beirut: Centre for Arab Unity Studies, 1983), pp.51-53.

organizations dealing with energy are the Industrial Development Centre for the Arab States (IDCAS), the Arab Mining Company, the Organization of Arab Petroleum Exporting Countries (OAPEC), the Arab Fund for Economic and Social Development (AFESD), and the Kuwait Fund for Arab Economic Development.

Thirdly, it is estimated that throughout the Arab world there is a total of 60,000 tons of reasonably assured reserves and 9,000 tons of estimated additional reserves of uranium, according to the Fourth Arab Mineral Resources Conference in 1981.[409] These figures are based on extensive mineral exploration and surveys programmes carried out by local and foreign companies since the early 1950s. It is also estimated that 3.6 million tons of economically recoverable uranium was contained in Arab states phosphate deposits, mostly in Morocco.[410] The Arab world has 40 percent of the reasonably assured reserves of world phosphate and produces 26% of total world production.

The Arab experience in nuclear cooperation has achieved a limited success in spreading awareness of the urgent need for nuclear power and arrangements to be made in order to speed up the process of nuclear development. It also highlighted the importance of cooperation and coordination of nuclear activities between several Arab states,

(409) Ibid, p.121; IDCAS, Arab Conference for Mineral Resources, 4, Amman, Jordan 25-30 April 1981; Mustafa, A. 'The Status of Arab Nuclear Potential' Energy in the Arab World: Proceedings of the First Arab Energy Conference, op.cit., pp.157-320; Mustafa and Jasim 'Arab Uranium Resources' op. cit.; Cameron, J. 'Speculative Potential for Uranium Resources in the Arab World' in Proceedings of the First Arab Energy Conference, op. cit., pp.259-95.

(410) Mustafa, Arab Nuclear Energy, op. cit., p.121.

especially in uranium exploration, training and the establishment of joint nuclear research and power reactors and the fuel cycle. Several organizations and institutions and joint venture companies emerged as a result of intensive contacts, seminars, conferences and resolutions. Arab cooperation in the nuclear field is closely related to international cooperation with the Soviet Union and UN Agencies. The Soviet Union provided research reactors to Egypt, Iraq and Libya and trained several Arab scientists and engineers. It is helping Syria in uranium exploration and building a power reactor in Libya. United Nations Specialized Agencies helped in establishing several projects in the Arab world including the establishment of the Middle East Regional Isotopoe Centre for the Arab World, training of 37 nuclear scientists for a total period of 956 months and supported feasibility and planning studies for uranium prospecting and the establishment of nuclear research centres in several Arab states.[411] United Nations Agencies such as UNESCO, ECWA and UNDP contributed to nuclear development in several nuclear projects.[412]

To sum up, the experience of Arab nuclear cooperation and Arab cooperation with international organizations has led to limited progress in the spread of nuclear technology in terms of research and power reactors if not in terms of training, establishment of institutions and overall nuclear

<411> UNESCO, 'UNESCO Activities in the Field of Science and Technology in the Arab World,' Paris 1976 (Sc-76/ Conf 232/ Col 8); Hazaa, I.B., 'Activity of the Middle East Regional Isotope Centre for the Arab Countries' Paper presented to IAEA Conference on Peaceful Uses of Atomic Energy in Africa, Vienna, 1970, pp.509-520.

<412> UNESCO 'Regional Plan of Action for the Application of Science and Technology to Development in the Middle East', Paris, 1974 (St/UNESCO/11).

infrastructure. Iraq and Libya's quest to develop the nuclear option was often referred to on a number of occasions as an Arab venture. Iraq indicated that it would allow scientists from the Arab and Islamic countries to be trained at Iraq's nuclear research centre which was capable of training 600 scientists at one time. Libya declared that it wanted to develop an advanced Arab nuclear university to train Arab nuclear scientists and engineers.[413] Moreover, scores of Arab nuclear scientists and engineers are working in Iraqi, Libyan and Saudi nuclear institutions and installations.[414]

There is another route for Arab regional nuclear cooperation which deals with nuclear collaboration with the Moslem states of Asia and Africa. Moslem nuclear cooperation was originally highlighted by the late Pakistani Prime Minister, Ali Bhutto, who came up with the concept of an 'Islamic bomb' which entails a marriage between Pakistan nuclear technological skills and Arab money. He gave his message during the holding of the Second Summit of the Organization of Islamic Conference attended by Islamic Nations leaders in Lahore, Pakistan, in 1974. There were several reports about a Pakistani nuclear connection with Libya, Saudi Arabia and Iraq.[415]

(413) Perera, Can the Arabs win the Nuclear Race, op. cit. p.40; 'Libya Nuclear Dreams' Foreign Report, 9 July 1981; 'Insight report maintains Iraq was planning to produce bombs' The Sunday Times, 14 June 1981.

(414) See Europa, World of Learning (London: Europa, 1986).

(415) Ali, 'Zia's Search for Parity' op. cit., Weissman and Krosney, The Islamic Bomb, op. cit., p.60; 'Libya's Nuclear Dreams' Foreign Report, 9 July 1981; Giradet 'Is Qaddafi Financing Pakistan's Nuclear Bomb?' op. cit.; 'Saudi Arabia Offers $800 m. to Help Finance Nuclear Programme' The Sunday Times, 18 Jan 1981; 'Islamic Bomb for Sale' Time 24 Dec 1979.

Equally there were reports of Niger selling uranium to Libya, Iraq, Pakistan, Kuwait and Saudi Arabia.[416] Other examples of nuclear cooperation between Islamic nations can be found in Saudi financial assistance to the Bangladeshi nuclear programme. The Islamic Review magazine, Voice of the Organisation of the Islamic Conference wrote following the Israeli raid on Iraq's nuclear reactor:

> "The Organization of the Islamic Conference could play a central role in ensuring that a coordinated nuclear strategy be developed which takes into account the vulnerability of individual countries, selects appropriate sites for the development of technology, makes suitable arrangements for a wide regional distribution of the weapons and establishes an intergovernmental machinery to ensure that no country - or group of countries - has the ability to unilaterally exercise the nuclear option.[417]

More recently, the 15th Islamic Conference of the Foreign Ministers of Islamic Countries held at Sanaa, North Yemen, in December 1984, expressed deep concern about Israeli

(416) Ibid; 'Niger stop Uranium Ore Sales' MEED, 6 Feb 1981.

(417) The Islamic Review, June 1981.

nuclear armament and the attack on the Iraqi nuclear installations[418], and called for the establishment of Nuclear-Free Zones in the Middle East, Africa and South Asia. At a meeting in Damascus, Syria, the Foreign Ministers of Syria, Libya and Iran discussed ways of acquiring nuclear weapons to confront the Israeli nuclear threat.[419] It was described as the first time a meeting at this level discusses this matter of fate to confront the 'Zionist' enemy'.[420] The meeting warned of the Israeli nuclear threat to the peace and security of the region and the world in its final communique.[421]

The Arab regional nuclear cooperation on its Arab and Islamic components shows that since the second half of the 1970s this cooperation has intensified and has advanced from mere declaration and sentimental support to important discussions on steps to be taken for the development of a nuclear technological base. Undoubtedly, the vast financial resources of oil rich Arab countries played a major role in pushing ahead this process of nuclear cooperation although it was slow and limited in achieving its goals. This regional nuclear cooperation has its merits and its disadvantages. The main benefits of this cooperation can be seen in the exchange of nuclear information, materials and equipment and specialization and in allocation of resources between Third World countries as a result of deep concern

(418) UN A/40/173-S/17033.

(419) Ash-Sharaq, 28 August 1985.

(420) Ibid.

(421) JANA News Bulletin, Vol V, No 87, 27 August 1985.

over restrictions imposed by nuclear suppliers on transfer of nuclear technology.[422] This cooperation is seen as one way of breaking the restrictions imposed by supplier countries following the West European example of the Almelo Treaty of 1967 and eventually their achievement of independence in nuclear technology and materials. But this regional cooperation proved to be difficult and slow and also raised distrust and suspicion that a nuclear programme in one state could lead to a nuclear weapons capability and associated risks. This nuclear cooperation led to a deterioration of relations between Pakistan and Libya. There were reports that Saudi Arabia had offered to finance the Pakistani nuclear programme on condition that no access to Pakistan's sensitive technology was to be given to either Libya or Iraq.[423]

CONCLUDING REMARKS

Nuclear development in the Arab world had been very slow and limited during the first stage from the early 1950s until the mid 1970s; only Egypt, Iraq and Algeria had nuclear research reactors, installations and institutes. However, during the second stage from the mid 1970s until today, almost all Arab states have established energy commissions, signed agreements with advanced and developing

(422) See Resolutions of the First International Conference on Nuclear Technology Transfer, Tehran, Iran, 10 - 14 April 1977.

(423) 'Saudi Arabia Offers $800 m to Help Finance Nuclear Programme' The Sunday Times, 18 January 1981.

nuclear countries, and prepared plans for setting up atomic industries. Today there are small research reactors operating in Egypt, Iraq, Libya, Saudi Arabia and Morocco. Several others are planned in Tunisia, Algeria, Kuwait and Syria. There are plans for construction of several nuclear power plants in Egypt, Libya, Syria, Iraq, Algeria, Morocco and Tunisia. Although nuclear power is a controversial issue throughout the world, indeed in the Middle East, and there is the high cost of developing nuclear power programmes; several Arab states are determined to build up power generation plants. There are strong economic reasons for going nuclear since with the present growing demand for electricity and lack of prospects for further expansion of non- fossil based electricity generating capacity, the Arab states could begin to run out of oil by the end of the century.[424] This supports the argument that there is a need for nuclear power for the generation of electricity in the 1990s in the Arab world.

The growth of Arab states' nuclear infrastructures, and facilities and the accumulation of nuclear technological skills through learning by doing since the mid 1970s and on to the 1990s in contrast to the first stage of Arab states' nuclear development, is a vindication of the explanation and prediction of the product cycle theory during the maturity stage. The theory argues that the pattern of trade and the

(424) Centre for Application of Science and Technology, Science and Technology in the Development of the Arab World, op. cit.; OAPEC and AFESD, Energy in the Arab World, Proceedings of the First Arab Energy Conference op. cit.; IDCAS, Arab Conference for Mineral Resources, 4, Amman, op. cit.; Mustafa, Arab Nuclear Energy, op. cit., PP 122-25.

spread of technology is better explained by the lack of competition, knowledge and technology. At the maturity stage, when competition is increasing between developed countries and technology is fairly stable and knowledge is wide spread, less developed countries will be able to benefit from the spread of nuclear technology, as there will be a market demand for nuclear technologies, and competition is intense between suppliers. The experience of the international nuclear industry since the mid 1970s has shown a clear indication that the maturity stage of the product cycle has been reached, as competition between suppliers of the developed world moves towards Third World markets. When and only when technology in Third World countries is widespread and since nuclear technological skills are transferable skills through learning by doing, will they be able to acquire a nuclear capacity. This is what has been happening in the Middle East since the mid 1970s and probably by the 1990s several Arab states, in particular Egypt, Iraq, Libya, Syria and Algeria and perhaps Saudi Arabia will have the nuclear capacity and will be able to develop the nuclear option.[425]

The Israeli nuclear development is similar to the case of India, South Africa, Brazil, Argentina, Taiwan and South Korea who managed to develop nuclear capacity during the second stage of the product cycle, unlike the Arab states because they had a well developed industrial base, a highly

(425) The majority of respondents in the Survey conducted on Nuclear Proliferation in the Middle East believe that by the end of the century Egypt, Iraq and Libya would have the capability to produce nuclear weapons.

skilled cadre of nuclear scientists and engineers[426] and a large market for nuclear power. The lack of this crucial technological skill was one of the main reasons for the inability of the Arab states to develop a nuclear capacity in the past. Israel managed to develop its nuclear capacity in the 1960s with French and US help based on highly skilled cadre of scientists and engineers and a research reactor of considerable size which is capable of producing enough plutonium for weapons fabrication.So with the present state of Israeli nuclear weapons potential and the Arab states' quest to establish a nuclear technological base and skills, the Middle East is no longer on the threshold of the nuclear transformation process; it is now moving towards the nuclearization of the Arab-Israeli relations.

(426) Jaipal, 'The Indian Nuclear Situation', op. cit.; PP 44-45.

CHAPTER FOUR

NUCLEAR WEAPONS PROLIFERATION IN THE MIDDLE EAST

INTRODUCTION

It was shown in the previous chapter that a wide spread of nuclear technological skills and the establishment of nuclear infrastructures and facilities at a faster rate during the maturity stage of the international nuclear industry product cycle will pave the way for the development of nuclear capacities in several Third World countries. This does not mean that these countries will inevitably develop and produce nuclear weapons. Just because a nuclear weapons programme seems feasible does not mean that a decision to begin such a programme will be made. Technical and economic capabilities play the role of furnishing the necessary conditions for nuclear proliferation but not the sufficient ones. Indeed, it is political and security factors that motivate decision makers to begin nuclear weapons fabrication, that is to say provide the sufficient conditions for proliferation to happen. Though the technological explanation and prediction of the nuclear proliferation process can be fairly determined in the long run because they are based on the flow of technology, trade, knowledge and acquiring technological skills through learning by doing, determination of the political and security motivational factors is an inherently probabilistic process because there is no pattern and it involves many variables and intervening variables which are difficult to predict and ascertain. Moreover, the empirical data on such phenomena are limited, only five nuclear weapons states exist and evidence generated from them is limited and inconclusive.[1]

There is a consensus in the literature that specific politico-military motivational factors have led a decision maker to begin fabrication of nuclear weapons. Acquisition of nuclear weapons represents a viable answer to various military threats.[2] The arguments for political and security motivations for going nuclear can be grouped into three main categories: power and prestige, military and security and domestic politics. The power and prestige motivational factors arise from the link between power and prestige status with the possession of nuclear weapons.[3] The military and security factors are various ranging from deterring an attack from an adversary to an assertion of independence.[4] There are also domestic factors which may

(1) See Yaeger, Non-Proliferation and US Foreign Policy, op. cit.; p.407; Dunn and Kahn, Trends in Nuclear Proliferation, op. cit; Lefever, Nuclear Arms in the Third World, op. cit., pp.19-21; Dunn, Controlling the Bomb, op. cit., Chap 1; Schelling, Micromotives and Macrobehaviour, op. cit., pp.3-14.

(2) Dunn and Kahn, Trends in Nuclear Proliferation, op. cit.; Kissinger, Nuclear Weapons and Foreign Policy, op. cit., Chap 2; Harkavy, Y., Nuclear War and Nuclear Peace (Jerusalem: Israel Universities Press, 1966) p.278.

(3) Beaton and Maddox, The Spread of Nuclear Weapon, op. cit., p.192; Dunn and Kahn, Trends in Nuclear Proliferation, op. cit; Epstein, 'Why States Go - and do not go - Nuclear, op. cit, p.18; Greenwood, et al, Nuclear Proliferation, op. cit, pp.49-50; Growing, Independence and Deterrence, op. cit., pp.63, 184, 220, 407; Groom, British Nuclear Thinking, op. cit., p.44; Kahn, French Nuclear Diplomacy, op. cit., pp.98, 358.

(4) Ibid; Betts 'Paranoids, Pygmies, Pariahs and Non-Proliferation, op. cit pp.157-83; Harkavy, Spectre of Middle East Holocaust, op. cit., pp.8-9; Chain, 'Incentives for Nuclear Proliferation: The case of international pariahs' op. cit., pp.26-45.

play a dominant role in the decision to go nuclear. Equally there are several other factors which tend to work against going nuclear, ranging from alliance with a nuclear power to domestic political and economic factors. So whatever the motivational and disuasive factors leading a state to go nuclear (or not to go nuclear), a decision has to be made to exercise options available. It is a decision making process evolving from the selection of a particular option under conditions of imperfect information and uncertainty and making a commitment to the particular option which entails allocation of resources and continuous review of the situation as time passes. The motivational hypothesis argues that decision to begin nuclear weapons programmes is systematically related to prevailing motivational conditions. The acquisition of nuclear weapons is a profound and deliberate act which can only be undertaken after careful consideration of benefits and risks, not something that happens as part of automatic process.[5] This decision may or may not lead ultimately to nuclear weapons. There were a number of cases where technical and economic difficulties were major obstacles and in others actions of their rivals hindered this prospect, as highlighted by the Israeli attack on Iraq's nuclear reactor. But there are also a number of cases where decisions and subsequent efforts were made.[6]

(5) Lefever, Nuclear Arms in the Third World, op. cit., p.119, Beaton, Must the Bomb Spread, op. cit., pp.18,48.

(6) Gowing, Independence and Deterrence, op. cit., pp.160-193; Kohl, French and Nuclear Diplomacy, op. cit., Chap 1; Kapur, India's Nuclear Options, op. cit.

The Link Between Civil and Military Nuclear Technology

The wide spread and transferability of nuclear technological skills, facilities and materials at a faster rate during the maturity stage of nuclear technology product cycle is viewed as the link between nuclear technology and nuclear weapons proliferation. This link goes back to the publication of the MAUD report in 1940 which concluded that 'There must always be a very close relation between the exploitation of nuclear energy for military explosive purposes and for power production in peace and war. The development of one will have a considerable effect on the development of the other'.[7] The 1977 report of the Nuclear Energy Study Group came to the conclusion that 'The consequences of nuclear power that dominates all others is the attendant increase in the number of countries that will have access to the materials and technology for nuclear weapons'.[8] The United Kingdom's Royal Commission on Nuclear Power and Environment of 1976 came to the same conclusion 'The spread of the ability to make nuclear weapons, we fear, the construction of these weapons'.[9] Fred Charles Ikle, former director of USA Arms Control Agency, argued that 'with the benefit of hindsight we can clearly see that projects for peaceful applications of nuclear technology provided the essential expedient and in many cases the

(7) Gowing, Britain and Atomic Energy, op. cit., p.435.

(8) Keeny et al, Nuclear Power: Issues and Choices, op. cit., p.271.

(9) HMSO, Royal Commission on Environment and Pollution, Sixth Report, Nuclear Power and Environment (London: HMSO, 1976) p.76; See Maddox, 'Prospects for Nuclear Proliferation' op. cit., pp.10 & 11.

necessary cover for gaining capabilities to make the bomb'.[10] The Indian explosion of a nuclear device in 1974 using plutonium from a research reactor supplied by Canada, argued Robert Wohlstetter, is an example of the cover syndrome 'policy must principally address...the countries that can drift toward a military capability without any intention of arriving at it, and yet that may adopt a civilian program that ultimately places them within days of acquiring materials for nuclear explosives. The Indian experience illuminates that process of drifting toward a bomb. Canadian and US help-transfers of facilities, equipment and material, advisory scientific and engineering services, training of Indian personnel, financial subsidies and loans-formed a major ingredient of the Indian program that was shortening the critical time to make an explosive. And this help was given before and after the Indians revealed a strong interest in nuclear explosives'.[11] Frank Barnaby takes the argument a stage further by insisting that 'Beyond often setting up the means to produce nuclear weapons, civilian nuclear power programmes can also act as a powerful stimulant to groups of people capable of yielding significant influence in arguing for the development of nuclear weapons).[12]

(10) Wohlstetter, Swords from Plowshares, op. cit., P VIII.

(11) Wohlstetter, R., 'U.S. Peaceful Aid and the Indian Bomb' in Wohlstetter, A. et al., Nuclear Policies: Fuel without the Bomb (Cambridge, MA: Ballinger, 1978); See Marwah, 'India's Nuclear and Space Programs' op. cit, p.118; Nacht 'United States in a World of Nuclear Powers', op. cit., pp.163-4; Kapur, A., 'Nth Powers of the Future' Annals of the American Academy of Political Science, No 430, Mar 1979, p.94.

(12) In Rotblat, J. 'Proof of Evidence to the Windscale Enquiry' Planning and Plutonium, (London: Town and County Planning Association, 1978) p.41; See Baker 'The International Political Economy of Proliferation' op. cit., p.97.

Dr Sigvard Eklund, the former Director General of the International Atomic energy Agency, argued strongly that '... I do not believe that the spread of nuclear power must result in the spread of nuclear weapons or that we can stop proliferation by closing down nuclear power plants .... as far as we know, each of the countries that have nuclear weapons capacity have obtained this by building a specialized series of plants, dedicated to the production of nuclear explosives. We are aware of no case in which proliferation has resulted from nuclear power programme'.[13] Sir John Hill, the former Chairman of the United Kingdom Atomic Energy Authority agrees that 'various technologies for the procurement of the fissile materials need for a nuclear weapon capability exist and cannot be uninvented. Stopping civil nuclear power programmes...would not in itself remove the danger of proliferation'.[14]

The conventional wisdom of nuclear proliferation postulates that none of the nuclear weapons used the power reactor route. All nuclear weapons powers used the nuclear weapon production reactor route to manufacture nuclear weapons because civil nuclear technology was not developed then and there was strong motivation to produce weapons at all cost. For the USA and the Soviet Union, civilian nuclear technology did not exist. Britain saw the two very much as being in harness. As for China and France, circumstances

(13) Eklunds, S., 'Nuclear Power Development and Non-Proliferation' Nuclear Energy, Vol 17, No 2, April 1978.

(14) Hill, J., 'International Proliferation of Nuclear Weapons' Atom, No 253, Nov 1977, p.296; See Hill, 'The Driving Forces of Proliferation', op. cit., p.54.

were not clear-cut but their programmes were based on what was believed to be a civilian programme.[15]

The argument may be misleading because it makes an artificial distinction between a nuclear production reactor and nuclear power technology, which includes enrichment and reprocessing technology, trained scientists and engineers and nuclear infrastructure. Whatever route a country takes to develop nuclear weapons is based on the development and transfer of nuclear technology. The first three nuclear weapons states, the USA, the Soviet Union, and Britain, did not have a choice, as civilian nuclear technology was not developed and it was a product of military technology. The French nuclear programme was not clear at the early stage since most of the scientists involved believed it had only peaceful objectives.[16] The Chinese programme was undoubtedly based on a technological foundation established with the help of the Soviet Union's 1957 nuclear technology assistance programme to help its less developed communist neighbour.[17] Though the Soviets might have been motivated to help China develop its nuclear power technology, they terminated this help when they realized that the Chinese were acquiring nuclear weapons, not merely nuclear power energy.

The transfer of commercial power and research reactors means to the recipient country a sizeable cadre of highly

(15) Scheinman, Atomic Energy Policy in France, op. cit., p.215.

(16) Ibid.

(17) Office of Technology Assessment, Nuclear Proliferation and Safeguards, op. cit., p.101.

trained specialists in nuclear technology, a source of fissile material and the facilities to convert it to weapon-usable form. A country pursuing the route of development of civil nuclear technology either for research or energy through direct assistance of nuclear technology supplier countries would be able after some time to have both the material and expertise which make a nuclear weapons decision much easier later on if there were strong motivations to go nuclear. Otherwise nuclear weapons proliferation is not possible because the technical capability does not exist. Most important, a nuclear power programme provides a legitimating cover for nuclear activities which would otherwise undoubtedly be weapons oriented. Fred Ikle argued, in this respect, that

> "Today, the spread of nuclear weapons capability is riding on the wave of peaceful uses of the atom. The world's first five nuclear weapons states clearly started out with a military program. Now it is peaceful technology that provides not only the means, but also the cover, in all cases where we fear that a new weapons program might be on the way."[18]

A country launching a nuclear weapons programme without such

(18) In Beres, Louise R., Apocalypse: Nuclear Catastrophe in World Politics (Chicago and London: University of Chicago Press, 1980) p.96; See Nacht 'The Future Unlike the Past' op. cit., pp.193-212; Quester, Nuclear Proliferation: Breaking the Chain, op. cit.

cover is most likely to be discovered, exposed and possibly stopped.[19] But if a civilian nuclear programme does exist the country in question will have the opportunity with the availability of trained nuclear scientists and a source of fissile materials and facilities that make it easy to transfer these materials and facilities into a weapons programme. A nuclear power or research programme developed entirely with the intention of peaceful uses may become the vehicle for a rapid transition into a nuclear weapons stage whenever relevant political circumstances arise, in other words, the country in question has the nuclear option. Transferability of nuclear technological skills and materials, nuclear power and research reactors, enrichment and reprocessing facilities, stockpiling of fissile materials and training of nuclear personnel, may constitute an irresistable temptation or pressures to produce nuclear weapons under circumstances insufficient to motivate such decision to fabricate nuclear weapons from without.

Attempts to Control Proliferation

Fear of nuclear weapons proliferation is believed to have led the USA, Britain and Canada, three months after Hiroshima, to suggest that a nuclear monopoly was impossible and that the only choices were disarmament and proliferation.[20] They called for disarmament. In 1946, the

(19) Dunn and Kahn, Trends in Nuclear Proliferation, op. cit.; Wohlstetter, Swords from Plowshares, op. cit., Chap 3.

(20) 'Special Report: The Export of Nuclear Technology' US Department of State, Bureau of Public Affairs, Office of Media Services, No 9, Oct 1974; US Congress, House of Representatives, Committee on International Relations, Science, Technology and American Diplomacy (Washington, D.C.: Government Printing Office, 1971) Vol 1, pp.57-122.

USA President presented the Baruch Plan to the UN, calling for creation of a worldwide nuclear inspection system followed by nuclear disarmament.[21] By 1953, both Superpowers had acquired the Hydrogen Bomb and nuclear disarmament seemed an increasingly remote possibility. President Eisenhower then offered his 'Atoms for Peace' option.[22] He called for the creation of an international body for the development of commercial nuclear power and made special reference to the bright promise this source of energy could bring to the less developed world. USA Secretary of State, Dulles, in defending the programme, as other developed countries could not be persuaded to invest in non-proliferation efforts, testified that the USA could not hope to set up an effective dam against the flow of information, and 'if we try to do it we will only dam our influence and others will move into the field with bargaining that that involves'.[23] In 1957, the IAEA was established to promote the peaceful uses of nuclear power around the world. In 1967 the Treaty of Tlateloco prohibited nuclear weapons in Latin America and in March 1970 the NPT entered into force. But the NPT, the main non-proliferation commitment, suffers from several deficiencies

(21) Ibid.

(22) Sokolski, H., 'Atoms for Peace, A non-Proliferation Prime' Arms Control Vol 1, No 2, Sep 1980, pp.199-231; Pringle and Spigelman, The Nuclear Barons, op. cit., p.102.

(23) In 'Special Report: The Export of Nuclear Technology' op. cit.

and is still facing formidable challenges.[24] Other attempts have been made in the USA, through introduction of legislation such as Public Law 95-92 and Public Law 95-242, aimed at putting economic, military and political pressures on suspected proliferators and nuclear supplier countries. All these attempts including the NPT did not prevent India from exploding a nuclear device in 1974, and the spread of sensitive technology to near nuclear countries such as South Africa, Brazil, Argentina and Pakistan.

When the USA had a near monopoly on nuclear technology and uranium enrichment and reprocessing, close cooperation between the IAEA and the USA offered a possibility of sanctions. At present, however, there are many competing sources of fuel and technology for sanctions to be effective.[25] So with diffusion of nuclear technology, effective sanctions need united action by several nuclear suppliers; some of them are emerging Third World alternative producers.[26] But such a united action is difficult to contemplate as Fred Ikle explains.

> "The countries with the ability to supply technicians, reactor hardware and nuclear fuel have so many conflicting and even devious interests that any

(24) Simpson, 'Global Non-Proliferation Policies: Retrospect and Prospect' op. cit., pp.69-89; Kapur 'Nuclear Proliferation in the Eighties' op. cit., pp.535-55; Nye, 'Political Solutions' op. cit., p.32.

(25) Dunn, Controlling the Bomb, op. cit., Chap 2.

(26) 'Superpower Goals: Keeping the Nuclear Club Explosive' US News and World Report, 3 Dec 1984, p.30.

anti-proliferation agreement must be made at the mercy of the lowest common proliferation with long delays and more loopholes that anti-proliferation clauses!"[27]

Thus the spread of nuclear technologies and material from many competing Western and Eastern suppliers and probably from Third World suppliers in the near future and lack of effective non-proliferation barriers seem to make nuclear weapons proliferation more feasible and easier.

However, the nuclear technology spread is a technological and economic process while nuclear weapons proliferation is essentially a political process which is governed by perceived security needs and international and internal political constraints. It can be argued that the basic technical knowledge needed to develop nuclear weapons is already widespread[28] and that there are ways other than the further development of commercial nuclear power and research reactors, for countries to use that knowledge to acquire nuclear weapons if they want them badly. Some argue that more nations have decided not to acquire nuclear weapons at present than have to do so. Five countries are nuclear weapons powers and far more countries have small to non-existent nuclear installations than have extensive

(27) In 'Special Report: The Export of Nuclear Technology' op. cit.

(28) Beckett, Weapons of Tomorrow, op. cit., pp.11-23; Simpson, The Independent Nuclear State, op. cit., pp.72-4.

ones.[29]

This was the past state of affairs which the future might not disclose, especially with the present trend of fast and widespread of nuclear technology and materials.[30] Nevertheless, the widespread of particular nuclear technologies, materials and skills may make the link between nuclear technology and nuclear weapons proliferation more obvious.

Nuclear Weapons Proliferation

Nuclear weapons proliferation is mainly a political process. The main motivations of a country to acquire nuclear weapons are widely discussed in the literature as mentioned before, but the distinction and link between the nuclear technology spread and nuclear weapons proliferation processes have not been fully explored. The main reasons for this state of affairs are perhaps the mix between the tangible (technological and economic) and intangible (political) elements of the proliferation process, different levels of analysis (national and international) and the multiplicity of the non-proliferation efforts which have various objectives and interests.[31] This question of

(29) Nye, 'Maintaining Non-Proliferation Region' op., cit., pp.15-38; Kapur 'The Nuclear Spread a "Third World View" ', op. cit., p.60.

(30) Nacht, 'The Future Unlike the Past', op. cit., pp.193-212; Quester 'Nuclear Proliferation Breaking the Chain' op. cit. pp.217-18; Dror 'Nuclear Weapons in Third World Conflict', op. cit., pp.96-103; Frey, 'The Adequacy of Our Conceptual Tool for Dealing with a Proliferated World', op. cit., pp.208-9; Meyer, The Dynamic of Nuclear Proliferation, op. cit., p.164; Simpson 'The Nuclear Non-Proliferation Problem: Diagnosis and Treatment', op. cit., p.175.

(31) Ibid., p.177-78.

overlapping issue areas and concentration on non-proliferation policies led proliferation to be seen as motivation and barriers. The two main bodies of arguments of nuclear proliferation are as follows[32]: The first sees proliferation concerns mainly with technological and economic aspects of the phenomena and so the problem has to do with technological and economic barriers and regulations. The second argument sees proliferation as mainly a political problem and so it has to do with political motivations and incentives by creating a political climate in which states choose not to go nuclear. Both arguments failed to recognize the distinction between the nuclear technology spread as a technological and economic process and nuclear weapons proliferation as a political process and that there is a link between the two processes and the interaction between the two processes affects the nuclear weapons proliferation decision. Both technology and politics are essential ingredients in the nuclear proliferation process. Both technological and political variables change over time and so the dynamics of the nuclear proliferation process is the one when the two meet together.[33] The technological and economic aspects of the nuclear proliferation process are fairly unvaried over time and increase in quantity and

(32) Spaniard, Bernard., 'Nuclear Power and Nuclear Weapons: The Connection is Dangerous', Bulletin of the Atomic Scientists, Jan 1983, p.41; Keeny, et al, Nuclear Power: Issues and Choices, op. cit., Chap 9; Wohlstetter et al, Nuclear Policies: Fuel Without the Bomb, op. cit., p.89.

(33) Roscrance, Problems of Nuclear Proliferation, op. cit.; Nye 'Time to Plan the Next Generation of Nuclear Technology', op. cit., pp.34-41.

quality with time. The motivational element of the process does not necessarily follow a particular trend or pattern because it depends on how domestic and international political variables develop.

A country does not go nuclear simply because it has the capability to do so. Among the several concerns that might urge the country to go nuclear, the question of the impact on its national security must play a crucial role. The continuous development of nuclear capabilities of nuclear weapons powers gives justification for acquiring nuclear weapons when there is plausible security arguments for going nuclear,[34] especially at a time when the technical and economic difficulties of going nuclear are gradually decreasing over time. Nuclear weapons symbolize a state's modernity, scientific prowess and technological dynamism and ultimately enhance prestige with reference to existing military alliances and international hierarchy.[35] Epstein wrote to explain this point 'the same arguments that led to the emergence of five (or six) nuclear powers can be used by the seventh, eighth and ninth nuclear powers'.[36] Another argument used to justify the acquisition of nuclear capability is the notion that such weapons provide the

(34) Epstein, 'The Proliferation of Nuclear Weapons', p. 27; See Beker, The International Political Economy of Proliferation, op. ci.t, p.87.

(35) Nerlich, V., 'Nuclear Weapons and European Politics: Some Structural Interdependencies' in Holst, J.J. (ed), Security, Order and the Bomb (Oslo: Unwerstels Forlaget, 1972) pp.74-75, 78-83, 19; Maddox, 'Prospects for Further Proliferation' op. cit, pp.19-20.

(36) Epstein, 'Why States Go - and do not go - Nuclear', op. cit., p.19.

ultimate and most effective deterrence against potential agressors.[37] These have been the declared policies of the existing nuclear weapons powers, the USA, the Soviet Union, Britain, France and China, by having the ability to retaliate in kind and to deter attack on itself. Nuclear weapons have already been used in war against a non-nuclear weapons state, Japan. The USA achieved a decisive military advantage against a state that did not possess them. Nuclear weapons may provide an insurance or hedge against uncertainty (risk avoidance) in national security planning based on worst case analysis.[38] Israel's suspicion about Iraq's nuclear intentions led to the air raid on Iraq's nuclear reactor on June 1981.

Lack of credibility or absence of a nuclear weapons state's pledge not to use nuclear weapons against non-nuclear weapons states under any circumstances, and the negative security assurances given by nuclear weapons powers relating to giving up the use of nuclear weapons, may push forward the argument for going nuclear by some countries.[39] Another equally compelling argument in favour of going nuclear by some states are the doubts raised concerning the

(37) Lord Chalfont, 'Why Britain Must Keep Its Deterrent', The Times, 3 and 15 December 1980; Professor Rotblat, 'Letter to Editor', The Times, 6 Nov 1981.

(38) Gorthoff 'On Estimating and Imputing Intentions', op. cit., pp.22-31.

(39) Greenwood, et al, Nuclear Proliferation, op. cit., Chap 4; Yaeger, Non-Proliferation and US Foreign Policy, op. cit., P 372, US. Comprehensive Study on Nuclear Weapons, op. cit., p.120; Buzan, B., People, States and Fear: The National Security Problem in International Relations, (Brighton: Wheat Shaef, 1983) p.203; SIPRI, Agreements for Arms Control: A Critical Survey, (London: Taylor and Francis, 1982) pp.45-46; Dahlitz, Julie, Nuclear Arms Control, (London: George Allen and Unwin, 1983) pp.38-39.

credibility arising from their search for protection against nuclear attack by entering into alliance with nuclear weapons powers. The nuclear weapons powers provide these states with a nuclear umbrella and sometimes base nuclear weapons on their soil, especially when the two Superpowers are directly engaged in a local or regional conflict.[40] The main thrust of nuclear deterrence rationale of the British and French independent nuclear deterrent lies in serious doubt about the US nuclear commitment to the defence of the NATO alliance in case of a Soviet invasion of West Europe.[41] Finally, the acquisition of nuclear weapons by one state would have a dramatic effect on the local strategic map.[42] Not only its main adversary but also many other states in the region could be expected to review their level of national security and this could eventually lead to nuclear proliferation chains.[43] One chain is postulated, namely, India-Pakistan-Iran-Saudi Arabia-Iraq-Egypt-Syria-Libya-Israel, and then ultimately leading to brazil and hence Argentina.[44] Morgenstern wrote describing this situation.

(40) See Adam, Roberts., Nations In Arms (New York: Praeger, 1976) P254; Groom, British Nuclear Thinking, op. cit., p.587; Freedman, Britain and Nuclear Weapons, op. cit., Chapter 1; Gowing, Independence and Deterrence, op. cit., p.441; Kohl, French Nuclear Diplomacy, op. cit., p.154.

(41) Ibid; Sheehan, Michael., The Arms Race (Oxford: Martin, Robertson, 1983),p.63.

(42) King, International Political Effects of the Spread of Nuclear Weapons op. cit., p.61; Epstein, Why States Go - and do not go - Nuclear, op. cit., p.18.

(43) Dunn and Overholt, 'The Next Phase in Nuclear Proliferation Research', op. cit., pp.297-524.

(44) Ibid, pp.509-10.

"The spread of fission weapons is itself a kind of fission process: each nation that acquires nuclear weapons induces more nations to get them, too'.[45]

Those who felt national security was in some way affected might decide to acquire comparable nuclear capacity.

Nuclear Weapons Proliferation in the Middle East

Nuclear weapons proliferation in the Middle East, however, is governed by the acquisition of nuclear weapons potential by Israel to maintain an ultimate deterrence against hostile neighbours and from fear of unreliable Western security guarantees and the responses of the Arab states to this nuclear threat.[46] Following the 1967 war, France abandoned Israel and severed all military ties, and thus ended nuclear collaboration with israel. So, surrounded by hostile neighbours and almost entirely dependent upon the USA for military aid which became more evident during the Arab-Israel war of 1973, the Israelis began to doubt their ability to survive as a nation based solely on Western Security support and guarantees. The

(45) Morgenstern, O., 'The Nth Country Problem', Fortune, Mar 1961, pp.136-7, 205-8.

(46) Marcus, Joel., 'The Rift Between Israel and France', Midstream, Vol 14, Jan 1968, pp.39-44; Harkavy, Spectre of a Middle East Holocaust, op. cit., p.7; Nimrod, Y., Israel in the Nuclear Age, Oranum, Nov 1978, p.3; Perlmutter, 'The Israeli Raid on Iraq', op. cit., pp.34-43; Dowty, 'Nuclear Proliferation', op. cit. pp.79-120.

continuous state of hostility with Israel's neighbours and six wars led to a predominance of security problems and conditions in the political and social life of Israel.[47] The ambiguous nuclear weapons status of Israel and its determination to deny the Arab states the possibility of developing their nuclear capabilities and the fear of the Arab states of the Israeli nuclear capability is assumed to be the main motivating factor behind the Arab quest to acquire and develop nuclear capabilities.

Israel's Nuclear Motives

Israel's fear of her hostile neighbours was evident from the early years of the foundation of the State of Israel following the 1948 War with its Arab neighbours. David Ben-Gurion, Prime Minister of Israel, in 1949 recognized that Israel's major defence problem would be one of the Jewish quality versus Arab quantity.[48] Consequently, he sent a group of scientists to Europe to study nuclear physics. Hostility and agression continued, which led to a deterioration of the security of Israel as a result of commandos operations in 1955 and strong retaliation by Israel. Weapons delivery from the Soviet Union through Czechoslovakia to Egypt and the sign of growing military

(47) Eistenstadt, S.N., The Transformation of Israeli Society, (London: Weiden-feld and Nicholson, 1985) p.184.

(48) Bar-Zohar, M., Ben Gurion: A Political Biography (Tel Aviv: Amoved, 1978) Part III, P 1400, For the Concept of Fear as Motive for Proliferation, see Martin, Andrew and Young, Wayland, 'Proliferation', Disarmament and Arms Control, 3, 2, 1965, PP 107-134; Rothstein, Robert L., On Nuclear Proliferation (Columbia: Columbia University Press, 1966)

cooperation between Arab states produced a sense of crisis in Israel leading it to seek allies. In 1955 Shimon Peres and Moshe Dayan initiated more intensive cooperation with France following the agreement signed between the two countries in 1953, perhaps generated by the Egyptian Revolution in 1952 and later reinforced following the Czechoslovakian arms deal of 1955 and the Egyptian involvement in the Algerian War of Independence of 1954-1962. The overt aspect of the relations between Israel and France evolved into military alliance which led to the Sinai Campaign of 1956 with Britain as a result of Egypt's nationalization of the Suez Canal Company.[49] More secret was the cooperation in the nuclear field. France's UN representative said on June 2,1969 that France had just decided then to develop its 'force de Frappe' and was eager to utilize Israeli research on the production of heavy water.[50]

The fact that France was willing to cooperate with Israel, enabled Ben Gurion to begin implementation of an independent nuclear programme. The withdrawal of France and Israel from Suez brought about by the pressure of USA threats to use economic and political actions and Soviet threat to use military force are believed to have led to

(49) Harkavy, Spectre of a Middle East Holocaust, op. cit., pp.5-6; Jabber, Israel and Nuclear Weapons, op. cit., pp.20-22, 27; Bader, The United States and the Spread of Nuclear Weapons, op. cit., pp.33-35; Weissman and Krosney, The Islamic Bomb, op. cit., p.112; Egypt and The Palestinian Question, 1945-82, Ministry of Foreign Affairs, Egypt, (Cairo: Al-Ahram Press, 1982) p.12.

(50) Crosbie, A Tacit Alliance, op. cit., p.114.

France's decision, among other things, to seek freedom of action from the Superpowers by building an independent nuclear deterrent force.[51] Although the Suez Campaign enhanced Israel's position of strength, Ben Gurion was pessimistic about Israel's future both in the long and short run. He expressed this view on a number of occasions 'I could not sleep all night, not even for one second. I had one fear in my heart: a combined attack by all Arab enemies' and 'what's Israel?.... a small spot .... How can she survive in this Arab world'.[52] In his first meeting with De Gaulle in June 1962, Ben Gurion explained that there was no need for an Arab joint action to attack Israel, Egypt by itself with modern war planes could do it.[53] He expressed his great fear that the qualitative advantage of Israel was no match to the Arab quantitative advantage. This fear could only be solved either by a security arrangement with Western powers or by developing an independent deterrent capability. This independent deterrent capability one can assume to be 'nuclear' since the inability of conventional capability to deter the Arab states what was troubling him. This conventional deterrent capability was restricted by the extent of mobilization of Israel's limited resources and eventual Arab quantitative increases. So Ben Gurion thought this deterrent on the long run had to be nuclear. He described this vision more vividly when he retired.

(51) Nimrod, Israel in the Nuclear Age, op. cit., p.3.

(52) Bar-Zohar, Ben Gurion: A Political Biography, op. cit., p.1399.

(53) Ibid., p.1379.

"We need all possible means of defence: and I do not want to say what the most effective means is and what it signifies. We can ensure our security only if ourenemies know that we possess effective weaponry with which to deter them."[54]

Haikel, editor of Al-Ahram, the Egyptian government's official newspaper, gave reasons for Israel's nuclear venture: Living under a military siege and fear of dependence on foreign arms and support, the psychological disposition of "Israeli Security", the breaking of arms monopoly in 1955 and fear of Egypt's military superiority over time'.[55]

Moreover, Shimon Peres argued that in the long run, Israel will not survive if it relies on the conventional balance of power.[56] He noticed that from the manpower and territory point of view, the Arabs collectively enjoy a very important advantage so his objective is to neutralize this quantitative advantage by adding new factors to the equation, 'The limits of quantitative superiority and even its end, are more significant in the security field. The

(54) Maridor, M.M., Rafael (Tel Aviv: Maarachot, 1981), pp. 352-3.

(55) Al-Ahram, 20 August 1965.

(56) Bar-Joseph, Uri., 'The Hidden Debate: The Formation of Nuclear Doctrines in the Middle East', The Journal of Strategic Studies, Vol 5, No 2, June 1982, pp.212-13.

traditional strategy was based on three factors: quantitative superiority, geographical space, and duration of time. But these factors disappeared with the advent of nuclear and thermo-nuclear weapons and guided missiles.'[57] He did not change this perception of the nuclear factor in neutralizing the Arab quantitative superiority even after the successful Six Day War of 1967.[58] He contended that a nuclear option is an essential element of Israel's security to counter balance the Arab edge in manpower and territory until the Arabs accept Israel. But until that time, Israel must have a nuclear option to guarantee success in its struggle for existence.

It is suggested that, Moshe Dayan was instrumental in Israel's decision to move from the nuclear option to 'a bomb in the basement' while he was Defence Minister. He pushed for this step more because of fear of a regional balance of power between the two Superpowers than because of a balance of power between Israel and the Arabs for a number of considerations.[59] The first element of these considerations was the French embargo in 1967 after long reliance on French military supplies. The lesson was that the supply of American arms could not be assured for ever because it was

(57) Peres, S., Hashalav Haba, (The Next Phase) (Tel Aviv: Am Hasefer, 1965), p.179.

(58) Peres, S., David's Sling, (London: Weiden-Feld and Nicholson, 1970), p.112; See Perlmutter, et al, Two Minutes Over Baghdad, op. cit., p.48.

(59) Arnson, S., Conflict and Bargaining in the Middle East, (Baltimore: Johns Hopkins University Press, 1978), pp.86-6, 118; Haselkorn, A., 'Israel: From an Option to a Bomb in the Basement' in Lawrence, R.M. and Larus, J. (eds), Nuclear Proliferation Phase II, (Kansas: University of Kansas Press, 1974), pp.149-182.

conditional upon certain political circumstances. The second element was the growing Soviet involvement in the Arab-Israeli conflict and so American assistance would be restricted by the Soviet adventurism. The American support given would be restricted by political limitations. So an independent nuclear programme would expand Israel's freedom of action and manoeuverability between the Superpowers. He continued to express his views on several other occasions and concluded that the lesson of the 1973 War was that Israel had reached its quantitative limits, so it must guarantee the balance of war against increasingly expanding Arab forces 'by increasin the quality of its arms - a quality that will ensure that every Arab attempt to conquer and destroy Israel will end with the destruction of its enemies.'[60] Yigal Allon, former Israeli Foreign Minister, expressed similar views that Israel under no circumstances should allow her existence to depen on foreing guarantees.[61] Dayan once more expressed a fear that Israel had reached the limits of qualitative advantage while the Arab side's quantitative edge was on the increase.[62]More recently, Yuval Needman, a prominent Israeli nuclear physicist and Minister of Science and Technology, summarized Israel's fear of the development of an Arab nuclear threat as the main reason

(60) In Bar-Joseph, The Hidden Debate, op. cit., p.217.

(61) Allon, Yigal., The Making of Israel's Army, (London: Valentine, Mitchell, 1970).

(62) Dayan, Moshe., The Story of My Life (London: Sphere Books, 1976) pp.511-512.

behind the development of Israel's nuclear potential.[63]

The Israeli fear of defeat by combined Arab forces and the threat of destruction stems from the Jewish people's previous experience and memories of the holocaust, so vivid in the minds of the Israelis. As Pierre Gallois put it 'faced with an alternative of servitude or invasion, a nation would gamble on the policy of dissuasion (deterrence) to save its independence'.[64] This reflects the warning extended by Israeli Prime Minister, Begin, following the destruction of the Iraqi nuclear reactor in 1981 'Never again there will be another Holocaust. We shall defend our people with all the means at our disposal .... we shall not allow any enemy to develop weapons of man destruction'.[65] The Israelis continued from the early beginningof the foundation of the State of Israel to view the Arab-Israeli conflict as a war of survival in face of a previous Arab call for the total destruction of the State of Israel. Ben Gurion described the Israeli situation 'it should not be forgotten even for a moment that Israel's security problem is quite unlike that of any other country. This is no problem of borders or sovereignty but a problem of physical survival in the literal meaning of the world. And it is a question of the survival not only of the people of Israel

(63) Radio Free Europe Broadcast, 21 Feb 1983.

(64) Gallois, The Balance of Terror, op. cit., p.199.

(65) 'Israeli PM Definitely Justifies and Says: Israel would do it again if necessary' The Times, 10 June 1981.

but of Jewish people the world over.'[66] This concept of a state besieged is rooted in Zionist tradition as a result of the long history of Jewish suffering. This Israeli conception of security, based on Jewish perception of being victims of mass annihilation and surrounded by hostile Arab nations bent on its destruction, had a fundamental interest in military strength to deter and defeat any attack from any Arab state or combination of Arab states. President Sadat explained the Israeli fears in February 1978 by saying

> "The reason why Israel is perturbed is because she wants to be the strongest state in the region and to maintain this strength to create fear in the region. It is her fear and long sense of security which make her arm from top to toe...Israel's plan is to remain permanently connected to a great power in order to guarantee her survival and security"[67]

A leading Arab military commentator explained this Israeli conception of security in a more detailed manner.

> "The conviction of the Israelis (or at least the majority of them) that any military defeat would mean

(66) In Israel, A Country Study (Washington: The American University, 1979), Second edition, p.250.

(67) Interview with October Magazine, 19 Feb 1978, pp.8-10.

destruction of the state and would pose Israel's society with the danger of extermination. Thus, the nuclear balance of terror, which is a consequence of the fear of the extermination resulting from nuclear war would not bring about the non use of nuclear weapon in the instance that Israel faces the danger of complete conventional military defeat. This is due to the fact that in the Israelis' opinion the result in both cases would be the same: extermination and physical liquidation of the state and its citizens.

We are not going to debate here the 'danger of extermination" which is deeply rooted in the hearts of the Israelis and is accompanied by complexes, imagination and feeling of inferiority. It surfaces when the Israeli is faced with danger. It was clearly revealed during the initial days of October war ... any one reading the Blunder (Hamechdal) comes out with a deep impression

> that the enemy's society lived with
> a nightmare of extermination, at
> least through the first three days
> of the war."[68]

He concluded that 'this fear of conventional extermination gives the Israelis the incentives and needed justification for making decision in the nuclear field'. This view also is echoed by another Arab commentator who asserts that 'If Israel is forced to accept the just peace which the Arabs seek actively, then nothing will compensate her for her strategic withdrawal and for her historical fears and psychological worries except for the atomic bomb'.[69] The Israeli fears based on reality or imagination as a motivation for going nuclear can be explained by the argument that there is a tendency in developing countries to see dangers and enemies in exaggerated forms as a result of domestic political needs and historic perception.[70]

On the other hand, there were several arguments and reports about the Israeli decision to fabricate nuclear weapons. The first step in this direction is argued to have taken place in October 1957 in the face of Superpowers pressure on Israel to withdraw from Sinai following the

(68) Al-Ayubi, Haitam., 'The Truth About the Nuclear Challenge Between Egypt and Israel' Al-Usbu Al-Arabi, 1 and 8 July 1974.

(69) Al-Nasir, M.J., 'The Arab Nuclear Programme .... When and Where?' Al-Anwar, 26 June 1974.

(70) Gianfranco, Poggi., The Development of the Modern State (Stanford: Stanford University Press, 1978) pp.5-9.

campaign of 1956.[71] The second decision is believed to have been made between 1963 and 1964 as a result of a division between the Pro-French nuclear supporters and the Pro-American anti-nuclear advocates.[72] The first camp was represented by Ben Gurion, Dayan and Peres, while the second represented by Eshkol, Golda Meir, Allon and Rabin. The decision taken by the anti nuclear faction headed by Eshkol, Israeli Prime Minister, was to revert to a nuclear option rather than going for a full military programme.[73] This led later on to the resignation of the Chairman of Israeli Atomic Commission, Professor Bergman, believed to be a strong supporter of a nuclear military programme in 1966. The third decision is believed to come between 1966 and 1971. Fuad Jabbar claims that at the end of the Six Days War Israel reached the conclusion that it would need nuclear weapons in order to retain control over the occupied territories. His proof was that Dayan joined the Israeli Cabinet.[74] Peter Pry agrees and concluded that 'the Israelis apparently decided to actually construct atomic weapons after 1967 Six Days War, with deployment probably occurring between 1969 and 1973. They may have contemplated using the

(71) Douty, Ilan., Israel Nuclear Policy, State, Government and International Relations, No. 7, 1975, pp.21-22. This decision led to the establishment of Dimona Reactor.

(72) Ibid; Aronson, Conflict and Bargaining in the Middle East, op. cit., pp.44-45; Evron, 'Israel and the Atoms: The Uses and Misuses of Ambiguity' op. cit., p.133.

(73) Haselkorn, 'From an Option to a Bomb in the Basement' op. cit., p.42; Douty, Israel Nuclear Policy, op. cit., p.25.

(74) Ibid.; Jabber, Israel and Nuclear Weapons, op. cit., p.50.

bomb in 1973 October War'.[75] In mid 1970 reports from the USA referred to the fact that 'US policy in the Middle East is based on the assumption that Israel has in its possession a nuclear bomb, or the necessary components that would enable the speedy assembly of one'.[76] Others claim that the decision was taken in 1970, not as a result of an Arab threat, but rather of a Soviet threat,[77] especially with the expanding nature of the war of attrition. However, the advocates of the widely discussed thesis of 'a bomb in the basement' believe the decision was taken to adopt this option in 1968 or 1970.[78] They believe this option has the obvious advantage of enabling Israel to possess nuclear weapons and to employ a nuclear threat, without paying the political price of a declared policy, for example, put pressure on other side to go nuclear.

To sum up, the Israeli nuclear weapons proliferation case is a clear example of a technical ability meeting strong motivation. Israel has undoubted nuclear technological skills accumulated over forty years. It began with a 5 MW research reactor supplied by the USA which went critical in 1960, and a 26 MW natural uranium reactor provided by France, which went critical in 1964. the French

(75) Pry, Israel's Nuclear Arsenal, op. cit., p.109.

(76) Pragner, Robert J., and D.R. Tahtinen, Nuclear Threat in the Middle East, (Washington D.C.: American Institute, 1975) p.13.

(77) Bowyer Bell, J. 'Israel's Nuclear Option' The Middle East Journal, Autumn 1972, p.386.

(78) Aronson, Conflict and Bargaining in the Middle East, op. cit., p.118.

reactor has the potential to produce enough plutonium each year for fabrication of an atomic bomb. Several reports indicated that Israel has, at least, one small scale reprocessing and enrichment unit. Between 1955 and 1976 more than 250 Israeli scientists were trained at the US Atomic Energy Commission nuclear laboratories. Thus Israel came to possess a substantial cadre of trained nuclear scientists.

Moreover, Israel has strong motivations to go nuclear caused by fear of a conventional military threat and extermination posed by the Arab states and also because of being a pariah state. The motivation to go nuclear seemed to have existed long before the indigenous technical abilities did exist as expressed by Ben Gurion since the late 1940s and early 1950s. It is most likely that the decision to acquire nuclear capacity was a direct result of a proliferation decision to do so. It is argued that the continuously strong nuclear motivation provided the impetus for Israeli leaders to fund the purposeful development of a nuclear capacity.[79] So a strong motivation to go nuclear persisting over long time and a proliferation decision taken from the beginning led to the pursuit of the development of operational nuclear capabilities.

Arab States' Nuclear Motives

The Arab states' fear of, and response to, Israel's nuclear posture was clearly evident in their beliefs about

(79) Perlmutter, 'The Israeli Raid on Iraq' op. cit., pp.34-43.

Israel's nuclear weapons capability and actions to develop nuclear capabilities. The fear of the assumed Israeli nuclear posture led to the first attempts by President Nasser of Egypt to launch a preventive war against Israel's atomic installations in the mid 1960's.[80] He expressed his fear to the extent of signing a non-proliferation treaty and accepting safeguards.[81] Revelations of Israel's secret nuclear efforts, in the early 1960s, led to the convening of the Council of the Arab League in early 1961 to prepare plans for waging war against the Israeli atomic installations.[82] Nasser had another motivation for launching an atomic and rocket programme 'for self reliance in arms and defence policies' in order to deal with 'Imperialism'.[83] However, until the mid 1960s, Egypt was not sure of Israel had nuclear weapons.

On the other hand, following the Arab-Israeli Six Days War of 1967, the Egyptians began to believe that Israel had nuclear weapons. Egypt's envoy to the UN said that he was 'sure that Israel is developing nuclear weapons'.[84] Nasser continued threatening to go nuclear if Israel produced nuclear weapons and referred to the fact that Egypt had

<80> 'Nasser Would Fight to Prevent Israel Making Atomic Bomb' Jewish Post Weekly, 25 Feb 1966; Evron, 'The Arab Position in the Nuclear Field', op. cit., Pp.20-31.

<81> 'Nasser is Afraid of Israel's Atom Potential' Jewish Post Weekly, 13 May 1966; 'Egypt Fears Israel Nuclear Potential' OFNS, No 23509, 6 Feb 1967.

<82> Bar-Joseph, The Hidden Debate, op. cit., p.206.

<83> 'Nasser Insists U.A.R. Take Part in Rocket Race' International Herald Tribune, 25 Dec 1964.

<84> 'Arab Capitals A-Jitters' Christian Science Monitor, 10 Oct. 1968.

signed the NPT while Israel had not.[85] There were reports that Nasser tried to obtain a nuclear bomb or guarantee from the Soviet Union and China.[86] Haikel argued in 1973 that Israel had probably atomic weapons hidden away and the Arab countries must, therefore, have their own deterrent, eventually, as the only guarantee of security and peace.[87] He explained that the Arab countries could obtain an atomic bomb from the Soviet Union, or China or they could develop it by themselves. President Sadat said Egyptian intelligence had 'confirmed to a certain extent the report that Israel has tactical nuclear weapons'.[88] He told an Iranian newspaper that he believed Israel had nuclear weapons and similar statement in an interview with an Arab magazine.[89] General Al Shazly, Egyptian Chief of Staff during 1973 War explained

> "Egypt has to believe that Israel has atomic weapons at hand because of the announcement by Israel's Head of State Katzir that it could convert its nuclear capabilities to

(85) 'Nasser Expects Atomic Protection' Jewish Observer and Middle East Review 16 May 1969, p.7.

(86) 'Nasser Thwarted Hopes' The Guardian, 8 May 1964; Salim, M.E. 'Egypt', in Katz and Marwah, Nuclear Power in Developing Countries, op. cit., pp 138-9; Haikel, M.H., The Cairo Document, (Garden City, New York: Doubleday, 1973) pp.304-305, 312-13.

(87) Haikel 'The Bomb', op. cit.

(88) MENA, 23 June 1974.

(89) New York Times, 15 Dec 1975; Al Usbu Al Arabi, 2 July 1976 (see Sadat's speeches and interviews, (Cairo: Information Dpt, 1975) Vol 5, pp.755, 170,27.

> weapons making in a few days. I do not think capabilities could be converted in a few days unless they have the atomic weapons at hand.'[90]

Ismail Fahmi, Foreign Minister of Egypt, made statements in 1975 that 'If Israel explodes an atomic device Egypt will obtain a similar weapon or manufacture it'.[91] President Sadat said once again in 1977 he had definite information that Israel had produced atomic bombs and pledged that if Israel possessed the bomb he would eliminate the State of Israel.[92]

The leader of the Palestine Liberation Organization, Yasser Arafat, stated his belief in a BBC-TV interview that Israel 'possessed between seven and ten atomic bombs.'[93] King Hussein of Jordan told a Kuwaiti newspaper that 'Israel has nuclear weapons and it had developed these weapons and continues to do so at the present'.[94] He made similar statement to Amman Radio.[95] The Saudi Minister of Foreign Affairs was reported to have told Le Monde that 'We have reasons to believe (that Israel) possesses an 'atomic

(90) United Press International (UPI) London, 3 Dec 1974.

(91) 'Middle East Planners Push for Nuclear Energy Development' MEED, 21 Nov 1975; pp.11-12.

(92) MENA, 6 July 1977.

(93) 'A-Bombs in Israel', Daily Telegraph, July 1977.

(94) Al-Qabas, 23 Jan 1977.

(95) Amman Domestic Service, 10 Jan 1975.

arsenal'.[96] The Commissioner General of the Arab League's Boycott of Israel Bureau estimated that Israel's two nuclear reactors had produced enough plutonium to make ten bombs in kiloton range.[97] In a document submitted to the 1977 Arab League Summit, Iraq stated 'although Israel did not declare officially that she possesses nuclear weapons, there is not a shadow of doubt that she has indeed acquired such arms'.[98] Meanwhile, there were a number of reports that Libya had made several attempts to obtain an atomic bomb from Pakistan, India and China.[99] There were reports that Sadat's partial agreements with Israel between 1973 and 1977 were partially motivated by fear of a nuclear arms race in the Middle East and, that his peace initiative of 1977 was also motivated by this fear, too.[100]

Israel's destruction of Iraq's nuclear reactor was a turning point in confirming the Arab States' fear of an Israeli nuclear threat and its determination to deny them developing nuclear capabilities which led to even more Arab determination to develop their nuclear industrial base. The President of Iraq, Saddam Hussein, called on peace-loving nations to help the Arabs get atomic weapons to counter

(96) Reuters (Paris), 20 Jan 1977.

(97) 'Israel Can Make 10 Atom Bombs' The Guardian, 14 Nov 1964.

(98) Al-Usbu Al-Arabi, 17 Oct 1977.

(99) Giradet, 'Is Qaddafi Financing Pakistan's Nuclear Bomb?' op. cit.; 'Libya's Nuclear Dreams', Foreign Report, 9 July 1981; Haikel, The Road to Ramadan, op. cit., pp.75-77; Foreign Report, 9 Aug 1978, pp.2-3; 'The Middle East's Nuclear Race' Foreign Report, 13 Aug 1980, pp.1-6.

(100) Ibid; Bar-Joseph, 'The Hidden Debate', op.cit., p.207; Perlmutter, Two Minutes Over Baghdad, op. cit., p.34; New York Times, 6 Nov and 20 Dec 1977.

Israeli nuclear power.[101] He contended that the Arab quest for an atomic bomb was 'rational ... a remedy to an existing situation in Israel' and 'what could happen to the Arabs and humanity if the Israelis were to impose conditions and the Arabs refused them and Israel used the atomic bomb against the Arabs because of this.' He went on to say '....even force Saudi Arabia to change the course of its highways, force the Arabs to drop the courses of sciences, physics, mathematics and astronomy from secondary schools and colleges text books because these are courses that give experience in a military domain' and 'the Israeli intervention would then reach the point where the Israelis replace Emirs and Kings and change Prime Ministers or even headmasters'. Qaddafi, the Libyan leader, argued that if Israel considered the presence of a nuclear reactor in the Arab homeland was in conflict with its security, then the existence of Israel is in conflict with the security of the Arab Nation.[102] He contended that the Arabs had no choice but to destroy the Israeli nuclear reactor 'which produced an atom bomb following the precedent set by the Israelis themselves. The destruction of the Israeli nuclear reactor, therefore, becomes a legitimate act'.[103] More recently, he addressed the late Indian Prime Minister, Mrs Indira Gandhi,

(101) Associated Press (AP) and United Press International (London) 23 June 1981.

(102) JANA News Bulletin, Vol I, No 80, 12 June 1981.

(103) JANA News Bulletin Vol IV, No 27, 9 April 1984.

in Tripoli saying that 'the Zionist camp has become more dangerous after the announcement by Israeli scientists that they have produced 200 nuclear warheads in the Dimona Nuclear Station in the Negev Desert. This is a highly dangerous new threat to the Arab existence.'[104] He told an Italian newspaper by the end of 1984 that the Arab nation would not accept the existence of a 'nuclear armed hostile camp' in her land.[105]

It is argued that Egypt opted for a non-nuclear policy since 'the atomic weapon factor will remain a source of mutual mistrust between Egypt and Israel which is the required trust for the success of any efforts towards arms control, generally, in the region'[106] In the light of the difficulties of acquiring nuclear weapons, at the present time, Egypt's threats to go nuclear were seen as a form of political pressure on Israel to reverse its efforts concerned with nuclear weapons, especially after the peace agreement between the two countries, a fear partly of a continued conflict with its inherent danger of escalation to a nuclear confrontation.[106] The Egyptian Defence Minster, General Abu Ghazala, said in an interview with a Kuwaiti newspaper that Egypt and the Arab States were not threatened as a result of Israel's possession of atomic weapons because it would not be able to use them owing to the inherent

(104) JANA News Bulletin, Vol IV, No 54, 14 Dec 1984.

(105) Ahmed, President Sadat and Disarmament Issues, op. cit., p.70.

(106) Ibid; Bar-Joseph, 'The Hidden Debate', op. cit., p.207; Egypt and the Treaty on the Non-Proliferation of Nuclear Weapons, op.cit., p.75.

dangers of destruction to Israel itself.[107]

President Sadat's policy was to prevent development of a situation where Israel would feel compelled to contemplate the use of nuclear weapons. This means that Egypt would not be threatened by Israeli nuclear weapons nor would it have to pay the political and economic cost of acquiring nuclear weapons. Kamal Hassan Ali, Egyptian Deputy Prime Minister, and Minister of Foreign Affairs, told the People's Assembly 'We feel that Israel has gradually become aware of the danger which might threaten it and the area as well, if a nuclear arms race were to begin between the nations of the region'.[108] In order for Egypt to develop its civilian nuclear industry to meet its growing electricity needs, it had to ratify the NPT and accept safeguards. There is an alternative view expressed by former Egyptian Foreign Minister, Ismail Fahmy, setting forth grounds for a nuclear policy to provide Egypt with a nuclear status which neutralizes the possibility of a nuclear threat from Israel and other states in the region.[109]

Furthermore, Iraq's nuclear quest was also motivated by a desire for regional status and prestige.[110] President Saddam Hussein of Iraq contended in 1976 that 'our long term plan is to establish an Islamic hegemony in the Middle East.

(107) BBC, SWB, 16 October 1981.

(108) Egypt and the Treaty on the Non-Proliferation of Nuclear Weapons, op. cit., p.75.

(109) Al-Sha'ab, 17 February 1981.

(110) 'The Secrets of Osirak', The Sunday Times, 14 June 1981.

We plan to establish a core of nuclear scientists and send them out to Arab countries who agree with our political philosophy'.[111] Qaddafi of Libya argued in 1975 that one of the goals of the 'Arab city of scientists' he was planning would be to turn Libya into a nuclear power.[112] So in the future the strength of the nations would not be measured in terms of the number of aircraft it possessed but in terms of the atom bombs it had, he asserted. Whatever possible motivations the Arab States may have to go nuclear, the overriding one has been and is most likely to remain the fear of war, compounded by a possible Israeli nuclear threat and lack of adequate security guarantees and assurances by the Great Powers.[113] A leading Arab strategist summarized the Arab states' motivation to go nuclear.

> "There is a final point in constructing the independence force: nuclear weapons .... Ownership of this weapon is not something to take pride in, but is rather a 'must' that was imposed upon the Arabs, ... particularly when all evidence indicates that

(111) Ibid.

(112) Al-Nahar, 13 January 1975.

(113) Waltz, K., Man, The State and War (New York; Columbia University Press, 1954) pp.159 - 60, 182, 184 - 85; Dahlitz, Nuclear Arms Control, op. cit., pp.38 - 39.

Israel has 10 nuclear weapons of
the 20 kiloton type".[114]

Future Nuclear Proliferation in the Middle East

From the previous analysis of the declared and actual policies of Israel and some Arab states, words and actions, one can draw four possible nuclear strategy options, concerned with Israel's decisions and Arab states beliefs and perceptions about Israel nuclear status, and actions. The typology of such options can be summarized as follows:[115]

NUCLEAR ACTIVITIES

Nuclear policies	Non-nuclear actual strategy	pro-nuclear actual strategy
non-nuclear declared strategy	1	3
pro-nuclear declared strategy	2	4

Each one of the four possible nuclear strategy options has its appeals, benefits, costs, risks and implications. The first option (1) has its appeals for countries which want to avoid the risks and costs of a nuclear arms race and

(114) Al-Asaly, Bassam., 'Reviewing the Components of Arab Strategy' Al-Majalla Al-Askariyya, August/September 1975.

(115) Actual strategy means steps taken to acquire nuclear capabilities while Declared Strategy means declared policies about acquiring nuclear capability. See also Dror 'Small Powers Nuclear Policy', op. cit., pp.29-49; Bar-Joseph, 'The Hidden Debate' op. cit., p.120.

confrontation, but run the risks of not being able to counter and deter nuclear threats of a nuclear armed adversary. The second option (2) appeals to countries which want nuclear weapons but are unable to acquire them or do not want to pay the costs and run the risks of acquiring them and so depend on nuclear and security guarantees and arrangements. However, they run risks of the reliability of depending on nuclear and security guarantees and assurances of other great nuclear powers. The third option (3) appeals to countries which want to retain the option of acquiring nuclear weapons but without provoking adverse international responses and motivating rivals to acquire these weapons. The fourth option (4) appeals to countries which are determined to acquire nuclear weapons whatever the consequences of adverse international responses and want to encourage a 'balance of terror' and avoid the risks of being at the mercy of a nuclear armed adversary based on worst case assumptions.

The optimal nuclear strategy for Israel motivated by fear for survival and perhaps regional prestige would seem to be the third option; non declared nuclear strategy/pro nuclear actual strategy. This means that the optimal possible course of action for Israel is to acquire nuclear weapons, if it does not, already, have them, and to try to push its Arab rivals to the first two options by preventing them from obtaining nuclear weapons through diplomatic means, covert operations and direct actions or declarations that such Arab attempts would be regarded as a casus belli.

At the same time Israel would be able to avoid adverse international responses and to encourage some Arab states not to go nuclear. The analysis of Israel's declared nuclear policy and activities in the last thirty years suggests that Israel has indeed followed this nuclear strategy option.

For the Arab states motivated by fear of the Israeli nuclear threat and, perhaps, rivalry in the Arab world and their beliefs that Israel has already developed nuclear weapons or the ability to produce them in a short time and, in some cases for regional prestige, the optimal nuclear strategy is a non-nuclear declared/pro-nuclear actual strategy. This means that the optimal course of action for the Arab states is to adhere to a non-nuclear declared nuclear strategy in order to allow them to obtain the necessary nuclear technological and technical capabilities and skills to keep the nuclear option open to counter the Israeli nuclear threat. The analysis of the Arab states declared nuclear policies and activities suggests that these policies and activities have been changing from one period to another and from one country to another.

Egypt began with a pro-nuclear declared nuclear strategy/pro-nuclear actual nuclear strategy and ended up in the late 1970s by adopting what appears to be a non-nuclear declared nuclear strategy/non-nuclear actual strategy. Iraq began with a non-nuclear declared nuclear strategy/pro-nuclear actual strategy then switched to pro-nuclear declared nuclear strategy/ pro-nuclear actual strategy, especially after the Israeli raid on Iraq's nuclear research reactor in 1981. Libya began with pro-nuclear declared nuclear strategy/pro-nuclear actual strategy and more recently shifted to what appears to be a non-nuclear declared nuclear strategy/pro-nuclear actual nuclear strategy. Syria more likely opted to what it seems to be a pro-nuclear declared nuclear strategy/non-nuclear actual nuclear strategy.

Stephen Meyer attempted to forecast the likelihood of nuclear proliferation among several countries including Israel, Egypt, Iraq, Libya and Algeria based on what he described 'nuclear propensity indicator'.[116] He concluded that Israel, a country with very strong and constant propensity would by its proliferation have greater effects on regional incentives for further proliferation. As for the Arab states, Libya and Iraq have a very strong nuclear propensity while Egypt and Algeria have a moderate nuclear propensity but unlike Israel the time lag for these proponsities to materialize is long. Countries with a very strong nuclear propensity will continue to pursue a nuclear weapons capability no matter what technological barriers they encounter.

The nuclear propensities of Iraq and Libya seemed to be highly influenced by the Israeli nuclear threat while Egypt's propensity appeared to be highly volatile over the time. This evidence suggests that the motivation of Egypt, Iraq and Libya to go nuclear is closely related to the

(116) Meyer, Dynamics of Nuclear Proliferation, op. cit., pp.144-64.

Israeli nuclear threat and has remained of considerable magnitude over the last two decades.
It seems that the Arab states, during the first stage of their nuclear development, had made it clear that they wanted to acquire nuclear weapons to counter the assumed Israeli nuclear threat following the short route. However, since the mid 1970s an element of realism and pragmatism began to emerge in their declared nuclear policies and nuclear activities, perhaps, because they realized that this course of action would lead to achievement of the desired results. During the same period, Israel's declared nuclear policy and nuclear activities remained the same and consistent in obtaining a non declared nuclear weapons capability.

To sum up, it seems that in the foreseeable future Israel will attempt to prevent her Arab neighbours from acquiring nuclear weapons capabilities while improving her nuclear weapons potential and capacity and retaining non-nuclear declared nuclear policy.
Some of the Arab states, especially Libya and Iraq, will attempt to obtain a nuclear weapons potential following the route of non-nuclear declared nuclear policy/pro-nuclear actual nuclear strategy.

The analysis of the nuclear activities, motivations and intentions of Israel and some Arab states provides credence for the proposition that the Middle East is no longer on the threshold of nuclear transformation. It has, in fact, already begun moving towards nuclearization of the Arab-Israeli relations.

CHAPTER FIVE

NUCLEAR PROLIFERATION AND RISKS OF NUCLEAR WAR IN THE MIDDLE EAST

The Causes of Nuclear War

What are the causes of nuclear war? There are three schools of thought.[1] The first school sees the major cause of war as one-sided weakness which tempts an agressive adversary to take advantage of this opportunity. There are several historical cases of weakness which invited aggression such as the Munich Agreement of 1938. Therefore nuclear war can be avoided through the establishment of superior military strength and by showing resolve towrads defending commitments and interests. This school can be called the peace-through-strength school because of its tenets and its primary concern is superior military force. The second school argues that the basic cause of war lies in the acceleration of the arms race which beocmes war-like and eventually undermines deterrance and the balance of terror. The main focus of this argument is military preparedness as the spirit of the arms race prevents peace-making since threats meant to deter may lead to provocation. The remedy to this situation lies in communication, conciliation and accommodation, and in a crisis to reassurance and

(1) Allison, Graham T., Albert. Carnesale and Joseph S. Nye, Jr., 'Hawaks, Doves and Owls: A New Perspective on Avoiding Nuclear War', International Affirs, Vol 61, No 4, Autumn 1985, p.584; See Howard, M., 'The Causes of War: Historians and Problems of Power' Encounter, Jan 1982, pp.22-25; Thatcher, M., 'Man and His Weapons', The Times, 24 June 1982; Beaton, L., The Struggle for Peace (London: Allen and Unwin, 1966) Chap.IX; Williams, Crisi Management, op.cit., pp.94-95; Frei, Risks of Unintentional Nuclear War, op. cit., pp. 155-65; British Security, Al Chatham House Study Group Report, Royal Institute of International Affairs, 1946, p.11.

compromise. The peace-through-conciliation school argues that increasing military strength and threats may cause the breakdown of deterrance rather than strenthening it, as there is a limit at which military strength can be transformed into provocation. The country under threat of a superior military force may decide to go to war despite the consequences because it has no alternative; that is to say, to gamble on a preventive or surprise attack rather than to suffer defeat later. This possibility was demonstrated by the Israeli surprise attack during the Six Days War of 1967. Though the primary concern and the conclusion of the two schools are quite different, they are based on a common assumption that war might break out as a deliberate act by rational decision makers based on accurate information, calculation of costs, benefits and risks and control over activities of state bodies. One sees effective deterrence through strength and the other on improved relations between rational actors.

The third view focuses on very different concerns, mainly loss of control. It is based on non-rational elements as a major war might arise not from deliberate action but from organizational practices, human and machine errors, misperceptions and misunderstanding and mistakes. The third school argues that crises and conventional war could create the circumstances in which an unintentional war might take place. There are several dangers that might arise from these circumstances such as misperception of the real situation and intentions, human error due to stress, difficulty of controling large organizations, accidents, and events arising simultaneously. The classical example of loss of control due to difficulty of controlling large organization occured during the Cuban crisis when President Kennedy was unaware of what was going on, and eventually it was impossible for him to control in detail.

The peace-through-strength and conciliation schools, on one hand agree that nuclear war might occur as a result of a deliberate act (intentional) of rational decision maker either because of weakness or preparedness, and the arms race. Both give the example of the Second World War as the major historical case of the validity of the deterrent value of deliberate policy. On the other hand, the loss-of-control school argues that nuclear war might occur as a result of human and machine errors (unintentional). This school gives the example of the First World War as the main historical lesson of unintentional war caused by accident, misperception and escalation of events and actions. The peace-through-strength view argues that accidents are unlikely to lead directly to nuclear war while the loss-of-control argument points out that an accident in a crisis situation or conventional war might lead to nuclear war. It can be argued that peace through strength may lead to provocation and probably to war and that peace through conciliation may lead to false appeasement which might lead to war. Also, the loss of control view concern over unintended triggers of war in a crisis situation, unmanageable control could lead to outbreak of war.

But, real situations are unlikely to unfold in a similar way in the three different views. Even the examples of the First and Second World Wars were not purely accidental nor were they deliberate policy. In a real crisis situation both rational and unrational elements play a part; rational acts and accidents change over time in a crisis situation. A major war is less likely to begin purely by accident or purely by calculation than by an evolving combination of the two in a crisis.

Probability of Nuclear War

Since the potential cause of war remains, there also remains the theoritical possibility of war. There are two main opposing arguments about the likelihood and possibility of wars. The first contends that war has abolished itself in the sense of becoming highly unlikely. The second allows for some likelihood of it and points to several factors which may favour its outbreak. John Strachey argues that since there is not the remotest possibility today of any one winning a nuclear war, in this sense, war is unlikely.[2] But the risk of war while impossible to calculate, is not insignificant because the balance of terror is too fragile a basis for peace as one leading scholar points out

> "One must accept as not inconceivable...the risk of total war arising through escalation, by accident or miscalculation or

(2) Strachey, John., On Prevention of War (London: Macmillan,1962) p.10.

through unreasoning fear on one
side or another."[3]

The question of the possibility and likelihood of wars short of total has been answered almost with certainty through the occurance of many such wars, especially in Third world.[4] This possibility of localized war as a means of testing resolve and a trial of strength, irrespective of the horrific consequences of Third World War, can not be ruled out between the two superpowers.[5]

However, this possibility of the occurence of wars short of total war between nuclear weapons powers, or waged with their participation, was rejected on the basis that deterrence also discourrages small wars.[6] But so long as nuclear weapons exist there will always be some chance of their use, though the likelihood of such a chance is a matter of judgement. Twenty years ago C.P. Snow predicted nuclear war within a decade as a 'mathematical certainty'.[7]

(3) Slessor, John., 'Nuclear Power and Britain's Defence' Survival Nov/Dec 1962, pp.5-8.

(4) Strachey, On Prevention of War, op.cit., p.86.

(5) Slessor,John., 'The Chances of War' John Slessor, The Great Deterrent (London: Cassell, 1957) p.100; See Buchan, A., War in Modern Society (London: Watts, 1966) pp.65-6; Brown, N., The Future of Global Challange: A Perspective Study of World Security (London: Royal United Services Institute, 1977) p.5; Bull, H., 'Force in International Rellations: The Experiences of the 1970s and Prospects for the 1980s' in O'Neill, R. and Horner, D.M. (eds), New Directions in Strategic Thinking (London: Goerge Allen and Unwin, 1981) pp.17-33.

(6) Jervis, Robert., 'Deterrence Theory Revisited' World Politics, 3,2, 1979, p.11.

(7) Quoted in Schlessinger, 'Nuclear Spread: The Setting of the Problem', op. cit., p.10.

Kenneth Boulding argued that any thing which is possible, no matter how unlikely, will happen if we wait long enough. He attempted to calculate the probability of the outbreak of war based on a 2% chance of a nuclear war per year and reached the conclusion that within a thousand years the outbreak of nuclear war is a virtual certainty.[8] Nevertheless, whatever the chances and likelihood of the outbreak of nuclear war, the risks on different paths change over time. When the paths and routes to nuclear war occur in combinations rather than singly, one can see that the risks are higher than on single paths. The risks of nuclear war in a crisis situation (or conventional war) prone to accidents and mistakes and loss of control, are higher than in the case of a single accident. Irrespective of the degree of the likelihood of nuclear war, the horrific consequences of this war require careful consideration and analysis of all possible risks involved.

The Routes to Nuclear War

Several attempts have been made to construct and examine the different paths and routes to nuclear war, plausible scenarios for nuclear war.[9] But one of the main reasons why it is difficult to examine nuclear war is the implausibility of ratinal decision makers choosing a course of action with such unprecedented consequences. Unfortunately, implausibility and likelihood do not amount to impossibility. There is always the chance of the

(8) Boulding, Conflict and Defence, op. cit.

(9) Kahn, H., Thinking About the Unthinkable (New York: Horizon Press, 1962) pp.145-50.

outbreak of war so long as nuclear weapons exist.

There are five hypothetical paths leading to nuclear war commonly mentioned. The first is surprise attack to disarm the nuclear forces of an adversary, especially with the adoption of a counterforce strategy, or when a state is seen to be on the eve of becoming a nuclear weapons power. As a state develops a nuclear weapons capability, there will be a temptation for its potential enemies to attack it before its nuclear system is operational.[10] Intriligator and Brits argue that when there are very few nuclear weapons states, a further nuclear nation would tend to increase the probability of nuclear war: the new nuclear nation may be particularly inviting as a target in that it has a minimal stockpile with no retaliatory capabilities.[11] One of the existing nuclear weapons states might then be tempted to take out this minimal stockpile by a 'surgical strike'. The second case is pre-emption in a crisis situation: an attack launched in a crisis because one side believes, rightly or wrongly, that the other intends to strike soon, especially with the adoption of a 'first use' policy and lack of effective communication between adversaries. This, also, would be the case when regional rivals deveop nuclear weapons and because of the lack of effective invulnerable

<10> Towle, P.A., 'Letter to the Editor' Survival, Vol 22, No 5, 1980 p.219.

<11> Intriligator, Michael D. and Dagobert L. Brits, 'Nuclear Proliferatin and the Probability of Nuclear War' Public Choice, Vol 37, 1981, p.256; See Intriligator and Brits 'Nuclear Proliferation and Stability' Journal of Peace Reserach, Vol 3, 1979, p. 176; Betts, Richard K., 'Nuclear Surprise Attack: Deterrence, Defence and Contradications in American Policy' Jerusalem Journal of Internaitonal Relations, Vol 5, No 3, 1981 pp.1-8, and his 'Nuclear Proliferaitorn After Osirak' Arms Control Today, Vol 11, No 7, 1981, p.2.

delivery systems, there will be a temptation to strike first.[12] The third case is accidental or unauthorized use resulting from human and machine errors.[13] The fourth case is catalytic war triggered deliberately or inadvertently by actions of a third party, including the use of nuclear weapons by a nuclear weapons state or terrorist group.[14] The fifth case is escalation from conventional to nuclear war if the losing side possesses nuclear arms or is allied with a nuclear power. It is doubtful whether once nuclear weapons are used, the war would remain limited. As long as the losing side possessed still more nuclear weapons, it would be tempted to use them.[15] There are several factors which tend to escalate wars, irrespective of the wishes of the political leadership, such as vulnerability of central command to attack, poor communication and inadequate information. The fire link between offensive and defensive military actions and the fact that tactical and strategic nuclear and conventional forces and facilities are now closely integrated that it is difficult to disentangle them is a significant escalatory factor. Two historical examples demonstrate the escalation process which could lead to a nuclear war between the two Superpowers, the Cuban crisis of

(12) Beres, Apocalypse, op. cit., p.81f; Deutsch, Morton.,'The Prevention of Word War II: A psychological Perspective' Political Psychology, Vol 4, No 1,1983, p.20.

(13) Frei, Risks of Unintentional Nuclear War, op. cit., pp.155-65.

(14) Beres, Apocalypse, op. cit., p.87; Waltz, 'The Spread of Nuclear Weapons: More May be Better', op. cit., p.13; Rosenbaum, D., 'Nuclear Terror' International Security, 1,3, Winter 1977, pp.140-161.

(15) Schell, Jonathan., The Fate of the Earth (New York: Alfred A. Knopt, 1982) p.191.

1962 and the Arab-Israeli 1973 war.[16]

Nuclear weapons proliferation is often cited as one route to the outbreak of a nuclear war in a sense that the prospects arise from a local war could lead to global nuclear war.[17] Though most of the experts would agree that the most plausible route to a nuclear war would be escalation from crisis, it would involve several paths such as the path of escalation from conventional war in Europe to a major nuclear war or from a local conventional war in the Middle East to a nuclear confrontation between the two Superpowers.[18] Paul Jabber believes the development of a nuclear Middle East to be probable by 1990. The development of nuclear weapons by Israel and some Arab states could increase the probability of a nuclear war, especially by involving the two Superpowers into local conflict thereby increasing the risks of escalation to a major nuclear war.[19] So a nuclear war in a nuclear Middle East could result through escalation from a conventional war which might involve the two Superpowers.

(16) Steinbruner, J., 'An Assessment of Nuclear Crises' in F. Griffiths and J.C. Polany (eds), The Dangers of Nuclear War, (Toronto: University of Toronto, 1979) pp.34-49; Blechman, B.M. and D.M. Hart, 'The Potential Utility of Nuclear Weapons: The 1973 Middle East Crisis', International Security, 7, 1,1982, pp.132-56; Ground Zero, Nuclear War: What's in it for You (New York: Pocket Books 1982) Which envisage outbreak of nuclear based on internal crisis in Iran and both Superpowers came to defend it.

(17) Calder, Nigel., Nuclear Nightmares: An Investigation Into Possible Wars (Harmmondworth: Penguin 1981) PP 19-20.

(18) Barnaby, Frank C., Prospects for Peace (Oxford: Pergamonl, 1980) PP 3-4.

(19) Jabber, A Nuclear Middle East, op. cit., PP 92-93.

The Risks of Nuclear War

Risks of nuclear war are basically of two types, intentional and unintentional war resulting from a deliberate act or human errors. Right from the very beginning of the nuclear arms race, considerable attention has been devoted to the problems of nuclear weapons accidents and incidents. Such incidents might start a nuclear war or at least cause great damage at the location of accidental detonation and also over a wide area due to nuclear fall out.[20] In 1962, Hermann Kahn noted a widespread concern that 'an electric circuit might short cut, a relay stick, a switch failure or that a button might be pressed accidentally, a message misunderstood, an aurora breaks, or flock of geese be mistaken for an attack and so on'.[21] Though he concluded that the probability of inadvertent war was low, he pointed out this danger may grow as a result of proliferation of independent nuclear capabilities and the growing number of buttons that can be pressed by mistake. Dumas defines accidental war as an 'exchange of weapons of mass destruction not initiated by the purposeful calculation of the governmental decision makers in authority'.[22] He argues that two conditions are necessary for this exchange to happen: the triggering event because of faulty

(20) Leitenberg, Milton., 'Accidents of Nuclear Weapons and Nuclear Weapons Delivery Systems' in SIPRI Yearbook of World Armament and Disarmament, 1968/1969 (Stockholm: Almqust and Wiksell, 1970) pp.259-70.

(21) Kahn, Thinking About the Unthinkable, op. cit., p.40; His, On Thermonuclear War (Princeton, N.J.: Princeton University Press, 1961) p.467.

(22) Dumas, Lloyd J., 'Systems Reliability and National Insecurity' Peace Research Reviews, Vol 7, No 3, 1977, pp.70 & 73.

communication, false alarm and accident involving nuclear weapons, and the situation in which it can have a catalytic effect during a high tension when quick response is required. Schelling and Halperin argue that war could result from failure to foresee consequences of military action or accumulation of irresponsible threats in heat of crisis or from belief that war has started.[23] More recently, Fred Ikle wrote

> "The more we rely on launch on warnings (or, for that matter, the more the Soviets do) the greater the risks of accidental nuclear war ....The crux of the matter is that the more important it becomes to launch on warning, the more dangerous it will be. The tightening noose around our neck is the requirement for speed. The more certain one wants to be that our missile forces (or Soviet missile forces) could be launched within minutes and under all circumstances, the more one has to practice the system and to loosen the safeguards."[24]

(23) Schelling, T. and Halperin, M., 'Pre-emptive, Premaedicated and Accidental War' in Dean G. Prutt and Richard C. Snyder (eds), Theory and Research on the Causes of War (Eglewood, Cliff, NJ.: Prentice-Hall, 1969) pp.46 & 47.

(24) Fred C. Ikle, 'The Growing Risk of War by Accident' Washington Post, June 1980.

Over an 18 months period from Jan 1979 to 30 June 1980, it was reported that no less than 3804 false alarms indicating a potential nuclear attack on the USA were generated by the NORAD computerized warning system.[25]

There are two potential causes of nuclear accident, technical and human factors. The technical factor arises obviously from the fact that 'no mechanical system, however carefully constructed and monitored, can be presumed to be infallible'.[26] The main sources of accidents are many including aircraft crashes, bombs dropped accidentally, submarine lost, accidental launch of ballistic missiles and so on. However, whatever the probability of accidents happening, in a serious crisis, not only will accidents be more likely to cause dramatic effects, but the likelihood of accidents may increase because of transportation of weapons, loading of missiles, and possibly emphasis may be placed on quick response.[27]

Human beings are even more fallible than technical systems. Human accidents can be caused by unauthorized action, human error or sheer madness. However, the ultimate significance of a nuclear accident caused by human error is the same as

(25) New York Times, 29 October 1980; See Leitenberg, 'Accidents of Nuclear Weapons Systems' in SIPRI Yearbook 1977, op. cit., pp.52-82; Newsweek, 8 Mar 1982, p.4; Britten, S., The Invisible Event (London: Menard Press, 1983) pp.41 & 49; Calder, Nuclear Nightmare, op. cit., p.96; 'The H-Bomb That Fell on America' London Standard, 28 Aug 1986; New Scientist, 5 June 1986; p.21.

(26) Beres, Apocalypse, op. cit., p.35.

(27) Niezling, Johan., 'Broken Arrows and Bent Spares: Towards a Social Theory of Nuclear Weapons Accidents' Bulletin of Peace Proposals, Vol II, No 1,1980, pp.71-8.

in accidents caused by technical problems. There are opportunities available for nuclear accidents to happen; nuclear submarine missile might be launched by the crew independently of orders and reliance on the military in the use of nuclear weapons also entails risks.[28] These risks of unauthorized use of nuclear weapons are believed to increase with the spread of nuclear weapons to a large number of countries.[29] In conclusion, though experts may agree that the triggering off of nuclear war by technical failure or any other type of break down of safety rules is highly improbable, the real dangers inherent in this problem cannot be underestimated. Moreover, the increasing number of warheads, weapons and nuclear weapons states cannot but increase the probability of accidents and incidents, even if the original risk of such occurance is low.

There is also the risk of catalytic nuclear war in a sense that a local nuclear accident or war might ignite a major nuclear war by getting major powers involved or a deliberate plot by third party to precipitate war between major powers.[30] According to Calder, if Brazil and Argentina, for example, were to fight a nuclear war 'the Soviet and American leaders might quickly agree to let the fire burn itself out'.[31] In a region where the Superpowers

(28) Steinbruner 'An Assessment of Nuclear Crises' op. cit., pp.38-39.

(29) Calder, Nuclear Nightmares, op. cit., pp.76-77.

(30) Schelling and Halperin, 'Pre-emptive, Premediated and Accidental War', op. cit., p.46.

(31) Calder, Nuclear Nightmare, op. cit., p.79

have commitments, interests and deployment of military units and facilities, such as the Middle East, a local nuclear war might easily lead to nuclear confrontation between the two Superpowers. It is important to distinguish between regions where it is possible for the Superpowers to get involved and this transformation of a local war to global confrontation is not necessarily automatic or inevitable.[32] It is argued that in a multinuclear world, nuclear strikes could be executed without clear identification, at least in the initial stage, of the source of the attack.[33] Then the response of the attacked nation may be directed against the using power based on erroneous perceptions about the attacker. In this case the response of the victim state may trigger a global nuclear war. The Israeli attack on US ship Liberty during the Six Days War of 1967 is cited as an example of the confusion created at the early hours of the attack. Hermann found in a simulated analysis of such an unidentified attack that the confusion of who is the attacker increased the likelihood of a delayed response[34] which is encouraging. Furthermore, there is the possibility of fanatical non-governmental groups gaining access to nuclear weapons by theft, hijacking and seizing of

(32) Frei, Risks of Unintentional War, op. cit., p.170.

(33) Beres, Apocalypse, op. cit., p.87.

(34) Hermann, Charles F., Margarett G. Hermann and Robert. Cantor, 'Counter Attacks or Delay: Characteristic Influencing Decision Makers, Response to the Simulation of Unidentified Attack' <u>Journal of Conflict Resolution</u>, Vol 18, No 2, 1974, pp.87-8.

installations of means of transport.[35] It is argued that such opportunities for such acts increase with nuclear proliferation as new nuclear weapons states may even be more vulnerable to nuclear terrorism than the traditional nuclear weapons powers.[36] Others envisage the possibility that nuclear weapons might be misused by sub-groups within the armed forces and that one side may fire a nuclear warhead at its opponents in a civil war.[37] However, in such cases, the risk would produce a national or local tragedy if not a global nuclear war. But the worst case is when a terrorist group holding possession of a nuclear weapon fires an anonymous attack against a nuclear regional power which may lead to retaliation based on false assumption about the identity of the attacker.[38] Also, this would amount to a regional tragedy if not to a global nuclear war. However, whatever the likelihood of this risk, the danger inherent in nuclear terrorism cannot be ruled out or neglected.

There is also the risk of escalation of a regional conventional war during a crisis and international tension

(35) Schelling, 'Who Will Have the Bomb?' op. cit., pp.84 - 6; Epstein, The Last Chance, op. cit., Chap 19; Leitenberg, 'Background Materials in Tactical Weapons', in SIPRI, Tactical Nuclear Weapons, (London: Taylor and Francis, 1978) pp.40-49; Rosenbaum, 'Nuclear Terror', op. cit., pp.140-61; MITRE, The Threat to Licensed Nuclear Facilities, op. cit.

(36) Intrigator and Brits, 'Nuclear Proliferation and Probability of Nuclear War' op. cit., pp.247-60; Epstein, W., 'Nuclear Terrorism and Nuclear War' in Griffiths and Polany, The Dangers of Nuclear War, op. cit., pp.112 and 114.

(37) Calder, Nuclear Nightmare, op. cit., p.76; Waltz, 'The Spread of Nuclear Weapons: More May Be Better' op. cit., p.11.

(38) Dror, Crazy States, op. cit.; Rosenbaum, 'Nuclear Terror' op. cit., p.151.

that may lead to a major nuclear war between the Superpowers. Every war or period of international tension involving the nuclear weapons powers or their allies and client states threatens to escalate to nuclear war. Though the two Superpowers have been anxious to avoid direct military confrontation, there have been a number of occasions on which they have been prepared to risk global nuclear war in pursuit of shorter term interests.[39] The obvious example is the Cuban crisis of 1962 and the Arab-Israeli 1973 War. When the two Superpowers get sucked into a war in the Third World fought between their respective allies or clients the situation becomes highly dangerous. As the situation becomes serious, each of the Superpowers is increasingly faced with the alternatives of either to back off and erode its international credibility or to back its allies to the limit. However, as soon as neither of them feel able to backdown, then they will be forced to try and manage the crisis to advantage.

There has been a global shift in the functions of military force from direct and open confrontation to indirect and covert issues and crises (of Berlin crisis of 1961 and Cuban Crisis of 1962) and to crisis management. This focus of attention was reinforced by the War of 1973. A crisis can be caused by an action of one of the two Superpowers against the interests of the other or a chain of

(39) Report of the Independent Commission on Disarmament and Security Issue, Common Security: A Programme for Disarmament, (London: Pan Books, 1982), p.46. USA considered formally use of Nuclear Weapons 30 times since 1945, see Ball, D. 'US Strategic Forces: How Would They Be Used' International Security, Vol 7, No 3, 1982/83, p.41.

events started by an action of third parties. However, the principal danger involved in crisis management is that it may fail to prevent nuclear war for several reasons such as both sides deliberately take excessive risks, miscalculation, uncertainty, and limited freedom of action.[40] Decision making during a crisis and international tension creates risks, dangers and uncertainty that are neither deliberately created nor extremely controlled by the adversaries called 'autonomous risks'.[41] A crisis situation can get out of hand and lead to a nuclear war despite serious efforts by the parties involved in a conflict to avoid such an outcome. Basically, there are two inherent dangers in crisis management out of control of the two Superpowers: loss of control of events and actions of allies and client states. These risks involved in escalation of conventional war and events, during a crisis situation and international situation, to nuclear war lead to the question of the prospects for keeping the nuclear war limited. Clearly, if the nuclear war started because one of the two Superpowers (either rightly or wrongly) believed that the other had launched or was about launch a massive nuclear attack against it, then the chances of limited war are slim. In this case escalatory control and crisis management is out of the question as the nuclear war could be global and

(40) Williams, Crisis Management, op. cit., p.17.

(41) Snyder, Glenn., 'Crisis Bargaining' in Hermann, Charles. (ed), International Crises: Insights from Behavioral Research) (New York: Free Press, 1972) pp.241-2.

unlimited from the very beginning. In nuclear wars which are initially confined to some geographically limited area such as Europe or the Middle East, the prospects for keeping the war limited through escalatory control and crisis management are available, especially in areas where the Superpowers have no vital interests.[42]

Attempts to Reduce Risks of Nuclear War

Several attempts have been made by the nuclear weapons powers to reduce the risks of nuclear war since the Cuban crisis of 1962 which demonstrated the need for quick and reliable communications between heads of governments to reduce the danger that war might break out due to technical failure, misunderstanding or miscalculation. This led to the conclusion of the Hot Line Agreement in 1963 which proved to be a useful measure during military crises such as the Six Days and 1973 Wars between Israel and the Arab States. Similar accords were signed between the Soviet Union and France and Britain in 1966 and 1967 respectively. This was followed by the 1971 Agreement between the USA and the Soviet Union to reduce the risk of the outbreak of nuclear war. The two parties recognized the need 'to exert every effort to avert the risk of outbreak of such a war, including measures to guard against accidental or

(42) On Limiting Atomic War, Chatham House Study Group (London: Royal Institute of International Affairs, 1956) pp.34 & 39; Ball, Desmond., 'Can Nuclear War Be Limited' Adelphi Paper No 169 (London, International Institute for Strategic Studies, 1981) pp.3-53.

unauthorized use of nuclear weapons'.[43] Some believe these agreements contributed to reducing the risk of war by accident, miscalculation or escalation through divided attention because of the awareness of the problem and commitments to make efforts to cope with it.[44] Moreover, in 1972 the two Superpowers concluded an agreement on the Basic Principles of Relations between the two Superpowers stating that in the nuclear age there is no alternative to peaceful coexistence. The two parties promised to exercise restraint in their mutual relations, to prevent situations capable of causing dangerous escalation of their relations to avoid military confrontation, and not to take advantage of each other's differences, and to prevent the outbreak of war.

However, the most significant agreement to reduce the risks of nuclear war was the 1973 Agreement between the USA and the Soviet Union on the Prevention of Nuclear War. The two Parties pledged themselves to remove the danger of nuclear war and use of nuclear weapons by acting in such a manner as to prevent the development of situations capable of causing dangerous exacerbation of their relations to avoid military confrontation and to preclude the outbreak of war. If a situation concerning one of the two parties entails the risk of nuclear conflict, the parties will

(43) Treaties Series; Treaties and International Agreements Registered or Filed with the Secretariat of the United Nations (New York; UN) Vol 807, pp57-66.

(44) Gartholl, Raymond L., 'Salt 1: An Evaluation' World Politics, Vol 31, No 1, 1978, p.19. Britain and France signed similar agreements with the Soviet Union in 1976 and 1977 respectively.

engage in urgent consultations and every effort shall be made to avert the risk. This agreement is of significant importance because of its multilateral implications as it aims at preventing nuclear war not only between the two Superpowers but also with other countries, and at non-use of nuclear forces against allies and other countries. The agreement marked a significant step towards lessening and ultimately removing the threat of nuclear war and towards the creation of real guarantees of international security.[45] Alexander George rates the Basic principles Agreement and the Prevention of Nuclear War Agreement as important first steps in the direction of preventing dangerous crises.[46] However, the Prevention of Nuclear War Agreement is questionable in practical terms since it contains a clause which reserves the right of self-defence and use of force in circumstances which endanger international peace and security and embodies no specific terms on how to deal with a crisis when the parties have to contact each other or cooperate. The agreements on crisis prevention were put to a test during the 1973 Arab-Israeli War. The outcome of their conduct in this crisis did not lead to further agreement on crisis prevention nor have the lesson of

(45) Bykov, Oleg., 'The Control of Crisis Situations in Contemporary World Politics' in Frei, Daniel. (ed), International Crises and Crisis Management: An East-West Symposium (Farnborough: Saxon House, 1978) p.63.

(46) George, A., Discussion Paper: Towards a Crisis Prevention Regime in US-USSR Relations, Paper Presented for Pugwash Workshop on Crisis Management and Prevention, Geneva, Dec 13-15 1978.

failure been adequately taken care of.[47] Calder argues that the agreements were not successful in the 1973 crisis as the support of client states in the Middle East was judged to be of superior importance, though crisis management helped to restrain the actions of the Superpowers after some critical periods.[48]

It seems that crisis management is much easier than making crisis prevention norms and procedures operational. The 1973 agreement was potentially significant on the sense that for the first time the two Superpowers, formally and in a bilateral document, expressed intentions not only to avoid accidental use of nuclear weapons but also to minimize the probability of nuclear war started by deliberate act. Neither of them has unconditionally renounced the first use of nuclear weapons.

Nuclear Proliferation and Risks of Nuclear War

It is often argued that minimization of the proliferation of nuclear weapons to non-nuclear weapons states over the long run is a necessary condition for stable international security and aversion of the risk of nuclear war.

> "States facing regional conflicts
> will look at rival defence and
> nuclear programs for signs that
> nuclear renunciation may no longer

(47) Ibid,

(48) Calder, Nuclear Nightmare, op. cit., p.42.

be tolerable. Insecure states will ask themselves whether they can continue to rely on their conventional military strenght, or on particular great power protectors.... States in relatively secure situations may assess the status they might gain from weapons .... Desperation and ambitions may move national leaders to threaten or exercise the nuclear option...., the root of concern over proliferation...[is] fear of enhanced international instability and of the risk of nuclear war .... In unstable countries, there is the added threat of seizure and possible use of nuclear weapons and materials by dissident or rival groups in time of military revolt or civil war"[49]

It is widely argued that as the number of countries with nuclear weapons increases, the probability of nuclear war also increases.[50] This argument is based on two

(49) Keeny, Nuclear Power Issues and Choices, op. cit., p.275.

(50) Barnaby, Prospects for Peace, p. 4.

assumptions: that the new nuclear powers may be ruled by radical or irrational leaders and that the major nuclear powers might be called on to act in such a situation.

The fear of radical and irrational leaders in a proliferated world is based on questioning their ability to cope in a crisis situation and also on the skill and quality of leadership of the major nuclear powers. Schultze emphasized that these considerations do not imply an a priori case against all new nuclear powers assuming that only the existing nuclear powers which have learned to 'live with the bomb' can be expected to act in a rational manner.[51] The important point is that in a proliferated world there will be greater apocalyptic potential for irrational leaders and countries with unstable governments. A Soviet author noted that 'that fascist elements, rising to power in a nuclear state could threaten.the world with nuclear war.'[52] There is the problem caused by lack of experience in 'living with the bomb'. In such a situation one would expect that, as a consequence of deep hostilities between new nuclear weapons states, these governments would probably be more ready to use nuclear weapons and to use them indiscriminately against civilian populations.[53] Bearing in mind the difficulty of foreseeing what any one of

(51) Schultze, Walter., 'A World of Many Nuclear Powers' in Griffits and Polany, the Dangers of Nucear War, op. cit., p. 91.

(52) Yefremor, A.Y., Nuclear Disarmament (Moscow: Progress Publishers, 1979) p.112.

(53) Wohlstetter, Swords from Plowshares, op. cit., p.131.

these states may do (or not do) in an altered international environment or as the consequence of an internal change of government, prediction about the consequences of apocalyptic devastation, such as nuclear proliferation might produce, can only qualify as dealing with hard uncertainties. Nevertheless several predictions of this kind are confidently being made.[54]
To sum up, there are two main hypotheses about destablizing effects of nuclear weapons proliferation. The first hypothesis is that proliferation increases the chances of accidental nuclear war.[55] The second hypothesis is that increased proliferation will require the Superpowers to intervene more often in local conflict and possibly lead them into a nuclear war against their will. President Kennedy pointed out that spread of nuclear weapons would be 'an increased necessity for the great powers to involve themselves in otherwise local conflicts'.[56]

Some analysts argue that in certain strategic situations, the acquisition of nuclear weapons by one or more adversary states might actually contribute to a relationship of mutual deterrence, much as the development of invulnerable second strike nuclear weapons capabilities

(54) Gompert, et al, Nuclear Weapons and World Politics, op. cit., pp.301 - 331.

(55) Aron, The Great Debate, op cit., p.237 - 38; Williams, The US, India and The Bomb, op. cit., p.7; Gleb, L., 'The Atom is a constant in US Foreign Policy' New York Times, 14 March 1976.

(56) Quoted in Rosecrance, The Dispersion of Nuclear Weapons, op. cit., p.310; See Long, Clarence, D., 'Nuclear Proliferation: Can Congress Act in Time?' International Security, 1, Spring 1977, p.52; Buchan, A World of Nuclear Powers, op. cit., p.3; Bader, The United States and the Spread of Nuclear Weapons, op. cit., p.12

have arguably stabilized relations between the Superpowers.[57] These analysts concluded that in these circumstances nuclear proliferation is either positively beneficial for, or at least, not determintal to, the stability of the international system. This stabilizing effect of nuclear proliferation is based on the assumption that the absence of a single nuclear engagement between the Soviet and American forces for a period of over forty years best demonstrates the stabilizing effects of the nuclear calculation. The Soviets cautioned against firing a single shot across the Berlin dividing border line. This is because there is an ever present chance that any limited conventional operation would escalate eventually leading to global nuclear confrontation.[58]

There are some risks of inevitable unintended escalation. Waltz argues that in a country where political control is difficult to maintain, governments are least likely to initiate nuclear weapons programme and that countries governed by seemingly 'irrational' leaders, are nevertheless, unlikely to use nuclear weapons irrationally.[59] He noted that 'those who dread a world with more nuclear states do little more than assert that more is

(57) Ra'anan, V., 'Some Political Perspectives', op. cit.; p.20; Rosen, 'Nuclearization and Stability in the Middle East', op. cit., p.157; Sandoval, 'Consider the Procupine', op. cit., pp.17-19; Waltz 'The Spread of Nuclear Weapons: More May Be Better', op. cit., p.30; Feldman, ' A Nuclear Middle East' op. cit., pp.107-115; His, Israeli Nuclear Deterrence, op. cit., pp.106, 242.

(58) Jervis, 'Deterrence Theory Revisited' op. cit., p.11.

(59) Waltz, 'The Spread of Nuclear Weapons: More May Be Better', op. cit., pp.10 & 11.

worse without substantiation that new nuclear states will be less responsible and less capable of self control than the old ones have been. They expressed fears that many felt when they imagined how a nuclear China would behave'.[60] It seems that the fears expressed about the destablizing effects of nuclear proliferation focus on 'rationality' of leaders of new nuclear weapons states and their control over weapons as well as involving the two Superpowers based on worse case analysis.

However, there are several possible risks inherent in a future proliferation of nuclear weapons. These inherent risks are concerned with accidental nuclear war due to human and machine mal-function, involvement of the Superpowers in local conflicts with the risk of escalation to global confrontation and possible irrational behaviour of the leaders of the new nuclear states. Daniel Frei argues that the probability of accidental or unintentional war seems to increase with the number of countries acquiring nuclear weapons but this does not necessarily imply that such accidents will trigger a global nuclear war. But the complicated effects of nuclear proliferation involve several political, economic and social elements. Beaton once summarized these complicating effects:

(60) Ibid., 30.

(61) Frei, Risks of Unintentional Nuclear War, op. cit.,pp. 169-70.

"This new complexity in the relations of powers is the most fundamental danger in a nuclear spread and so often appears to be the case with these weapons, the advantage will be with the incautious or apparently incautious. ...If means are not found to contain proliferation the whole structure of world security is going to become very difficult to sustain"[62]

But there can be no decisive answer to the effects of proliferation. Outcomes may differ. Some may be a disastrous chain of events, others may turn out to be benign. Stable outcomes may be a happy regional surprise; an unstable outcome that triggers a chain of proliferation events could have dangerous effects on global security.

Nuclear Risks in the Middle East

Fears are often expressed that the possibility that nuclear weapons will be used increases when such weapons are introduced into a traditionally unstable conflict as the

(62) Beaton, Must the Bomb Spread, op. cit., pp.23, 31; See Rosecrance, R., 'Introduction' and Quester, G., 'The Politics of Twenty Nuclear Powers' in R.N. Rosecrance, (ed), The Future of the International Strategic System, (San Fransico: Chandler Publishing, 1972) pp.1-9 & pp.56-77; Clark, Donald L., 'We Could Be Wrong?' Air University Review, 29, Sep/Oct 1978, pp.28-37; Lefever, E., 'Undue Alarm Over Nuclear Spread', Wall Street Journal, 15 Oct 1976, p.12; Proxmine, William., 'Why Does Nuclear Proliferation Pose The Most Serious Threat of Nuclear War' Congressional Record, Vol 130, 82, 15 June 1984, pp.7352-7353; Hoffmann, 'Nuclear Proliferation and World Order' op. cit., PP 89 - 121.

Arab-Israeli one with some four decades of continuing warfare. Evron argues that this long tradition of war and violence may lead to the inclusion of the nuclear weapons in existing warfare strategies.

> "The military establishments, because of their inbuilt bureaucratic conservatism and because of the centrality of the war fighting mission for the armed forces, may consider nuclear weapons for warfare rather than as deterrents'[63]

Harkavy concluded that the possibility of nuclear war in the Middle East appears to be substantially higher than that of a nuclear exchange between the nuclear powers or nuclear explosions anywhere else.[64] He based his prediction on the absence of formal relations, lack of rules of nuclear conduct between Israel and the Arab States and that the Superpowers are most likely to clash in the Middle East because of their commitment and assurances given to their client states in the region. Greenwood foresees an increase in the probability of the use of nuclear weapons during the transitional period between a balance based on conventional power and a mutual nuclear deterrence, especially with state

(63) Evron, Y., 'Some Effects of the Introduction of Nuclear Weapons in the Middle East' in Asher, Arian, (ed), Israel: A Developing Society (Tel Aviv; Pinhas Sapir Centre for Development, Tel Aviv University and Van Gorom, Assem, Netherlands, 1980) p.107.

(64) Harkavy, Spectre of a Middle East Holocaust, op. cit., p.111.

of the ambiguous status of the Israeli nuclear programme.[65] A leading Arab strategist argues that the limited retaliatory capacity of the regional nuclear powers and the nature and orientation of the leaders in the Middle East will allow for the use of nuclear weapons.[66]

There is a different school of thought which argues that the probability of outbreak of war decreases with the introduction of nuclear weapons. This view is based on the experience of evolution of mutual nuclear deterrence between the two Superpowers and that the fears expressed about the risks of nuclear war in the Middle East are exaggerated and unsubstantiated. Those holding this view take note of the undeniable fact that in the Middle East nuclear weapons will be introduced in a region where forces of the adversary states fought each other at least five times in the last thirty five years, and believe that this fact will not have an impact on their pattern of behaviour in a nuclear Middle East. Shai Feldman argues that because Israel and Arab forces met on the battle fields several times, unlike Soviet and American forces, this would not make enough difference to lead to the actual use of nuclear weapons.[67] The Soviet-American conflict was extremely tense and fervent when

(65) Greenwood, T., 'The Proliferation of Nuclear Weapons' in Diffusion of Power: Conflict Control, Adelphi Paper No 133 (London: International Institute for Strategic Studies, 1977) p.24.

(66) Huweidi, The Arab-Israeli Conflict Between Conventional and Nuclear Deterrence, op. cit., p.210.

(67) Feldman, Israeli Nuclear Deterrence, op. cit., p.150.

nuclear weapons were introduced in the late 1940s and early 1950s but it did not lead to the use of nuclear weapons. It is argued that no US Chief of Staff asked for the use of nuclear weapons during the American wars in Korea and Vietnam.[68] Neither the USA nor the Soviet Army advocates reliance on nuclear weapons or wants nuclear war.[69] Secondly, the USA, the Soviet Union and France have all integrated nuclear weapons into their respective war fighting strategies and that the employment of nuclear weapons is a central point in Eastern and Western alliances doctrines, but this has not yet led to the use of nuclear weapons or to the adoption of a 'more of the same' attitude to nuclear weapons. Thirdly, it is assumed that a similar attitude is most likely to develop in the Middle East concerning the use of nuclear weapons.[70]

Harkabi contends that the introduction of nuclear weapons could lead to the relaxation of the Arab-Israeli dispute and ease tension and transform the dispute into other fields of peaceful competition.[71] Nye noted that Iraq could not have attacked Iran if Iran had been a nuclear weapons state and Israel could not have used nuclear weapons against Egypt

(68) Brodie, War and Politics, op. cit., pp.64 - 66, 179 - 80, 79.

(69) Wellenitz, B.A., (ed) LASL Panel on Tactical Nuclear Warfare, April 5-6, 1977 (Los Alamos: Los Alamos Scientific Laboratory, Aug 1977) p.35; See Schelling, T., Arms and Influence (New Haven: Yale University Press, 1966), p.12; 'Excerpts from Soviet Booklet on Nuclear War' New York Times, 21 Nov 1981.

(70) See statements made by Egyptian Defence Minister in Al-Hawadeth, 23 Jan 1975 and Chief of Staff, 22 Feb 1975.

(71) Harkabi, Y., Nuclear War and Nuclear Peace, op. cit., p.253.

when it crossed the Suez Canal during the Arab-Israel 1973 War, without extending the war to the pre-1967 borders with Israel.[72] This is because the nuclear weapons tend to raise the stakes of potential conflict and because their acquisition would make governments more cautious and thus less likely to go to war. Paul Jabber contends that the Arab-Israeli nuclear balance would be stable because this stability would grow out of a recognition that unacceptable damage could be inflicted on both sides with minimum counter-value retaliation.[73] Otherwise one would expect to see a crisis situation with the danger of escalation to the highest ring. Waltz summarized the expected effect of the nuclearization of the Middle East.

> "One may be impressed that, despite ample bitterness, Israelis and Arabs have limited their wars and accepted constraints placed on them by others. Arabs did not marshal their resources and make an all-out effort to destroy Israel in the years before Israel could strike back with nuclear warheads. We can

<72> Nye, Joseph, 'Sustaining Non-Proliferation in the 1980s', Survival, Vol 23, No 3, May/June 1981, p.98; See Rosen, Steven J., 'A Stable System of Mutual Nuclear Deterrence in the Arab-Israeli Conflict', American Political Sciences Review, No 71, Dec 1977, p.1370.

<73> Jabber, ' A Nuclear Middle East' op. cit., pp.92-93.

not expect countries to risk more
in the presence of nuclear weapons
than they have in their absence"[74]

To sum up, the two schools of thought regarding the effect of the introduction of nuclear weapons into the Middle East predict quite different probabilities and likelihoods of outbreak of nuclear war. These are based on various assumptions and inconclusive evidence. But each school has placed greater emphasis on what appears to be the primary concern based on its position on the theory of nuclear deterrence. Moreover, most studies point more to explaining the dangers than to the likelihoods of nuclear war. So in order to examine the likelihood of the nuclear risks associated with the Middle East, a detailed analysis of these risks will be examined in the light of arguments presented in the literature and experts' opinion based on extensive survey carried out among leading nuclear proliferation and Middle East specialists.

The Level of Rationality

To begin with, the likelihood of nuclear war is often associated with the nature of the leaders of the new nuclear weapons states compared with the old nuclear weapons states. Newcomers to the nuclear club are considered immature and they are prone to act in irrational and unpredictable manner.[75] These fears were first raised in the mid 1960s by

(74) Waltz, 'The Spread of Nuclear Weapons: More May Be Better' op. cit., p.12.

(75) Marwah, 'India's Nuclear and Space Programs', op. cit., pp.113-14; Mandeblbaum, 'International Stability and Nuclear Order', op. cit., p.66.

Aron and Hoffmann based on lack of responsible behaviour, non recognition of the existing status quo and disregard of the accepted international code of conduct.[76] One scholar produced possible situations involving irrational behaviour by a new Chinese leadership.[77]. In the Middle East context, Alan Dowty points out that all theories of nuclear deterrence assume constant cold rationality which is not quite the case in the Arab-Israeli conflict because of the feeling that war is inevitable and use of nuclear weapons is probable.[78] Evron casts doubt on rationality of some Arab leaders which could lead to the use of nuclear weapons.

> "The level of rationality of some of the leaders in the Arab World and the highly irresponsible behaviour of some of the other leaders suggest that nuclear weapons in the Middle East, far from necessarily stabilizing relations in that troubled and tormented region, might in fact lead to the first full scale nuclear war in the world."[79]

(76) Aron, The Great Debate, op. cit., pp.61-61; Hoffmann, 'Nuclear Proliferation and World Politics', op. cit., pp.89-90.

(77) Krieger, David., 'What Happens if...? Terrorists, Revolutionaries and Nuclear Weapons', Annals of the American Academy of Political Science, No 430, Mar 1977, p.52; See Morgan, Patrick., Deterrence, (Beverly Hills and London: Sage Publications, 1977), p.13 (Irrational Behaviour is also associated with existing nuclear powers).

(78) Dowty, 'Israel and Nuclear Weapons', op. cit., p.6.

(79) Evron, Y., 'Letter to the Editor', Commentary, Feb 1976, p.6.

This concern regarding the irrationality of some of the leaders of the Middle East is based on two assumptions: The relationship between underdevelopment and irresponsible behaviour and past irrational behaviour of the people of the Middle East. It is argued that there is a link between underdevelopment and irrational behaviour because of the lack of shared logic, values and calculation and what Dror described as 'their political dynamism and culture' in these new nuclear weapons states.[80] This link is neither explicitly stated nor even supported by evidence. This assumption is strongly rejected in the Third World and labelled as some sort of racisim.

> "No Indian can accept the underlying assumption, in many Western discussions of the dangers of proliferation that there is necessarily a correlation between underdevelopment and irresponsible behaviour and that nuclear weapons in the hands of a new nation are like guns in the hands of juvenile delinquents?"[81]

The second assumption is that some leaders of the Middle East behave in an irresponsible manner, for example, Nasser's behaviour in the 1967 War and more recently

(80) Dror, 'Nuclear Weapons in Third World Conflict', op. cit., p.100.

(81) Gupta, Sisr., 'The Indian Dilemma' in Buchan, A World of Nuclear Powers, op. cit., p.59; See Jaipal, 'The Indian Nuclear Explosions', op. cit., p.47.

Qaddafi's link with terrorism and adventures. Here too no efforts were made to substantiate this assumption of irrational behaviour in a crisis situation in the Middle East. Nasser's asserted miscalculation in the 1967 War was not worse than US Presidents' Truman and Kennedy, in the Korean and Cuban crises respectively as Rosen explained.[82] The history of the causes of war is full of examples of miscalculation and misassessments made by the existing advanced industrial nations.[83] Moreover, these 'irrational' leaders have shown caution and restraint when punitive retaliation against them might have direct implication on the stability of their regimes. Qaddafi showed remarkable restraint during the border clashes with Egypt in 1977 and more recently in the skirmish off the Gulf of Sert with US forces.

This concern about irrational behaviour of the leaders of the new nuclear weapons states was raised several times before, first against the Soviet Union, then China and India[84] but without any substantiated evidence to support it. Furthermore, regarding the question of rationality being required for successful and effective deterrence, it is argued that perfect rationality may be counter productive for effective deterrence which may at sometimes be the product of irrational fears of a nuclear holocaust when

(82) Rosen, ' A Stable System of Mutual Deterrence', op. cit., p.1374.

(83) Blainey, Geoffrey., The Causes of War, (New York: Free Press, 1973) pp.108-19.

(84) Brodie, Bernard., Strategy in the Missile Age, (Princeton: Princeton University Press, 1959), p.280.

rationality indicates that an action is possible and could be carried out with impunity. Jervis pointed out that 'irrationality could also lead a state to passive acquescence when a rational grasp of the situation could lead to belligerence'.[85] Morgan calls it 'sensible decision making' and Feldman describes it as 'sensitivity to costs', instead of constant steady rationality.[86] Schelling used the notion 'the threat that leaves something to chance' and Brodie believed that governments would behave very carefully in the presence of dreadful dangers.[87] As Donald Michael has pointed out, there are already in adopted national policies of nuclear powers 'distortions and oversights so gross that one can suspect that individuals and institutions involved are not responding with sufficient attention to reality to be called sane by any standard'.[88] So it seems there is no substantiated evidence from the above arguments concerning irrational behaviour of some of the leaders of the Middle East in a way substantially different from that of the advanced industrial nations. The experts' opinion is also at odds with this assumption of a low level of rationality among leaders of Middle Eastern

(85) Jervis, 'Deterrence Theory Revisited', op. cit., p.299.

(86) Morgan, Deterrence, op. cit. p.116; Feldman, Israeli Nuclear Deterrence, op. cit., p.147.

(87) Schelling, T., The Strategy of Conflict, (Cambridge, MA: Harvard University Press, 1965), p.188; Brodie, Bernard., Escalation and the Nuclear Option, (Princeton: Princeton University Press, 1966), pp.74-8.

(88) Michael, Donald D., 'Psychopathology of Nuclear War', Bulletin of the Atomic Scientists, May 1962, p.28.

countries.[89] In conclusion, the assumption of a low level of rationality as a cause of war in the Middle East is highly questionable.

Level of Conceptualization of Use of Nuclear Weapons

A second risk related with the level of rationality widely referred to is the problem of the level of conceptualization about the use of nuclear weapons. Pragner and Tahtinen expressed the fear that the worst outcomes might result from proliferation of nuclear weapons into a region such as the Middle East that lacks a code for nuclear conduct. So if nuclear weapons are introduced into the Middle East without the development of a doctrine for their use, one would expect the worst consequences.

> "The most dangerous element in nuclear proliferation among nations outside the realm of this web of policies, deterrence, technology and communication between Moscow and Washington is that beyond this almost ritualized, bilateral relationship there is no ritual, and in certain instances, not even bilateral relations. In the Middle East as significant formal or

(89) The overwhelming majority of respondents believe that the level or rationality is not low in Israel, Egypt, Algeria; while in the case of Iraq and Libya the experts opinion is slightly lower.

> informal relationships between the Arab governments and Israel exist, to say nothing of nuclear conduct, should such weapons be introduced into this tumultuous setting'[90]

The need for a nuclear doctrine is essential because it leads to the development of a dialogue and the emergence of a shared code for nuclear conduct. Otherwise, it will be difficult to reach implicit or explicit agreement on thresholds, and ultimately the task of controlling escalation may prove to be difficult in a crisis situation and high tension. However, this view was criticized on the grounds that the development of nuclear weapons preceded the development of doctrines in all nuclear weapons states.[91] The current level of debate about nuclear weapons in Israel and some Arab states is no less significant than that which developed during the early stages of the development of nuclear weapons in nuclear weapons states. The Arab and Israeli press, scholars, military chiefs and politicians reveal appreciation of the costs of nuclear weapons and constraints imposed by these costs on the freedom of action in a nuclear Middle East.[92] One would expect this appreciation of the realities of nuclear politics to

(90) Pragner and Tahtinen, Nuclear Threat in the Middle East, op. cit., p.3.

(91) Feldman, Israeli Nuclear Deterrence, op. cit., p.148.

(92) See Al-Ahram, 20 July 1975, 30 April 1976; Al-Usbu Al-Arabi, 2 July 1977; Al-Ayubi, 'The Truth About the Nuclear Challenge', op. cit; Al-Qabas, 11 May 1976, 11 Sep 1980; New Outlook, May 1982.

increase with the open introduction of nuclear weapons into the area, possibly, leading to the development of a code of nuclear conduct. There are opportunities open for formal and informal relations and contacts between Israel and some of the Arab states, especially with the conclusion of the peace treaty between Israel and Egypt in 1979 and recent contacts between Israel and Morocco. Here, also, the odds are in favour of the development of rules of nuclear conduct between Israel and some of the Arab states in a nuclear Middle East, according to experts' opinion.[93]

There is a closely related risk associated with the development of rules of nuclear conduct in that there is fear often expressed of the possibility of use of nuclear weapons in a traditionally volatile area. In contrast to the case of the two Superpowers, nuclear weapons in the Middle East will be introduced on a heated conflict of long and continuous warfare. This conflicting pattern of behaviour is feared to have an impact on the likely behaviour of political and military establishments. Evron suggested that the long tradition of war and violence experienced in the Arab-Israeli conflict could lead to transformation of nuclear weapons into warfare strategies.[94] As mentioned before, US and Soviet relations were heated when nuclear weapons were introduced but this did not lead

(93) See Footnote (89).

(94) Evron, 'Some Effects of the Introduction of Nuclear Weapons in the Middle East', op. cit., p.107.

to the use of nuclear weapons in the Korean and Vietnamese wars. The major nuclear powers, the USA, the Soviet Union, Britain and France took part in the Second World War but this did not induce them to develop 'more of the same' attitudes towards nuclear weapons, except in 1945. If one adds to this the emerging appreciation of military and political leaders of some of the Middle East states that nuclear weapons are not more of the same, he would expect this likelihood in a nuclear Middle East to be highly questionable. However, the experts dismissed this possibility of inclusion of nuclear weapons in warfare strategies in the case of Algeria, Egypt and Syria but not in the case of Iraq, Israel and Libya.[95]

To sum up, it seems that there is no good evidence for the fears expressed about the relationship between low level of rationality and conceptualization about use of nuclear weapons and the possibility of inclusion of these weapons in warfare strategies and the likelihood of nuclear war in the Middle East. But this does not imply that these risks are insignificant or non-existent, but their likelihoods are far less than is often expressed and exaggerated. One can argue that these risks themselves could enhance credibility of deterrent threats.

(95) The majority of the respondents believe Libya, Israel and Iraq would most likely include nuclear weapons in their warfare strategies under extreme contingency. This explains why there is strong support among respondents to the argument that these countries will use nuclear weapons when political survival is at stake.

Nuclear Weapons and Installations Safety

A third risk area in a nuclear Middle East which is frequently invoked is that the control of nuclear weapons and their use are difficult to maintain. It is argued that the requirements of a dispersion of nuclear weapons reduce the capacity to maintain control of such weapons and open the way for two possible risks: accidental and unauthorized use of nuclear weapons.[96] The probability of nuclear accidents is thought to grow as a result of proliferation of independent nuclear capabilities and the growing of the number of buttons that can be pressed accidentally.[97] The two Superpowers together deploy between 48,000 and 60,000 nuclear warheads and the number is on the increase (97 percent of all nuclear warheads),[98] but the assessment of the risks of accidental nuclear war in East and West are considered low. In a nuclear Middle East, there would be only a tiny fraction of this enormous arsenal, so there is no reason to believe that this very small fraction should dramatically raise the overall probability of an accidental war, unless it is assumed that nuclear weapons in the Middle East would be equipped with an unsafe technology of control. However, there are several mitigating factors to this

(96) Dunn, Lewis A., 'Nuclear Proliferation and World Politics' , Annals of American Academy of Political Science, No 430, Mar 1977, pp.98.

(97) Kahn, Thinking About the Unthinkable, op. cit., p.40.

(98) UN, Comprehensive Study on Nuclear Weapons, op. cit., p.31; The Military Balance, 1985/1986, op. cit., pp. 3, 16, 158-65.

assumption and risk. First, the new nuclear weapons states in the Middle East would most likely be equipped with relatively small forces, so one would expect the span of control of weapons to be shorter. Secondly, the existing nuclear weapons powers may provide the Middle Eastern countries with means of weapons safety in the interest of international stability.

> "Once a state comes into possession of nuclear weapons, it is in the interest of the entire international community that it also possesses the means to manage them safely. It may be in the higher interest of the great powers, however opposed they may be to proliferation itself, to pass along weapons security technologies that will reduce the chance of accidents as well as disable weapons that fall into the hands of terrorists or fanatical insurgent groups"[99]

There are two possible objections by the Superpowers concerning this transfer of weapons safety technologies. One is that this transfer of weapons security means that

(99) Rosen, 'A Stable System of Mutual Deterrence in the Arab-Israeli Conflict', op. cit., p.1380; Lawrence and Larus, 'Implications of Phase II Proliferation for the United States', p.242; Rochen, 'The Development and Deployment of Nuclear Weapons', pp.12-16; Betts, 'South Africa', Chap 7, in Lawrence and Larus, Nuclear Proliferation Phase II, op. cit.; Dunn, 'Controlling the Bomb', op. cit., p.151.

the Superpowers would be encouraging further proliferation.[100] The second is that by giving these technologies to new nuclear weapons states, the Superpowers will be endangering their own security.[101] However, assessing the risks of accidental war against those of further future proliferation, the Superpowers, judging from their past anti-proliferation practices, would respond to an immediate serious threat of accidental war rather than discourage further proliferation.[102]
It is possible for nuclear weapons states to produce weapons security technologies suitable for export as has been the case in many advanced conventional arms. Weapons safety requirements could not be an impossible problem for new nuclear weapons states in the Middle East.

The second risk of accidental use of nuclear weapons is an unauthorized use or seizure of weapons by a section of the armed forces or a terrorist group. Calder argues that the spread of nuclear weapons may increase the danger of the unauthorized use of nuclear weapons by officers of the armed forces.[103] Though such a danger also exists in generally recognized nuclear weapons powers, the Superpowers have a carefully devised chain of command and control designed to prevent any misuse of nuclear weapons by officers. These

<100> Schelling, 'Who Will Have the Bomb?', op. cit., pp.89-90; Waltz, 'What Will the Spread of Nuclear Weapons Do to the World', in King, International Political Effects of the Spread of Nuclear Weapons, op. cit., p.190.

<101> Feldman, Israeli Nuclear Deterrence, op. cit.,p. 164.

<102> Dunn, 'Nuclear Proliferation and World Politics', op. cit., p.108.

<103> Calder, Nuclear Nightmares, op. cit., pp.76-77.

judgements are based on an assumption that the military authorities are less loyal to civilian authorities and that safeguards are less stringent for the armed forces in new nuclear weapons states. However, there is no reason to assume that civil control of the military in all existing nuclear weapons states is assured or that the civilians are more cautious than the military.[104] Others argue that nuclear weapons could be used in a domestic struggle between different factions of armed forces to gain control of power.[105] But one would doubt if nuclear weapons will be of any use in coups or domestic power struggle though the possibility cannot be ruled out that one faction would not want to concede defeat to another as Schelling explains

> "When Moslems are fighting Christians within a country, or officers fighting enlisted men, the Navy fighting the Army or French paratroopers marching in Paris, even those who would find plutonium an embrassment may have to race for it and fight for it, simply to keep it from falling into the wrong hands"[106]

Nevertheless, such an act would produce a domestic

<104> Waltz, 'The Spread of Nuclear Weapons: More May Be Batter', op. cit., p.12.

<105> Dunn, 'Nuclear Proliferation and World Politics', op. cit., p.102.

<106> Schelling, 'Who will Have The Bomb?', op. cit., p.88.

catastrophe rather than trigger a major nuclear war.

The possibility of seizure of nuclear weapons by fanatical non-governmental and terrorist groups by theft or hijacking is thought to increase with the wide spread of nuclear weapons.[107] This is because the weapons of new nuclear weapons states would probably be small and less well protected than those of the existing nuclear weapons powers. Yet, because nuclear weapons are small in number, one would expect protecting them from attack by terrorist groups a less difficult task than seizure by a faction of armed forces. Though the possibility of seizure and use of weapons by a fanatical group exists, it has no strategic consequences but it is a serious domestic problem. Once more, it is difficult to see how the domestic use of nuclear weapons might lead to a major nuclear war.

Furthermore, there is the risk of attack on nuclear installations as demonstrated by the Israeli attack on Iraq's nuclear research reactor in 1981 and Iraq's attack on Iran's nuclear research reactor in 1984 and 1985. Though no radio-activity was released, contamination would have been significant had the installation been a nuclear power plant in operation.[108] Land contamination and death resulting

(107) Intriligator and Brits, 'Nuclear Proliferation and the Probability of War', op. cit., p.256; Krieger, 'What Happens if...?', op. cit., p.51; Epstein, W., 'Nuclear Terrorism and Nuclear War', in Griffiths and Polany, The Dangers of Nuclear War, op. cit., p.112.

(108) Ramberg, Bennett., 'Attacks on Nuclear Reactors: The Implications of Israel's Strike on Osiraq' Political Science Quarterly, 97, Winter 1982/83, pp.653-669; His Nuclear Plants as Weapons for the Enemy: An Unrecognized Military Peril (Barkely: University of California Press, 1984) PP XV - XXI.

from a conventional attack on a large power plant is equivalent to a major accident and effect of detonation of a nuclear weapon.[109] There are several reasons for such an attack beside the Israeli ratinale for the attack on the Iraqi reactor. One is to cripple the enemy's industrial capabilities to wage war. Second is because nuclear plants may represent one of the greatest concentration of investment in a country. Third is to threaten contamination of the enemy's environment as a means of coercion. However, carrying such an attack depends on factors as whether this contamination would effect the attacker and if these installations would be protected against attack.

To sum up, it seems that the probability of nuclear war caused by accidents and misuse by a sub-national group is not substantially different from that within the existing nuclear weapons powers. Expert opinion is decidedly in favour of low probability on the question of nuclear terrorism as a cause of accidental war. Three out of five of respondents think this probability is low while the rest think it is high. The majority of the respondents agreed with the notion that the Superpowers' opposition to proliferation of nuclear weapons is because proliferation increases the likelihood of accidental nuclear war.[110] The fear of accidental war is the major concern of the two

(109) Ramberg, Bennett., Global Nuclear Energy Risks (Boulder; Westview Press, 1986) p.19; Royal Commission on Environmental Pollution, Sixth Report: Nuclear Power and Environment, (London; HMSO, 1976), pp.123-24.

(110) The majority of respondents support the view that proliferation is the major source of accidental war, 92% for the USA and the Soviet Union.

Superpowers, probably because it is one of the risks and events outside their control. So the risk of accidental nuclear war in the Middle East remains a major concern though the probability is low.

Vulnerability of Command and Control Facilities

The fourth risk area of nuclear proliferation is the vulnerability of command, control and communication facilities and weapons to attack. It is argued that this risk is inherent in a world of many nuclear powers.[111] This requirement of invulnerability of weapons and a protected centre of command and control is central for effective deterrence. The nuclear forces of the new nuclear weapons states one would expect to be far less sophisticated and vulnerable to attack and small in number. Because of this, new nuclear weapons states might adopt a policy that implied early use once the centre for command and control is destroyed. Thus the adoption of this policy would invite pre-emption and so it is highly destabilizing. However, as the nuclear weapons of the new nuclear weapons states are small in yield and few in number, they are easy to hide and move.[112]

Today, the two Superpowers are still concerned about the vulnerability of their strategic forces because land-based missiles can be struck and destroyed. But the

(111) Aron, The Great Debate, op. cit., p.117, ; Dunn, 'Nuclear Proliferation and World Politics', op. cit., p.98.

(112) Waltz, 'The Spread of Nuclear Weapons: More May Be Better', op. cit., p.16.

uncertainty associated with such a venture in terms of success and retaliation deters such an act. Feldman argues that such elements singled out as sources of instability might in fact enhance deterrence.[113] So if command and control centres are located in main cities, this would imply early firing and instant retaliation if they are destroyed. The uncertainty about the speed and degree of response could also have a positive deterrent effect. The nuclear weapons powers might supply the new nuclear weapons states with more secure command and control centre technologies as shown before. The experts' opinion regarding the vulnerability of weapons and command and control facilities to attack was decidedly mixed with 25% saying command and control centres were vulnerable to such an attack and 32% saying they were not, and 43% believe it depends on circumstances.[114] This is perhaps because this vulnerability depends on such elements and requirements mentioned above and the element of uncertainty regarding the success of such an attack and the speed and degree of retaliation.

To sum up, it seems the risk of vulnerability of weapons and centres of command and control to attack is of low magnitude though it would remain a major source of concern.

Difficulty of Control of Escalation and Miscalculation

A fifth and sixth risk area is the difficulty of controlling escalation and miscalculation in a proliferated

(113) Feldman, Israeli Nuclear Deterrence, op. cit., P 167.

(114) The experts' opinion was divided as whether weapons of new nuclear weapons states would be highly vulnerable to attack, 26% said they were, 26% said they were not and 42% saying it depends on the circumstances.

world. It is argued that stability decreases with every increase in the number of the powers in the system.[115] This is so because the larger the number of powers in the system, the greater the problem of achieving a stable balance of forces and the greater the difficulty of controlling escalation. There are three main reasons. First the degree of attention each power in the system can allocate to each of the other powers decreases with every increase in the number of powers in the system. This means a reduced ability of states to monitor each other's actions leading to more uncertainty. This would create a tendency to over reaction and escalation which may take place quickly, and eventually its control would become more difficult. Secondly, in a system of many nuclear powers, escalation is expected to move rapidly up the ladder by the powers possessing the least nuclear forces. This is because states with small and less developed nuclear forces enjoy less flexible options which might lead them first to use the counterforce option. This tendency to strike first would inevitably lead to speedy escalation to a countervalue option. It is argued this is best demonstrated by the French nuclear strategy which is based on the assumption "That the French nuclear forces could serve in case of extreme provocation against France or Western Europe, as a

(115) See Waltz, 'What will the Spread', op. cit., pp.165-96; Deutch, Karl W. and J. David Singer, 'Multi-Polar Power Systems and International Stability', World Politics, 16, 1964, pp.390-406; Rosecrance, R.N., 'Bi-Polarity, Multi-Polarity and the Future', Journal of Conflict Resolution, 10,1966, pp.314-27.

trigger of the American nuclear arsenal"[116]
Thirdly, states enjoying close relations in a multipolar world might be able to involve each other in a nuclear war.[117] This is because such close relations imply that an escalatory step taken by one may commit others and so lead to escalation of the overall level of conflict. In such circumstances, escalation control would be extremely difficult to pursue. It is argued that calculation is more difficult in a multipolar world than in a bipolar world because the attention each state can allocate to others decreases with the increase in the number of nuclear powers. An increased attention would lead to less involvement and hence less conflict.[118] In a bipolar world, most of the balancing is done internally by monitoring and responding to the activities of each other while in a multipolar world most of the balancing is done externally by continuous shifting coalition partners, especially in time of a crisis and international tension. This means less stability and greater difficulty of calculation and controlling escalation. This state of affairs increases the dangers of nuclear war and keeping nuclear war limited.

One would expect war in the Middle East to be fought on these states territories; such a war would be extremely difficult to control because of the enormous pressures on the decision makers to act quickly. Prospects of keeping

<116> Kohl, French Nuclear Diplomacy, op. cit., p.154.

<117> Ibid.

<118> Deutch and Singer, 'Multipolar Power Systems', op. cit.

war are slim since limited war

> "practically always connotes a war in which there is no strategic bombing between the United States and the Soviet Union....[A] situation which admitted some strategic bombing with nuclear weapons would be simply too near the blow-out point where restraints of any kind are abandoned."[119]

When more than two powers are involved, the probability of keeping nuclear war limited or controlling it is even smaller.[120]

However, in the era of nuclear forces the significance of precise calculations is diminished with reduced importance of a precise balance since a nuclear weapons state does not require to make guesses about the strength of the opposing parties but only to measure the strength of itself in relation to the other.[121] Nuclear weapons make miscalculation less likely to be committed because it is not difficult to appreciate the enormous damage a few warheads can do. A shift of coalition membership one would expect not to create substantial balances in a nuclear Middle East where there are few urban centres and nuclear targets. So

(119) Brodie, Strategy in the Missile Ages, op. cit., pp.310-11.

(120) Ibid.

(121) Waltz, 'The Spread of Nuclear Weapons: More May Be Better', op. cit., p.30.

because of the horrific consequences which nuclear weapons can bring about, nuclear weapons states would have more incentives to disassociate themselves from each other's actions, though in a practical sense this disassociation, especially among close allies, is hard to contemplate. In a conventional era, wars could bring political gains to some countries to the disadvantage of others, while in the nuclear age possible losses are more likely to outweigh any expected gains. However, this disassociation will reduce the chance that an escalatory step taken by one nuclear power would involve other powers, leading to major nuclear war.

> "Nuclearized Egypt, Saudi Arabia, Jordan and even Syria would be likely to disassociate themselves from each other and particularly from Libya and Iraq."[122]

Others argue that there is little reason for concern that a failure of nuclear deterrence would necessarily bring disaster since the ability to keep nuclear war limited 'depends on our will to make it so'.[123] The cost of uncontrolled escalation, no doubt, will be enormous. But in the nuclear age, the enormous and indiscriminate effects of nuclear weapons will make the efforts to keep war limited a very difficult task to achieve. The nuclear states'

(122) Feldman, Israeli Nuclear Deterrence, op. cit., p.161.

(123) Enthoven, Alan C., 'American Deterrent Policy', in Henry A. Kissinger (ed), Problems of National Strategy, (New York: Praeger, 1965), p.131; Feldman, Israeli Nuclear Deterrence, op. cit., p.158.

ability to limit a nuclear war is far from certain and the danger that it would rapidly escalate to global war cannot be eliminated or ruled out.[124] The risk of uncontrolled nuclear war is very real as more than two nuclear weapons states would be expected to be involved in a nuclear Middle East. Experts voted 5 to 1 that escalation in a nuclear Middle East would be very difficult to control. Also, four out of five respondents believe that miscalculation would be a major risk of war.[125]

To sum up, it seems that the difficulty of controlling escalation and miscalculation would be the most likely cause of nuclear war in the Middle East.

Catalytic War

A seventh risk area is the problem of catalytic war which is part of the general problem of controlling escalation in a multinuclear world.[126] It is argued that a small nuclear weapons state may involve the Superpowers in a global nuclear confrontation against their will as a member of the US House of Representatives explains.

> "More likely than an all out war beginning between Superpowers is a nuclear exchange between small countries and a nuclear war anywhere has to be assumed to risk

(124) Gallois, The Balance of Terror, op. cit., p.199.

(125) It is interesting to note that just less than half of the respondents (45%) believe that miscalculation would be a major problem under certain circumstances.

(126) Aron, The Great Debate, op. cit., pp.62-63; Dunn, 'Nuclear Proliferation and World Politics', op. cit., p.101; Schelling and Halperin, 'Preemptive, Premeditated and Accidental War', op. cit., p.46.

escalation to Superpower
involvement whether by deliberate
intervention or by miscalculation,
bluff or panic"[127]

Catalytic war is regarded as a very real possibility in the Middle East more than in any other region because the two Superpowers' prior commitments and Naval deployment might relatively easily lead to their involvement.[128] Evron pointed out that in the case of a regional war escalating into a nuclear confrontation, the two Superpowers would have only two options: to try to disengage themselves as quickly as possible or reimpose their control on the area in order to suppress the use of nuclear weapons by either client.[129] There is also the risk of unidentified attacks which cause the victim to react on a basis of wrong perceptions about the attacker in a multinuclear world. Beres argues that in a world of many nuclear powers where unidentified nuclear attacks are feasible, the deterrence provided by possession of nuclear weapons could no longer be considered credible and 'the victim state might lash out blindly, thus triggering a world wide nuclear war'.[130] However, in the case of the Israeli attack on US ship 'Liberty' during the

(127) Long, 'Nuclear Proliferation: Can Congress Act in Time', op. cit., p.52; See Buchan, A World of Nuclear Powers, op. cit., p.3; Bader, The United States and the Spread of Nuclear Weapons, op. cit., p.12.

(128) Calder, Nuclear Nightmares, op. cit., p.79.

(129) See Frei, Risks of Unintentional Nuclear War, op. cit., p.170.

(130) Beres, Apocalypse, op. cit., p.87.

Six Days War of 1967 in the Middle East, the ambiguity surrounding the source of attack had the effect of a delay until evidence was gathered that the ship had not been attacked by hostile forces.[131]

Evron notes that the pattern of behaviour of some of the Middle East states such as Syria, Libya and Algeria have always had many catalytic characteristics and that the preconditions for catalytic war exists in the Arab-Israeli conflict.

> "Strong motivation among some Arab states to initiate military confrontations between Israel and a third Arab country and the short distances involved would make detection and early warning less reliable than in the superpower context. The relevant scenario could be the proliferation of relatively small missile boats carrying short range (up to 100 miles) nuclear missiles operating in the Easter Mediterranean if a nuclear missile were landed at Tel Aviv, it would be very difficult to determine who was responsible. Moreover, a ship belonging to one state might be taken over by agents

(131) Hermann, Hermann and Cantor, 'Counter Attack or Delay', op. cit., pp.87-88.

of another or by an indigenous organisation."[132]

However, the realities of nuclear war reduces the likelihood that any third party might embark on such adventure. This is because being a catalyst of war could be counter productive strategy for achieving desired outcomes by initiating a process that would lead eventually to nuclear retaliation and war. There is a possibility that the initiator would be identified and exposed to nuclear retaliation by other states, not only the victim state. This possibility is enough to deter such an act.

Syria and the Palestinian 'Fatah' organisation played the catalytic role which led to the Six Days War of 1967, but catalytic behaviour is normally a feature of a party that wants to shift the costs of war to others to achieve political ends. However, the horrific costs of nuclear war and retaliation are less compatible with catalytic behaviour. The probability that such an act might have disastrous consequence would be sufficient to cause the catalyst to think twice before embarking on such a costly business.[133] If the catalytic behaviour in conventional warfare in the Middle East has led to instant retaliation and punishment, in a nuclear situation, one would expect it to be even greater. This minimizes the likelihood of

(132) Evron, 'Some Effects of the Introduction of Nuclear Weapons in the Middle East,' op. cit., p.116.

(133) Jabber, Israel and Nuclear Weapons, op. cit., pp.205-7.

catalytic behaviour and war in a nuclear Middle East. Because of the catastrophic consequences of catalytic war, the probability of such a war is a cause of concern. As for the experts' opinion regarding the probability of catalytic war in the Middle East the overwhelming majority of respondents consider it unlikely to take shape. This risk of catalysis would be further complicated if one introduced the factor of short distances between Israel and some Arab states.[134]

To sum up, the risk of catalytic war, though not likely, remains a cause of concern for several reasons, including the proximity of adversaries, intense Superpower involvement and other risks discussed above.

Nuclear Terrorism

An eighth risk is nuclear terrorism. There is an agreement among analysts that actual detonation of a nuclear device by a terrorist group would have horrific consequences[135] and that nuclear terrorism is both conceivable and technically feasible.[136]

However, this does not indicate its probabilities. There are three routes by which a terrorist group could obtain a nuclear device. The first route is by theft of nuclear weapons, hijacking and seizure of nuclear installation or

(134) It is interesting to note that just over half of the respondents (55%) say shortness of distance and existence of common borders matter in the probability of nuclear war in the Middle East.

(135) Wohlstetter, Roberta., 'Terror on Grand Scale', Survival, 18 May / June 1976, pp.100-1.

(136) Ibid., p.99; Krieger, 'What Happens if...?' op. cit., pp.51-53; Schelling, 'Who Will Have the Bomb?', op. cit., pp.83-84; Dunn, 'Nuclear Proliferation and World Politics', op. cit., p.105; Rosenbaum, 'Nuclear terror', op. cit., pp.153-4.

means of transport.[137] There is serious doubt whether such a route would be successful considering the stringent safety measure adopted by nuclear weapons powers. A second route is to obtain nuclear weapons from a supporting nuclear state such as the example of Libya often mentioned.[138] But this act of giving nuclear weapons to a terrorist group means loss of control over a tool of unprecedent consequences. One would expect that no rational nuclear weapon state would contemplate such a venture because the chance of detection of this act is high and the state would face serious consequences. Also, the nuclear device might endanger the security of the supporting state since it might be used against it.[139] So such a state would expose itself to dangerous consequences. The third route is that a terrorist group might produce nuclear weapons by itself. However, there are certain requirements that must be met to contemplate such a venture. The first requirement is to obtain weapons grade materials and then to design and fabricate a nuclear device. This needs highly specialized nuclear scientists and technologists, considerable financial resources and freedom of actions for long time,[140] though

<137> Ibid., pp.140-61; Mitre Corporation, The Threat to Licensed Nuclear Facilities, op. cit.; Schelling, 'Who Will Have The Bomb?' op. cit., pp.84-86; Epstein, The Last Chance, op. cit., Chap 19; Leitenberg, 'Accidents of Nuclear Weapons System' op. cit., pp.40 - 49.

<138> Rosenbaum, 'Nuclear Terror', op. cit., pp.153-54; Krieger, 'What Happens if...?', op. cit., p.51; Wohlstetter, 'Terror on Grand Scale', op. cit., p.100; Kupperman, Robert H., 'Nuclear Terrorism: Armchair Pastime or Genuine Threat', Jerusalem Journal of International Relations, Vol 3, No 4, July 1978, p.29.

<139> 'Arafat, Qaddafi Feuding; PLO Post in Libya Seized' International Herald Tribute, 2 Dec 1979.

<140> Schelling, 'Who Will Have the Bomb?' op. cit., p.75, 83-84.

the possibilities of a group of dedicated scientists in a hide-out building a crude nuclear device in an advanced nuclear state cannot be ruled out. The second requirement is the availability of a delivery vehicle to deliver the bomb to a target. It is argued any terrorist organization would find such requirements very hard to meet since weapons grade materials are well protected and difficult to obtain, and fabrication of a nuclear device is a very complex operation demanding highly skilled manpower.[141] Jenkins argues that the Palestine Liberation Organisation would probably come closest to meeting these requirements.[142] But the Palestine Liberation Organization is thought unlikely to embark on such venture which would have adverse consequences and provoke hostility[143] such as possible punitive repraisal by Israel. Moreover, Schelling pointed out that even if the Palestinians resort to nuclear terrorism, it 'would probably look more like diplomacy than terrorism'.[144]

The conclusion is that nuclear terrorism is a very complicated matter because it involves several different factors and steps but the odds are against the development

(141) Ibid; Kupperman, 'Nuclear Terrorism,' op. cit., p.2; Gompert, Nuclear Weapons and World Politics, op. cit., p.251 & 252; Jenkins, Brian Michael., 'The Potential for Nuclear Terrorism', Rand Memo p.5876, (Santa Monica, Calif: Rand Corporation, May 1977), pp.2 & 10.

(142) Jenkins, Brian Michael., 'The Impact of Nuclear Terrorism', cited in Feldman, Israeli Nuclear Deterrence, op. cit., p.171.

(143) Wohlstetter, 'Terrorism on Grand Scale', op. cit., p.102; Jenkins., 'The Potential for Nuclear Terrorism', op. cit., p.8; Gompert, Nuclear Weapons and World Politics, op. cit., p.251.

(144) Schelling, 'Who Will Have the Bomb?', op. cit., pp.84, 86; Jenkins 'The Potential for Nuclear Terrorism', op. cit., pp.9 & 10.

of such a venture.

There are three views about the impact of nuclear weapons on terrorism. The first view sees nuclear deterrence as having no impact on terrorism.[145] The second contends that nuclear deterrence may in fact lead to an increase of terrorism.[146] The third point.out that nuclear deterrence would reduce terrorism.[147] However, the impact of nuclear deterrence can be seen as a risk, in this context, of the development of a catalytic process to involve the supporting state in war and the danger of escalation to the nuclear level. In a nuclear Middle East the possible costs of uncontrolled escalation are extremely high and so it is most unlikely that supporting states would get involved in such a dangerous game of terrorism.[148] The odds are that terrorism in a nuclear Middle East would not lead to war. However, the experts' opinion on the probability of nuclear terrorism in the Middle East was decidedly mixed with 23% of respondents saying it was high and 32% saying it was not. To sum up, the likelihood of nuclear terrorism and that terrorist groups would involve supporting states in a nuclear Middle East seems to be far less than is often expressed. But the risks involved cannot be ruled out.

(145) Al-Amal, 24 April 1976.

(146) Jabber, Israel and Nuclear Deterrence, op. cit., pp.204 - 6.

(147) Feldman, Israeli Nuclear Deterrence, op. cit, p.134.

(148) Jabber, Israel and Nuclear Weapons , op. cit., pp.204 - 6; Al-Ray, 20, 22, 24, 26 January 1976.

Preemptive and Preventive Strike

A nineth risk area is pre-emptive and preventive strike. It is argued that further proliferation of nuclear weapons states tends to increase the probability of war because the new nuclear weapon states may be particularly inviting as a target in that it has a minimal stockpile of weapons with no retaliatory capabilities.[149] One of the existing nuclear states might be tempted to knock down this small force by a 'surgical strike'. As state develops a nuclear weapons capability, there will be a temptation for its potential adversaries to attack it before its weapons system becomes operational.[150] Such an attack was carried out by Israel in 1981 against Iraq's nuclear research reactor. Betts argues this could have implications as a precedent since other threatened countries might more readily consider similar actions and launch deliberate attacks on nuclear installations.[151] Moreover, an incentive to pre-empt may also be generated after two regional rival states have acquired nuclear weapons. This is because the initial delivery system developed would be highly vulnerable since one can hardly expect new nuclear weapons states to have a diversified and expensive delivery

(149) Intrigator and Brits, 'Nuclear Proliferation and the Probability of Nuclear War', op. cit., p.256; Schelling and Halperin, 'Pre-emptive, Premeditated and Accidental War' op. cit., p.46, 43f.

(150) Towle, A., 'A Letter to the Editor', Survival, Vol 22, No 5, 1980, p.219.

(151) Betts, 'Nuclear Proliferation After Osirak', op. cit., p.2, 'Nuclear Surprise Attack', op. cit., pp.1 - 8.

system.[152] It would be a situation similar to the period of strategic instability between the great nuclear powers in the 1950s. The temptation to pre-empt increases the probability of war during this period of instability. Quester pointed out that the temptations to launch a pre-emptive first strike is a real possibility.[153] A typical example of such a situation which involved only conventional weapons, was the outbreak of the Six Days Arab-Israeli War of 1967 as pre-emption was initiated in belief that war was imminent. Both Egypt and Israel had vulnerable warplanes and each side knew that whoever initiated the first strike could easily bomb and destroy the other's warplanes on the ground, thereby gaining air superiority. Despite US and Soviet agreement that each would restrain its 'client' state, Israel broke that agreement, as it did in 1956, by striking first when war appeared to be imminent. Such considerations could also lead to the outbreak of a nuclear war. The main danger is not that a nuclear war might start because each side expects to win but the more likely and more serious possibility that, during a crisis, one side might launch a pre-emptive strike against the other's nuclear forces in an attempt to reduce losses from an anticipated attack.

However, the risks involved in any first strike are

(152) Beres, Apocalypse, op. cit., p.81f.

(153) Quester, George., Offence and Defence and in the International System (New York: John Wiley and Sons, 1977).

certainly enormous because of the uncertainties inherent in carrying out such a strike, namely miscalculation.[154] The problem is that a leader might perceive the risks of not firing the weapons as equally grave, if he thought an attack was imminent.

> "For the nuclear game to be played and for the scenarios to be developed, assumptions about these matters have to be made. Once these assumptions have been made and have, by consensus, been accepted within one side's strategic group, they become psychologically 'real' and one treated as 'hard facts' no matter how dubious their grounding in actual realities"[155]

A counterforce strategy aimed at destroying the opponent's nuclear weapons before they can be launched is very dangerous and could increase the likelihood of the outbreak of a nuclear war.

An additional nuclear weapons state would be most likely to reduce the probability of a nuclear war by providing an additional restraining force for all the

(154) Fallows, James., National Defense (New York: Random House, 1981), p.147.

(155) Deutsch, 'The Prevention of World War III', op. cit., p.20.

existing nuclear powers.[156] This is because nuclear weapons tend to raise the stake of potential conflict and because their acquisition would make governments more cautious and less likely to go to war. In particular, uncertainty over the possible reaction of the new nuclear state may restrain the existing nuclear powers. Waltz notes that the risks involved in prevention and pre-emption are extremely high and the costs involved are so prohibitive to achieve political objectives.

> "Prevention and Pre-emption are difficult games because the costs are so high if the games are not perfectly played. Inhibitions against using nuclear forces for such attacks are strong, although one cannot say they are absolute. Some of the inhibitions are simply human...some of the inhibitions are political. ...Ultimately, the inhibitions lie in the impossibility of knowing for sure that a disarming strike will totally destroy an opposing force and in the immense destruction even a few warheads can wreak."[157]

(156) Intriligator and Brits, 'Nuclear Proliferation and the Probability of Nuclear War', op. cit., p.256, 'Nuclear Proliferation and Stability', op. cit., p.175.

(157) Waltz, 'The Spread of Nuclear Weapons: More May Be Better,' op. cit., P 17.

Paul Jabber contends that an Israeli preventive strike, during the initial stage of a nuclear Middle East when the capabilities are strongly asymmetric, providing temptation for such action, would in all probabilities, be prevented by a number of political considerations.[158] This is because both sides, Israel and the Arab states, would recognize that unacceptable damage could be inflicted on both sides by a few countervalue weapons. The two sides would not race to strike first but rather crawl up the ladder of escalation to its highest ring. Though the existence of several nuclear weapons might lead to considerable uncertainties and hence make crises less calculable, this might force governments to exercise self restraint.[159] But, with the degree of uncertainty growing rapidly, restraint may only be one possible reaction. A decisive offensive move may be another conceivable reaction to cope with uncertainty. Uncertainty about commitment could also lead to a sequence of actions and reactions which might develop into a wider scale use of nuclear weapons.[160]

It seems that the risks involved in pre-emptive and preventive nuclear strikes are enormous for any rational decision maker to contemplate but no one can be certain about the likelihood of such a venture. On the question of launching preventive and pre-emptive strike by Israel and

(158) Jabber, 'A Nuclear Middle East', op. cit., pp.92-93.

(159) Weltman, John., 'Managing Nuclear Multipolarity', International Security, Vol 6, No 3, 1982, P 188.

(160) Wohlstetter, Swords from Plowshares, op. cit., p.133f.

the Arab states the vast majority of the experts believe that the Arab states would be most unlikely to carry such an attack against Israel's nuclear weapons; in the case of Israel the overall majority of respondents were in favour of such an attack against some Arab countries, Libya, Iraq and Syria, if not against Algeria and Egypt. This explains why the majority of respondents believe that nuclear weapons would be procured by Israel as a deterrent against sudden use by the Arab states, though the overall consensus was that Israel would almost certainly use nuclear weapons if its political survival was at stake. [161] However, it is most likely that Israel would continue to use conventional weapons to strike Arab nuclear installations.

To sum up, pre-emptive and preventive strikes in a nuclear Middle East involve a high degree of risks and will remain a major source of concern.

Israel's ability to Match Combined Arab Nuclear Forces

A tenth risk area is fear that Israel might not be able to match the combined nuclear forces of the Arab states. In a nuclear Middle East, there is the possibility of the development of a nuclear coalition between the Arab states and that Israel might not be able to match such a nuclear coalition.[162] The risk is that the asymmetry in military and financial capabilities might work against Israel and so

(161) It is interesting to note that over half of the respondents believe Iraq and Libya would use nuclear weapons against Israel under extreme conditions, while opinion is divided as to whether the Arab states would procure nuclear weapons as a deterrent.

(162) Evron, 'Some of the Effects of Introduction of Nuclear Weapons in the Middle East', op. cit., p.116-20.

it is a destabilizing factor.[163] This view is based on population density and dispersion in Israel and the Arab states which might allow the Arab states to win a nuclear confrontation or at least be willing to run high risks. In this sense, the Israeli nuclear deterrent would be ineffective and dangerous.[164] There is also an Arab perception that in a nuclear Middle East the odds will be against Israel.

> "While Egypt and the Arabs enjoy a numerical advantage over Israel, and can absorb an attack of these weapons, Israel will not be able to absorb such attacks"[165]

President Sadat expressed this perception in a subtle form by saying that 'if half a million Egyptians were to die, I could recover them. But if I respond... and half a million Israelis are killed, Israel would never be able to make up the loss'.[166]

In order to assess this risk properly, one needs to consider whether the aggregation of nuclear forces has any strategic significance and whether this aggregation is a possibility

(163) Dowty, 'Nuclear Proliferation: The Israeli Case', op. cit., p.99; Bader, The United States and the Spread of Nuclear Weapons, op. cit., p.90; Haselkorn, Israel: From an Option to a Bomb in the Basement, op.cit., p.150.

(164) Gallois, The Balance of Terror, op. cit., p.50.

(165) Al-Ahram, 5 October 1976; See The Guardian, 28 April 1977; Tishrin, 5 August 1980; Al-Yamama, 15 August 1975.

(166) UPI, (Cairo), 2 July 1977.

in the Middle East. Feldman argues that aggregation is not very significant in the case of adoption of countervalue strategy because only a small number of nuclear weapons is needed to cause unacceptable damage to Israel.[167] This could be done by only one Arab state. However, the number of nuclear weapons is significant in the case of the adoption of a counterforce strategy, especially if disparities are large enough to provide the Arab side with a first strike capability, whereby Israel's retaliatory capability is seriously threatened.[168] Secondly, a quarter of Egypt's population may be found in Cairo during working hours and no rational leader would sacrifice a large number of the population of his country in coalition with other Arab states. More likely, each leader would consider the vulnerability of his country separately. Thirdly, comparing the relative vulnerabilities, Freedman argues that the odds are in favour of Israel

> "[In the event of an Arab nuclear attack on Israel] the large Arab population in Israel would suffer, as would Arabs in refugee camps and the neighbouring territories. In addition, Israel contains many sites of great religious and traditional importance to the

(167) Feldman, Israeli Nuclear Deterrence, op. cit., p.152 .

(168) Gallois, The Balance of Terror, op. cit., p.20.

Arabs, as well as the homeland of the Palestinians, supposedly the point of the whole conflict. The nuclear destruction of Israel would also be the destruction of Palestine"[169]

Fourthly, there are enormous difficulties in making and structuring a nuclear coalition to be effective in the case of a nuclear war because nuclear retaliation requires instant decisions.[170] These difficulties are best demonstrated in NATO's attempt to develop some form of nuclear sharing.[171] Finally, the introduction of nuclear weapons might lead the Arab states to develop greater rivalries among themselves than to join forces against Israel. There were reports of growing concern by some Arab countries over the nuclear programmes of others. These are described by the Egyptian Defence Minister.

"The day that [Libya's leader Muammer] Qaddafi obtains a nuclear bomb, we shall also acquire such a weapon, not in order to use it

(169) Feldman, Israel's Nuclear Policy, op. cit., p.119.

(170) Gallois, The Balance of Terror, op. cit., p.197.

(171) Zoppo, Ciro E., 'France as a Nuclear Power' in Rosecrance, The Dispersion of Nuclear Weapons, op. cit., pp.149-50; Hoffmann 'Nuclear Proliferation and World Politics', op. cit., p.121; Wohlstetter, 'NATO and the Nth+1 Country' op. cit., p.215.

against Libya, but rather in order to deter him from using it against us"[172]

In conclusion, it seems that the risk of combined Arab nuclear forces and the inability to match them on the part of Israel is unlikely to occur in a nuclear Middle East. Over half (58%) of the respondents think this possibility is unlikely to unfold.

It appears from the close examination and analysis of the ten main risk areas associated with nuclearization of the Middle East that some of them are far less worrisome than the others and that fears often expressed about some of these risks are rather an expression of worst case analysis than of well-founded and substantiated claims. However, some of these risks are plausible and possible and would remain major sources of concern. But there is no easy answer about the effects of nuclearization of the Middle East. It appears that the risks connected to a low level of rationality and conceptualization of use of nuclear weapons, accidental and catalytic wars, nuclear terrorism and that Israel might not be able to match the combined Arab nuclear forces are less likely to develop than those associated with the vulnerability of weapons and centres of command and

(172) 'Egypt Fearful Libya Might Get A-Weapons' 'Washington Post, 8 November 1980; See Resenberg, Robert., 'Iraq Nuclear Programme Worries Arabs', Jerusalem Post, 3 November 1980; 'Syrians Seeking Bids on Nuclear Technology' Nucleonics Week, vol 19, No 8, 23 Feb 1980, P 2; 'Saudis Reported Aiding in Bomb', Washington Star, 19 January 1981,

control, the difficulty of controlling escalation and miscalculation and pre-emptive and preventive strikes. Despite the variations in the probabilities of these different risks, accidental war, vulnerability of weapons, and centres of command and control, catalytic war and difficulty of controlling escalation and miscalculation would remain major causes of concern because of the horrific consequences and costs of nuclear war. The overall assessment of the probability of nuclear war in a nuclearized Middle East is seen to be that there is no decisive answer but the odds are in favour of a high probability though not substantially different from other parts of the world. In August 1980, a panel of 32 experts of nuclear weapons and strategy concluded that the first nuclear war is most likely to be fought between Israel and the Arab states.[173] However, the experts' opinion regarding the overall assessment of the probability of nuclear war in the Middle East was decidedly mixed; 35.5% denied that it was higher and 35.5% said it was higher than in any other parts of world while 29% think the probability depends on certain circumstances.[174] Several reasons were given for these variations in the probability of nuclear war in the Middle East such as the fear of Israel of elimination in case of conventional defeat, the intensity of rivalry between the parties of the conflict, the unique historical,

(173) AP, 26 August 1980.

(174) It is worth mentioning that only one in six of respondents thinks these risks of war are particular to the Middle East which explains why the opinion regarding the overall probability is mixed.

cultural and geographical reasons, intensity of superpower involvement and political factors.

To sum up, the widely held belief that the probability of nuclear war in the Middle East is substantially higher than in other parts of the World such as in Europe, Indian sub-continent or Latin America is far less founded and substantiated, though the probability itself is still high.

Superpowers' Response to Nuclearization

It is argued that because Third World countries operate in an environment dominated but not necessarily controlled by the two Superpowers, which is radically different from that of the Superpowers, this adds additional and special risks related to the problem of proliferation.[175] One has to consider the impact of nuclearization in the Third World on the strategic balance that exists between the two Superpowers, and the impact of this balance on a nuclearized Third World. The influence of the central strategic balance on Third World is logically inseparable from the global strategies of the two Superpowers. It is obvious that certain crises in the Third World, as soon as one of the two Superpowers is involved, can affect the central balance. This influence is essentially a function of the two Superpowers' delicate assessment of their own interest.[176]

(175) Dror, 'Nuclear Weapons in Third World Conflict', op. cit., p.100.

(176) De Montbrial Thierry., 'Perception of the Strategic Balance and Third World Conflicts', in The Future of the Strategic Balance, Par II, Adelphi Paper, No 161, op. cit., pp.90 - 95.

There are three risks involved in these complex but real links between the Superpower strategic balance and Third World conflicts. First, a Third World conflict involving one of the Superpowers which could lead directly to nuclear escalation if it were perceived by the other Superpower that its vital interest might be threatened. Second, in escalation of local conflict in the Third World that might lead to nuclear war between client states. Third that the possession of nuclear weapons by a Third World country could pose a threat to a Superpower. So in order to examine these risks in proper context, one needs to look into the proliferation policies and possible response of the two Superpowers to a nuclear Middle East and nuclear exchanges between Israel and the Arab states.

The American Response

To begin with, US non-proliferation policies since November 1945 when US President Truman, joined by the Prime Ministers of Britain and Canada, signed a declaration aimed at preventing the spread of nuclear weapons. This was followed by President Eisenhower's 'Atoms for Peace' programme which even today can be characterized by inconsistency.[177] This inconsistency in policy stems from two main reasons. First, the type of assessment made about the chances of success of policies to stop the spread of

(177) See 'Special Report: The Export of Nuclear Technology', op. cit.; Bader, The United States and the Spread of Nuclear Weapons, op. cit., p.35; Goldschmidt Bertrand., 'A Historical Survey of Non-Proliferation Policies', International Security, 3, 1, Summer 1978, p.72.

nuclear weapons. At the beginning there was an optimistic view that proliferation could be prevented, but this was shattered by the Soviet and British explosion of atomic bombs in 1949 and 1952 respectively. The 'Atoms for Peace' programme was based on a pessimistic assessment about the chances of preventing the spread of nuclear weapons as US Secretary of State Dulles testified that the USA could not hope to set up an effective 'dam against the flow of information, and if we try to do it we will only dam our influence and others will move into the field with the bargaining that that involves'.[178] However, some expressed doubts about the success of a non-proliferation agreement in preventing proliferation because of the conflicting interests of nuclear suppliers countries.[179] Not only that, since the motivation of a country to go nuclear might be based on local factors, the USA could do nothing to prevent a country from going nuclear, as Kissinger, US Secretary of State explained.

> "The causes of proliferation are too deep to be substantially influenced by any actions that the Superpowers alone might take."[180]

The introduction of the Nuclear Weapons Non-Proliferation Act of 1977 by President Carter and its subsequent adoption in 1978, marked the zenith of strong US

(178) 'Special Report: The Export of Nuclear Technology', op. cit.

(179) Long, 'Nuclear Proliferation', op. cit., p.53.

(180) See Gleb, 'The Atom is a Constant in US Foreign Policy', op. cit.

opposition to proliferation based on the assessment that the emergence of additional nuclear states would produce dangerously destabilizing consequences. However, when the USA attempted to apply the Act by negotiating supply agreements with recipient countries, it encountered stronger opposition than it anticipated. Moreover, other supplier countries did not close ranks on the issue.[181]

Since then there has been a number of assessments in the USA predicting that an increase in the number of nuclear weapons states is inevitable, manageable or advantageous. There is a notable contrast between the attitude that prompted the introduction of the 1977 Act and subsequent official attitudes to proliferation.[182] The new assessments tended to be optimistic and predicted no grave consequences of further proliferation. They are based on the assumption that further proliferation would have stabilizing effects on unstable regimes, could undermine Third World solidarity in its economic confrontation with the North, would not be likely to result in use of nuclear weapons and moreover, it would disadvantage the Soviet Union vis-a-vis the USA.[183]

There was a partial swingback of the pendulum towards a reassertion of the non-proliferation commitment spearheaded by the sponsors of the 1978 Act, which was later confirmed by a Presidential Statement on non-proliferation made on

(181) Krugmann, 'The German-Brazilian Nuclear Deal', op. cit., p.32.

(182) See US Congress, Nuclear Proliferation Factbook, op. cit.; King, International Political Effects of the Spread of Nuclear Weapons, op. cit., pp.X-XI.

(183) Ibid, pp.57, 143,146, 122.

July 16, 1981

> "Further proliferation would pose a severe threat to international peace, regional and global security and the security interests of the United States and other countries"[184]

Secondly, US interest in the non-proliferation of nuclear weapons must compete with a variety of other national interests such as maintenance of good relations with US allies. So, as Bader argued, US non-proliferation policy was not entirely negative but rather selective.[185] The USA compromised the non-proliferation policy in order to strengthen NATO in 1950s and 1960s in the case of proliferation by Britain and France.[186] In the 1970s tough measures were taken against Pakistan and South Korea but there was a mild response to India's explosion of 1974 and the West German nuclear deal and the US itself offered to sell Egypt and Israel nuclear technology and materials in 1974.[187] More recently, the USA has supplied nuclear fuel

(184) 'Presidential Statement on Non-Proliferation' Survival, Vol XXIII, No 5, September/October 1981, p.32; See 'Nuclear Arms Proliferation, New York Times, 26 April 1981; Nye, Joseph., 'Prospects for Non-Proliferation' Survival, Vol XXIII, No 3, May/June 1981, p.107.

(185) Bader, The United States and the Spread of Nuclear Weapons, op. cit., p.31; See Subrahmanyan , Nuclear Myths and Realities, op. cit., p.32.

(186) Bader, The United States and the Spread of Nuclear Weapons, op. cit., pp.35, 38,39; Kohl, French Nuclear Diplomacy, op. cit., pp.50-51, 52, 222.

(187) Cranston, Alan., 'How Congress Can Shape Arms Control', in Alan. Platt and Lawrence D. Weiler (eds) Congress and Arms Control, (Bouder, Col: Westview Press, 1978), p.208; Gillette, Robert., 'US Squelched Apparent S. Korea A-Bomb Drive' Los Angles Times, 4 November 1978; Nacht, 'The United States in a World of Nuclear Powers', op. cit., p.163.

to India, Brazil and other countries. The US position is best described by Brenner 'Washington simply is not prepared to risk a break with its allies over differences of approach to the proliferation problem'.[188]

US opposition to nuclear proliferation is based on a number of assumptions. First, it is argued that the spread of nuclear weapons increases the likelihood that nuclear wars will breakout, partly because proliferation increases the chances of accidental war.[189] Secondly, it is believed that increased proliferation will require the USA to intervene more frequently in local conflicts in order to avert escalation to nuclear confrontation.[190] Thirdly, one of the consequences of proliferation will be a global redistribution of power to the disadvantage of the USA and an erosion of the bipolar system.[191] Fourthly, the USA fears that small nuclear states may involve it in a major nuclear war against its will.[192] Finally, it is perceived that proliferation to small states could undermine US nuclear strategy to conduct limited and controlled nuclear war.[193] Accordingly, the USA has continued its attempts to control the spread of nuclear weapons to Third World

(188) Brenner, M., 'Carter's Non-Proliferation Strategy: Fuel Assurances and Energy Security', Orbis, 22, 2, Summer 1978, p.340.

(189) Williams, The United States, India and the Bomb, op. cit., p.7.

(190) Rosecrance, The Dispersion of Nuclear Weapons, op. cit., p.310.

(191) Buchan, A., A World of Nuclear Powers, op. cit., pp.3, 92.

(192) Long, 'Nuclear Proliferation', op. cit., p.52.

(193) Rosecrance, The Dispersion of Nuclear Weapons, op. cit., p.231.

countries. However, it seems that US opposition to proliferation based on assumptions of fear of accidental and catalytic wars finds very strong support among experts by nine out of ten and four out of five, respectively.

On the other hand, it is argued that US opposition to a nuclear Middle East, based on the Israeli case, is based on fears that it would undermine the non-proliferation regime, intense involvement of the two Superpowers in the area and it would lead to deterioration of the ability of the USA to influence her allies.[194] Feldman argues, however, that US response to a declared nuclear armed Israel, judging from his assessment of past US non-proliferation practices, and US-Israeli relations, is likely to be negative and the degree of this negative response will depend on the way this declared status comes about.[195] The vast majority of respondents believe that US opposition to a nuclear armed Israel would be mainly because of fear of nuclear confrontation with the Soviet Union (85%) and collapse of the non-proliferation regime (66%). As for the experts opinion towards US response to a declared nuclear armed Israel, 45% of the respondents consider this response would be lenient. Most of the respondents believe that the main reasons for this expected leniency are the strategic importance of Israel in US policy and inability of

(194) US Congress, Public Law 95-92, International Security Assistance Act of 1977 (Washington, D.C. Government Printing Office, 1977), pp.620-21; Feldman, Israeli Nuclear Deterrence, op. cit., p.211.

(195) Ibid., pp.210-27.

USA to control Israel nuclear development.[196] In conclusion, US opposition to nuclear proliferation in the Middle East is most likely to be fairly strong based on fear of nuclear confrontation with the Soviet Union, accidental and catalytic wars and the collapse of the non-proliferation regime. However, the chances of success of this strong opposition to be effective, at least in the case of Israel, appear to be limited, after an initial period of harsh public statements and strained relations. There are several reasons for this limited prospect of effective US response to declared nuclear weapons states in the Middle East based on the Israeli case. These factors, which might play a part in the US response, are domestic political factors (Jewish vote and Lobby), the Administration, political circumstance at the time and options available in influencing Middle East politics. The odds are in favour of less effective US response to a nuclear Middle East.

The Soviet Response

On the other hand, Soviet non-proliferation policies are argued to have been more stringent and consistent and the Soviet Union has been extremely cautious about the transfer of nuclear technology, even at the expense of serious political disadvantages in its relations with states friendly towards it.[197] Furthermore, the Soviet

(196) It is interesting to note that one in three of the respondents consider the strategic importance Israel plays in US policies is an important factor in Lenient US response.

(197) Fischer, D.A., Nuclear Issues: International Control and International Cooperation (Canberra: Australian National University, 1981), P VII.

Union has forgone the considerable advantages to be gained from selling nuclear technology and materials to countries refused these technology and materials by the USA and other Western suppliers. Whenever supplying special fissionable materials, the Soviet Union insists on the return of all spent fuel.[198]

The stringent Soviet non-proliferation policy goes back to the Soviet concern over West Germany rearmament agreement of 1954 until West Germany signed the NPT in 1975.[199] Though the Soviets reaction to India's nuclear explosion in 1974 and West German-Brazilian deal was described as mild, they refrained from taking any steps that encourage further proliferation

> "The Russians have never transferred to their present satellites, who are all parties to the NPT, enrichment and reprocessing technologies and would certainly not allow them to acquire and develop independently these steps of fuel cycle."[200]

(198) Nogee, Joseph L., 'Soviet Nuclear Proliferation Policy: Dilemmas and Contradictions', Orbis, Vol 24, No 4, Winter 1981, p.751.

(199) Lambeth, Benjamin S., 'Nuclear Proliferation and Soviet Arms Control Policy', Orbis, Summer 1978, pp.312-13, 318; Marwah, 'India's Nuclear and Space Programs', op. cit., p.118; Duffy, 'Soviet Nuclear Export', op. cit., p.97; Lawrence, 'Nuclear Futures for Sale', op. cit., p.147.

(200) Goldschmidt, ' A Historical Survey of Non-Proliferation Policies', op. cit., p.84; Wetting, Gerard., 'Soviet Policy on the Non-Proliferation of Nuclear Weapons', 12, Orbis, Winter 1969, p.1064.

Some argue that a declared nuclear armed Israel might pose a threat to the Soviet Union which would lead the Soviets to respond to this threat in several ways.[201] One way for the Soviet Union to deal with this situation could be a pre-emptive or preventive first strike against Israel. However, this option is believed to be extremely unlikely because it would be incompatible with Soviet past behaviour in the Middle East and interests in the region.[202] In 1970 when Israel shot four Soviet pilots during the War of Attrition between Israel and Egypt, the Soviets avoided escalation. Such action might also lead to nuclear confrontation with the USA. But one cannot rule out the possibility of such action if Israeli nuclear weapons pose a direct threat to the Soviet homeland. On the other hand, there is almost unanimous agreement among respondents (96%) that Soviet first strike against Israel is extremely unlikely. A second possible Soviet response is to supply the Arab states with nuclear weapons to counter the Israeli nuclear threat. There were several reports that the Soviet Union had in fact transferred nuclear weapons during the last days of the Arab-Israeli War of 1973.[203] However,

(201) Dowty, 'Nuclear Proliferation', op. cit., p.99; Freedman, 'Israel's Nuclear Policy', op. cit., p.19; Bader, The United States and the Spread of Nuclear Weapons, op. cit., p.93; Boskey, Bennet and Mason, Willrich., Nuclear Weapons : Prospect for Control (New York: Donellin, 1970), p.70; Bell, 'Israel's Nuclear Option', op. cit., pp.384-85, 386; Haselkorn, 'Israel: From an Option to a Bomb in the Basement', op. cit., p.165.

(202) Mangold, Peter., 'The Soviet Record in the Middle East', Survival, 20, May/June 1978, p.102.

(203) Schiff, Zeev., October Earthquake (Tel Aviv: University Publishing, 1974), pp.289 - 90.

Quandt doubted the credibility of such transfer based on the assumption that the Soviets possibly wanted to send a warning message to the Americans by the way they choose to send the weapons.

> "If the Soviets intended to send nuclear warheads to Egypt, they presumably would not send them by ship. If, however, they were engaging in a dangerous form of psychological warfare aimed at making the Americans worry about the possibility of nuclear weapons in the area, they might have chosen to send such weapons through the heavily monitored Turkish Strait."[204]

Moreover, judging from the Soviets past stringent and consistent non-proliferation policies including withdrawing assistance to China when it became clear that China's nuclear programme was intended for military purposes and the Soviet interest in the area, and taking into account the risks involved in such transfer which led to the nuclear alert and confrontation with the USA one would expect the likelihood of such a Soviet response to be low. This is illustrated by the fact that 96% of the respondents agree that this probability is very low indeed. A third possible

(204) Quandt, Decade of Decisions, op. cit., p.198f.

Soviet response is believed to be to offer the Arab states security guarantees against an Israeli first use of nuclear weapons. Feldman pointed out that such a response seemed best suited to enhance Soviet interests in the Arab world assuming the Soviets are willing to run the risk of direct involvement in a nuclear Middle East.[205] This would be the case because Soviet influence in the Arab world would increase rather than diminish with security guarantees. These guarantees would ensure continuous Soviet influence and greater dependency of some Arab states on the Soviet Union. However, one would expect these guarantees to be on certain strict conditions as Freedman explains

> "While the Soviet Union may be prepared to offer protection against Israeli offensives, it is very doubted that she would be prepared to provide nuclear cover for the consequences of all Arab adventurers."[206]

One would expect the Soviet Union to attach conditions to such guarantees against Israeli offensive use of nuclear weapons. Such conditions are important in a crisis situation which might lead to escalation and nuclear confrontation. This arrangement would limit the freedom of action of the Arab states because they would have to consult

(205) Feldman, Israeli Nuclear Deterrence, op. cit., p.183.

(206) Freedman, 'Israel's Nuclear Policy', op. cit., p.18.

the Soviet Union in advance because of fear of escalation. The Soviet Union refused several requests to extend a security agreement to India and indicated that it has no intention of becoming part of a regional defence commitment which could lead to adverse consequences in a crisis situation.[207]

To sum up, it seems the odds are in favour of limited Soviet security guarantees to some Arab states in response to a declared nuclear armed Israel. There were several reports that the Soviet Union has, in fact, made such an arrangement with Syria.[208] The overwhelming majority of the respondents believe that it is likely that the Soviet Union would provide some of the Arab states with limited security guarantees.

A fourth possible Soviet response, it is argued, would be an increase of the level of Soviet political and military involvement in the Middle East[209], as a result of Arab pressures. Such a possible response has to be considered on two levels. The first is whether such Arab pressures for intensive Soviet involvement in the Middle East are possible and desirable from the point of view of some Arab states. The second level is whether such an increase is in the interest of the Soviet Union considering the risks of confrontation with the USA. Considering the past pattern of

(207) Bray, Frank, and Michael, Moode, 'Nuclear Politics in India' Survival, 19, May/June 1977, p.12; Lambeth, 'Nuclear Proliferation', op. cit., p.319.

(208) Al-Ittihad, 3 October 1985; Der Spiegel, 11 September 1984.

(209) Dowty, 'Nuclear Proliferation: The Israeli case', op. cit., p.93.

Soviet behaviour in the Middle East conflict, one would arrive at the conclusion that such an increase of Soviet involvement is likely to occur in the case of a declared nuclear armed Israel. However, such an increase will be dependent on the domestic political circumstances in the Arab world, Soviet relations with the USA at the time and their willingness to take risk. This possibility finds very strong support among 85% of respondents, namely, that the Soviet Union is likely to increase its involvement in the Middle East in case of a declared nuclear armed Israel under favourable circumstances.

A fifth possible Soviet response is to disengage from the Arab-Israeli conflict if the Soviet Union believed that benefits are far less than costs and risks of such Soviet involvement in a radically different environment.[210] But considering the strategic importance of the Middle East region and the Soviet interests in the area, this would imply a willingness to lose such interests and influence in the Arab world. However, one would not expect such a response from the Soviet Union in an area of such importance and involvement with the USA

> "The United States and the Soviet Union will continue to have interests in various parts of the world for all of the old political, economic and military reasons. In a region where nuclear powers are

(210) Aron, The Great Debate, op. cit., p.239.

> locked in dispute, the great powers will move cautiously but not move out."[211]

Others argue that considering the pattern of Soviet behaviour in the Middle East, the Soviets could hardly afford to keep away from the Arab-Israeli conflict.[212] But this does not imply that the Soviet reaction would be to commit themselves without considering the risks involved, especially of a possible nuclear confrontation with the USA. The odds seem to be in favour of a possible positive Soviet involvement but cautiously with a 'playing it safe attitude' for fear of risks of confrontation with the USA. There is a consensus of opinion among experts that Soviet disengagement from the Arab-Israeli conflict in case of a declared nuclear armed Israel is highly unlikely. It appears that the possible overall Soviet response to a declared nuclear armed Israel would not be vigorous as some people believe. Just under half of respondents believe this Soviet response would not be vigorous. The most likely response would be to provide some of the Arab states with limited security guarantees and an increased Soviet military and political involvement in the Arab-Israeli conflict. There are several reasons for this possible Soviet response. One is the fact that the Soviet Union knew about the Israeli nuclear weapons

(211) Waltz, 'What Will the Spread of Nuclear Weapons Do to the World', op. cit., p.190.

(212) Freedman, 'Israel's Nuclear Policy', op. cit., p.18; Haikel 'Frankly Speaking', op. cit.

programme and did nothing about it as was the case with the Indian nuclear explosion. The second is that the Soviet Union has virtually no positive political influence on Israel and the only possible influence it has is to pressure the USA to take actions against Israel. Thirdly, the Soviet Union fears that using force against Israel could lead to direct confrontation with the USA.[213] Finally, the Soviet Union has been extremely cautious and shown less willingness than the USA to take unnecessary risks in the Middle East.

Joint American-Soviet Response

One also needs to consider a joint response by the two Superpowers regarding a nuclear Middle East based on the Superpowers' common interest in preventing nuclear war. Possible joint responses could be a joint intervention to disarm Israel and the Arab states nuclear weapons, a comprehensive agreement to ban nuclear weapons in the region and a joint declaration that they would act in concert against any state using nuclear weapons first. Feldman argues that the several elements which constrain both the Superpowers unfavourable response to a declared nuclear armed Israel are likely to prevent them from adopting a wide ranging response together.[214] Secondly, because the basic interests of the two Superpowers in the Middle East are different, the prospects for Superpower cooperation in the region are slim

(213) Gallois, The Balance of Terror, op. cit., p. 41.

(214) Feldman, Israeli Nuclear Deterrence, op. cit., p.235.

> "The assumption of coordinated action would have to be based on the possibility that the mutual interest of the Superpowers in non-proliferation out weighed other elements of political competition between them"[215]

Nacht contends that the interests that have for long connected the Superpowers to their client states are more important indicators of future behaviour in a nuclear environment than the act of nuclearization itself.[216] Nevertheless, the conflicting interests of the Superpowers relationship which is described as 'adverse relationship' could equally be seen as cooperative conflict.[217] This is because the use of force by the Superpowers or their allies comes with enormous dangers and so they have a common interest in avoiding the use of nuclear weapons. However, the different and conflicting interests might hinder any joint American-Soviet response, especially under circumstances when their relations are under strain. Moreover, a joint action in the Middle East would require a full Soviet participation on an equal footing with the USA in the Arab-Israeli conflict, one thing the USA has tried to

(215) Williams, The US, India and the Bomb, op. cit., p.11.

(216) Nacht, 'The United States in a World of Nuclear Powers', op. cit., p.164.

(217) Bell, Coral., '<u>The Conventions of Crisis: A Study in Diplomatic Management</u>, (London: Oxford University Press, 1971), p.50; Shulman, Marshall D., <u>Beyond the Cold War</u>, (New Haven: Yale University Press, 1966), pp.100-1.

avoid. Domestic political factors in the USA may also play a part in opposing any joint action against Israel. Finally, a joint action by the two Superpowers involves policing activities of an unprecedented dimension which could face world wide opposition, resistance and condemnation. On the other hand, Gampert believes that the situation would be radically different after the first use or serious threat to use nuclear weapons is made.[218] Under such circumstances the cost calculations of the two Superpowers will be different and there is a possibility that they would cooperate in taking action to disarm a local power that used nuclear weapons first by destroying its weapons in space perhaps using laser weapon sattelites.

It seems that the chances of a joint American-Soviet response to a nuclear Middle East are limited because of the conflicting interests of the two Superpowers in the Middle East, difficulties of joint responses in a regional nuclear environment, the strong US commitment to Israel and that both the Superpowers know of Israel's nuclear weapons programme and they have done nothing about it. Two in five respondents believe that the chances of a joint Superpower response are very limited under any circumstances. The majority of the respondents consider the possibility of a joint intervention to disarm Israel or the Arab states is out of the question as well as that the Superpowers would disengage themselves from the Arab-Israeli conflict.[219]

(218) Gompert, Nuclear Weapons and World Politics, op. cit., pp.234-35.

(219) It is interesting to note that only small proportion 20% support the view that the Superpowers would intervene only if they have a joint interest.

However, the respondents give greater weight to the possibility of a joint agreement to ban nuclear weapons in the Middle East under favourable circumstances.
To sum up, a joint American-Soviet response to a nuclear Middle East is difficult to imagine because of the conflicting interests of the Superpowers, difficulty of working out a joint plan or operation and it is dependent on the state of the two Superpowers' relations at the time but the possibility cannot be ruled out under unprecedent circumstances.

Superpower Confrontation

It is argued that the neglect of the social dimension in foreign policy may at least partly explain the present inability of the Superpowers to influence and control events in unstable regions of the Third World.[220] This is because local events are so complex; they hardly ever lend themselves to external influence and control. Yet they can have wider political and security implications. This could place the Superpowers in a situation in which they are increasingly compelled to intervene in local conflicts with the risks of confrontation and escalation. In a multi-nuclear world, control of events and allies are more difficult and the Superpowers may agree to some more explicit concerting, if not action in common.

"Soviet leaders, like their
counterparts in the United States,

(220) Strategic Survey, 1978 (London : International Institute for Strategic Studies, 1979), p.1.

> expect well defined areas of cooperation and less clearly marked areas of conflict to characterize bilateral relations in the foreseeable future."[221]

The foremost area of cooperation has been and is likely to remain the prevention of nuclear war. This major concern to avert nuclear war led to the most important document of the Superpower relations 'The Basic Principles of Relations' which laid considerable emphasis on confrontation avoidance.

> "The USA and the USSR attach major importance to preventing the development of situations capable of causing dangerous exacerbation of their relations. Therefore, they will do their utmost to avoid military confrontations and to prevent the outbreak of nuclear war. They will always exercise restrain in their mutual relations, and will be prepared to negotiate and settle differences by peaceful means. Discussions and negotiations on outstanding issues will be considered in aspect of

(221) Wessell, Nilsh., 'Soviet Views of Multipolarity and the Emerging Balance of Power', Orbis, Vol 22, No 4, Winter 1979, pp.786 - 813.

reciprocity, mutual accommodation
and mutual benefit."[222]

In addition, the two Superpowers acknowledged that 'in the nuclear age there is no alternative to conducting their mutual relations on the basis of peaceful coexistence' and that attempts by either one 'to obtain unilateral advantage at the expense of the other directly or indirectly are inconsistent with these objectives'. This declaration with the Agreement on Reducing the Risk of Nuclear War and the Agreement on the Prevention of Nuclear War of 1973, suggest that the desire of the Superpowers to avoid future confrontations is a significant factor in their calculation. But this does not imply that the Superpowers will succeed in avoiding situations in which one side makes gains or achieves objectives at the expense of the other. There would remain the possibility that on occasions the conflicting interests will play a major role. Similarly, one would expect neither of the Superpowers to refrain from all opportunities to obtain unilateral advantage at the expense of the other. However, in circumstances where both are deeply involved and where the absence of restraint by either would lead to confrontation, then the avoidance of nuclear war agreement is likely to be adhered to and attention will be directed to crisis management.[223] If either of the two Superpowers believe that it can make

(222) Agreement on Basic Principles on Relations Between the USA and the USSR, Department of State Bulletin, 26 July 1974.

(223) Williams, Crisis Management, op. cit., p.206.

substantial gains with little cost, the adherence to the agreement would be less relevant. But miscalculation could occur in such circumstances.

Crisis management, therefore, is likely to be more relevant in Superpower relations though current emphasis on confrontation avoidance, especially in cases where the Superpowers will be sucked into confrontation by their client states. This was best demonstrated during the Arab-Israeli War of 1973

> "The injunction to avoid involvement on opposite sides is difficult to fulfil because present conditions facilitate progressive commitment, because local conflicts often provide opportunities for Superpower gains, because local leaders often manoeuvre to commit one or both of the Superpowers to their side, because secondary powers may make tacit Superpower collusion difficult and because ideological dispositions of local regimes may naturally divide the Superpowers."[224]

This means that confrontation and conflict between the Superpowers may be unavoidable.

Conflicts in the Third World are widely accepted as the

(224) Spiegel, Steven L., Dominance and Diversity (Boston: Little, Brown, 1972), p.236.

main factor undermining Superpower relations because the great powers have for long realized that direct confrontation would be extremely dangerous and suicidal. So they attempted to avoid confrontation on central issues of their relations. This creates an impression that the major source of danger is in the Third World since the situation there is very volatile and the great powers have strategic interests in the Third World. But conflicts in the Third World are not the only principal source of danger and the course of events there depends to a large extent on the state of Soviet-American relations. It is obvious that certain crises in the Third World, as soon as one of the two Superpoers is involved, can affect the strategic balance.[225] But the effect on the central balance is basically a function of the two Superpowers' delicate assessment of their own interests. The question of the influence of crises in the Third World on the strategic balance is normally thought of in connection with the risk of conflict escalation; to what extent a local crisis could turn into a global one. The slide to global crises as a result of Superpower commitment entails the risk of escalation. In case the actions of local parties drag the Superpowers deep into conflict in which the stakes do not seem vital for either of them, the Superpowers could then come close to a nuclear confrontation. They would probably resort to Article IV of the Agreement on the Prevention of Nuclear War which provides for such a contingency.

(225) De Montbrial, 'Perception of Strategic Balance and Third World Conflicts'; op. cit., p.92.

"If at any time relations between the Parties or between either Party and other countries appear to involve the risks of a nuclear conflict or if relations between Countries not Parties to this agreement appear to involve the risks of nuclear war between the United States of America and the Union of the Soviet Socialist Republics or between either Party and other countries, the United States and the Soviet Union, acting in accordance with the provisions of this agreement, shall immediately enter into consultations with each other and make every effort to avert this risk."[226]

However, the Superpowers might react in an unpredictable manner, and undesired nuclear confrontation, and perhaps, exchange, could very well occur.

There are two important considerations that influence the willingness of Superpowers to risk precipitating a crisis with each other. The first is their assessments of

(226) Agreement Between the USA and the USSR on the Prevention of Nuclear War, Treaties and Other International Acts, Series 7654, (Washington, D.C.: US Department of State, 1973), Article IV.

interests and gains and losses. If the issues at stake are vital, it is less likely to refrain from taking steps leading to collision with the adversary. The second is their assessment of the risks of war involved in projected actions and the extent to which these are regarded as controllable. Williams argues that there is an inverse relationship between the probability of disaster should a crisis erupt, and the willingness to risk provoking confrontation in the first place.[227] So, the more confident the Superpowers are of their ability to defuse a crisis, the more likely they will become involved in such circumstances. However, in some crises the Superpowers may see no alternative to becoming involved, given the importance of the issues at stake. The Middle East crises of 1967 and 1973 best demonstrate such cases.

The crisis of the Arab-Israeli War of 1967 showed that the two Superpowers were in agreement on non-intervention. The USA went to a great length to refute allegations that American and British aircraft carriers had intervened on the side of Israelis.[228] Both the Superpowers made it clear that they were not prepared to go beyond indirect military intervention and diplomatic manoeuvres despite their vital interests and commitment, which they were prepared to sacrifice or relinquish. However, several threats of military intervention were made when the Soviet Union warned the USA on 10 June, 1967 of the consequences of Israeli

(227) Williams, Crisis Management, op. cit., pp.108-9.

(228) Howe, Jonathan T., Multicrises: Sea Power and Global Politics in the Missile Ages, (Cambridge, MA: MIT Press, 1971), p.99.

violations of the Security Council ceasefire resolutions.[229] The USA responded positively by putting pressure on Israel to adhere to the ceasefire resolutions. But, without the positive American response, the Soviets would have probably made further moves short of intervention. Howe argues that the threat of intervention was designed basically to ensure that intervention would be unnecessary.[230] The behaviour of the Superpowers during the Arab-Israeli War of 1973 was in many respects similar to that of the crisis of 1967. The reluctance to intervene militarily prevailed intact even when the Soviets began to make strong protests regarding the Israeli refusal to observe the ceasefire of 22 October 1973, supplemented by visible military preparations for intervention. The Soviet threat of intervention was probably intended to ensure Israeli observance of the ceasefire and respond positively to Egypt's call for intervention to enforce the ceasefire.

The Soviets visible preparation indicated that if there was no agreement on a superpower peace-keeping arrangement, then they would intervene unilaterally.[231] Laqueur argues that these military preparations and diplomatic messages to the USA were probably designed to ensure American pressure to restrain Israel and thereby eliminated the need for Soviet

(229) Johnson, Lyndon B., The Vintage Point: Perspectives of the Presidency (New York: Popular Library, 1971), pp.302-3; Howe, Multicrises, op. cit., pp.116, 105-8.

(230) Ibid., p.11.

(231) Bell, Coral., 'The October Middle East War: A Case Study in Crisis Management During Detente, International Affairs, Vol 50, No 4, Oct 1974, pp.531-43.

threat.[232] Again, the USA responded by increasing efforts to bring about strict observance of the ceasefire. Kissinger explained the risks and costs involved in direct military confrontation 'it would be disastrous if the Middle East, already torn by local rivalries would become...a legitimized theatre for the competition of the military forces of the great nuclear powers'.[233] The lesson learned from the Superpowers' apparent confrontation was that threats and materials assistance are permissible, but not direct military intervention.

Indeed, the Middle East provides a particularly dangerous area for Superpower confrontations since both sides have a great deal at stake. The USA has committed itself to supporting Israel since its foundation in 1948. The Soviet Union's involvement which came later has become equally substantial. The possibility of a Superpower disengagement from the Middle East is highly unlikely though the Superpowers are aware of the dangers involved.

> "The Middle East may become what the Balkans were to Europe. An area where local rivalries ... draw in the great powers into confrontations they did not necessarily seek or start."[234]

(232) Laqueur, Walter., Confrontation: The Middle East and World Politics (New York: Bantom Books, 1974), pp.182-206; See Mackintosh, M., The Impact of Middle East Crisis on Superpower Relations, Adelphi Paper No 114, p.3

(233) US State Department, Transcript of Secretary of State Press Conference of 25 October 1973, US Information Service, p.7.

(234) Newsweek, 22 October 1973, p.2.

However, there is an inherent danger in crisis management that it may fail to prevent war. Williams explains that there are several causes for such failure.[235] First because both sides deliberately take excessive risks in the bargaining risks. Second, because there may be a considerable element of surprise in the bargaining strategy. Third, because each state miscalculates the intentions of the other. Fourth, because there are elements of uncertainty in the very nature of a crisis which is volatile, explosive, spontaneous and full of ambiguity. Fifth, because the decision making process maybe in some aspects defective or ineffective. Finally, because Parties may have limited freedom of action under conditions of coalitionary crisis management. Though he praised the Superpower behaviour in avoiding nuclear exchanges during confrontations, he doubted whether they would be able to do that in the future.[236] A crisis situation can get out of hand and lead to war despite serious efforts to avert the outbreak of war. There are three dangers in a crisis situation. First, crisis management may go wrong with serious consequences. Secondly, the Parties may lose control of events. Thirdly, the Superpowers may lose control of the actions of allies and client states. This is possibly the case of a crisis situation in the Middle East because some of the states in the region are not readily amenable to the direction and control of the two

(235) Williams, Crisis Managaaent, op. cit., pp.94-95.

(236) Ibid., p.169.

Superpowers. Israel and Egypt's actions prior to the 1967 War showed both were disregarding Superpower directions and warnings.[237] Nasser went ahead to blockade the Gulf of Aqaba despite Soviet disapproval and Israel attacked Egypt in disregard of US advice and request.

The crisis of 1973 undoubtedly demonstrated that the two Superpowers hurried to support their client states and that they were responding to events rather than controlling them and also that war in the Middle East is decided locally and not by Superpower policies. It showed once more the need for crisis management. Because Soviet and the US readiness to intervene led to escalation of the conflict to direct Superpower confrontation in a very short period of time. The two Superpowers possibly learned that they were dealing with small countries capable of taking decisions to wage war with less regard to escalation, decisions which affected the Superpowers. The nuclear confrontation between the two Superpowers emphasised the need for Superpower cooperation in order to deal with a crisis of such magnitude. The Superpowers, in a crisis situation, are more likely to be averse to giving 'blank cheques' to allies and client states and to try to prevent any moves by the latter involving them in a position from which it is impossible for them to disentangle themselves. It is hard to imagine mechanisms of extreme crisis escalation that would lead automatically to a direct Superpower confrontation unless the conflict involved stakes they consider vital. The

(237) Howe, Multi Crises, op. cit., pp.74,145.

outcome of Superpower confrontations is determined not merely by the bargaining skills of the two parties but also by what Williams described as 'contextual, structural or situational factors'.[238] However, in all nuclear confrontations, the greater the interests at stake for any power involved, the greater the risks that that power will be prepared to take.[239]

It seems that a crisis situation in a nuclear Middle East would not radically affect the strategic balance. Though the risks of escalation to nuclear confrontation between the two Superpowers are real possibilities, and could have serious consequences for the Middle East and global security and stability, the chances of nuclear exchange between the two Superpowers appear to be far lower than has often been stated. However, no one can be certain of the outcome of Superpower confrontation resulting from a crisis situation in a nuclear Middle East. Past patterns of behaviour of the Superpowers in 1967 and 1973 survived the test because of caution, determination and accommodation of the two Superpowers. The odds are in favour of a positive outcome, since one would expect the two Superpowers to show more caution and restraint in a nuclear Middle East than they did in a pre-nuclear one. However, it may transpire that the rules are completely different in a nuclear Middle East than in a pre-nuclear one. Only one in five of

(238) Williams, Crisis Management, op. cit., p.153.

(239) Osgood, R.E. and R.W. Tucker, Force, Order and Justice (Baltimore: Johns Hopkins University Press, 1967), p.148; Maxwell, S., Rationality in Deterrence', Adelphi Paper No 50, (London: International Institute for Strategic Studies, 1968), p.13.

respondents believe that a nuclear exchange between Israel and the Arab states would fairly likely affect radically the strategic nuclear balance between the two Superpowers. There are several reasons for this likelihood, such as a common interest of the Superpowers to avoid nuclear war and contain dangerous conflict; the Superpowers would only use nuclear weapons against each other if one is convinced that the other is about to launch a nuclear attack upon it. The use of nuclear weapons in the Middle East would be a dramatic break of the 41 years moratorium on the use of nuclear weapons but it would not necessarily lead to global nuclear war, perhaps it would reinforce rather than weaken reluctance to use nuclear weapons.

In conclusion, it seems that the risks of nuclear war in a nuclear Middle East are essentially at three levels. The first level is concerned with the risks related in particular to the Middle East and other similar regions of the world. The second level of risks focuses on the possible responses of the major nuclear powers to nuclearization of the Middle East states. The third level is related to the risks of Superpower involvement in a Middle East nuclear conflict escalating to nuclear confrontation. Some of the risks at the first level are less worrisome than others such as a low level of rationality, weak conceptualization of use of weapons, accidental and catalytic war and nuclear terrorism. However, the risks of the vulnerability of command and control centres and weapons, difficulty of controlling escalation, miscalculation and pre-emptive and preventive strikes would remain major sources of concern. The possible responses of the major nuclear powers to the nuclearization of the Middle Eastern states are more likely to emerge in the form of strong protests, pressures and threats than in direct military intervention. The risks of a Middle East nuclear conflict escalating to a Superpower nuclear confrontation is a very real and serious risk but it would not necessarily lead to nuclear war between the two Superpowers. A nuclear exchange in the Middle East is more likely to be a regional tragedy and a very unpleasant contingency rather than a global holocaust. However, use or threat of use of nuclear weapons in the Middle East would be a serious danger to regional and global security of unprecedented magnitude. We just do not know the rules of the nuclear game between local powers and between parts of a regional system, or between other regional systems and the global system.

CHAPTER SIX

Survey of the Likelihood of Risks of Nuclear War in The Middle East

Introduction

Whether the spread of nuclear weapons undermines or stabilizes international politics has been a matter of debate in the literature. Applying the Superpowers illustration to other cases, such as the Arab-Israeli conflict area, some argue that proliferation would result in stablization. However, most analysts take the opposite view. They contend that one should not be very sanguine about the Superpowers relationship proving the case of stability. This relationship is based on an elaborate code of conduct that evolved by mutual consent over the years. Whether new nuclear weapons powers would show the restraint displayed by the two Superpowers over the last three decades remains to be seen. But so long as nuclear weapons exist, there will always be some chance of their use. Though few believe that any objective could justify the loss of millions of people or the end of life on earth, many would support actions that might increase the likelihood of a nuclear war if that preserves their way of life or avoids widescale conventional war. Some risks are unavoidable.

How likely is a nuclear war? In order to answer this question an assessment of the risks of nuclear war needs to be made. Several attempts have been made to predict nuclear war based on mathematical probabilities and development of scenarios of hypothetical circumstances under which nuclear war might occur. More recently, Britten has identified three main approaches to the assessment of risk.[1] The first one called the historical method in which the number of accidents per unit of time is recorded. Though this approach has some validity when the events are reasonably frequent, it is not useful when assessing the risk of an event which has never happened. The second approach is called Fault Tree analysis. It concerns the study of individual component failure rates and their further effects upon larger systems of which they are part. However, no one can be sure that the Fault Tree covers all eventualities and may therefore be incomplete or inadequate. Furthermore, irrational behaviour or terrorism is rarely represented in fault trees. It is useful in understanding component failures, but does not cover or assess all risks. The third approach is human factor analysis which is the attempt to measure the error rates of human operators under different circumstances. It is based on the argument that all system failures result from human error. However, attempts to chain together task error rates into a human fault tree are limited and could be misleading. This is because it assumes that an error in one task makes it no more likely that there will be an error in a subsequent task. Humans are affected

(1) Britten, S., The Invisible Event : An Assessment of the Risks of Accidental or Unauthorized Detonation of Nuclear Weapons and of War by Miscalculation (London: Menard Press, 1983)

by their own failures and when under stress or in a hurry can make serious error of judgement. When it is important to make a decission under a complex and uncertain situation, they tend to be unable to work out fully all the statistical probabilities and fall back on the rule of thumb.[2]

Accidents can happen even in tried and tested systems which often involve an anticipated sequence of events which have otherwise been avoidable ones. Human fallibility, irrational behaviour and terrorism, all constitute substantial risks. Imaginative construction of possibilites laying within boundaries of plausibility is concerned only with what might happen. However, there will be too many of these possibilities and their outcomes will be too vaguely determined for useful consideration. Model-building and simulation require sophisticated knowledge of interrelations of various variables. The processes of a system can be modeled or simulated appropriately only if its causal principles and laws of operation are sufficiently well understood to be incorporated into the working of the model. Considering the inability of the available approaches and techniques to predict and assess the likelihood of risks of nuclear war due to statistical ignorance and lack of a patterned historical regularity to observe and study, charting the likelihood of risks of nuclear war remains a matter of judgement.[3] One therefore

(2) Tversky, A. and Kahneman, D., 'Judgement Under Uncertainty: Heuristics and Biases' Science, 185, 1974, pp. 1124-31.

(3) While the exact probabilities cannot be determined, there is certain degree of reliability within boundaries of magnitude of these risks. In this sense, prediction can be made about the magnitude of tha risks of nuclear war.

needs to seek the judgement of specialists to arrive at a more realistic assessment of these risks. In this area, there are specialists not experts. The world has no experience with nuclear war (with th exception of 1945). Their judgement is based on more careful and sustained appraisal than others.

Elliciting the opinions of individual specialists with respect to anticipated future developments has the advantage of requiring not inspired but just well informed people. However, its disadvantage is obvious, the views of one specialist are likely to differ from those of another due to differences in training, orientation to the field and personal interpretations and like which undermine the utility of the opinions of individual specialists. Though this variance may lead to the emergence and increase in the number of relevent considerations. The traditional method for overcoming this disadvantage is to determine the collaborative position of a panel of specialists. But here other difficulties hide in the very nature of group dynamics. Specialists too are only human. It is all too easy for the views of the most influential, respected and articulate member of the group to prevail. It is desirable to resort to consensus methodology for sampling impersonal specialist opinion. The consensus methodology of questionnaires with controlled information feedback (Delphic Method) has the great advantage of reducing idiosyncratic bias from specialist opinion. In this sense, assessment of an individual specialist is good, a panel assessment is better and a structured consensus assessment is best.

The Delphic technique which was developed at the Rand Corporation in 1950 by Dalkey and Associates,[4] has employed the use of experts in order to arrive at consensus on the likelihood and timing of specified future events. These experts were queried independently on repeated questionnaires with feedback supplied between rounds concerning the group's comments and responses. Using experts (specialists) as panelists, one would presume then that, given a problem of a generally judgemental nature, the credibility of the panelists would be high. It is useful in reducing untoward sociopsychological influences, in part because of the anonymity involved. Delphic output is in no way definitive but rather a probabilistic appraisal of future events occuring. However, its main disadvantages are that it is administratively complex and takes a long time. The selection of experts can be problematic and a common misunderstanding of questions may occur. However, despite the weakness of the consensus methodology of reflecting opinions in predicting the future, it remains the most useful one with a proven record.[5] Without explicitly recognizing some important characteristics of the future, it is difficult if not impossible, to obtain useful information about assessments of the future. The Study takes the Delphic Method as the starting point and goes a step further

(4) Dalkey, N. and Helmer, O., 'An Experimental Application of the Delphic Method to the use of Experts' Management Science, 9, 1963, pp. 458-467.

(5) Bright, James R., ed Technological Forecasting for Industry and Government (Englewood, Cliffs, N. J. : Pentice-Hall, 1968); Fusfeld, A. and Foster, R., 'The Delphi Techniques: Survey and Comments', Business Horizons, 14, 1971, PP 63-74.

different parts of the world with various backgrounds and orientation. It is also comprehensive because its target is the by broadening the scope of specialist opinion through the use of a sample survey. The advantage of this method is that it allows for inclusion of specialist opinion from population of specialists in the field.[6] Furthermore, it provides a consensus of opinion on propositions and hypotheses outlined in the literature. The propositions of the risks of nuclear war in the Middle East have been put to a sample of specialists of nuclear strategy, nuclear proliferation and Middle East politics from different parts of the world to assess the likelihood of these risks.

Some Key Propositions in the Literature

Writers on the risks of nuclear war have identified six possible routes to nuclear war. The first route is a surprise attack, in case of the adoption of a counterforce strategy and because of the temptation to attack embryonic nuclear weapons of an adversary (Intriligator and Brits, Nuclear Proliferation and Probability of Nuclear War, P 256). The second route is a pre-emptive strike in a crisis situation launched in the belief that an adversary intends to strike soon and because of the temptation to strike first in case of lack of invulnerable delivery systems (Beres, Apocalypse, P 81). The third route is accidental or unauthorized use of nuclear weapons due to human fallibility

(6) Conceptual definition of an specialist (expert) is a knowledgeable and acknowledged person in the nuclear domain, Operational definition is measured in terms of the institution or organization to which the specialist belongs, his position and number of publications,

and machine malfunction (Fei, Risks of Unintentional Nuclear War, PP 155-56). The fourth route is catalytic war triggered deliberately or accidentally by actions of a third party - state or terrorist group (Beres, Apocalypse, P 87; Waltz, More May Be Better, P 13). The fifth route is escalation of conventional war to nuclear war because of the temptation to use nuclear weapons when the losing side possesses nuclear weapons or is allied with a nuclear weapons power (Schell, Fate of the Earth, P 191). The final route is a local nuclear war leading to global nuclear confrontation (Calder, Nuclear Nightmare, PP 19-20). However, the increase in the number of countries with nuclear weapons is cited as the one plausible route to the outbreak of a nuclear war because of fears that the new nuclear weapons states may be ruled by radical or irrational leaders and could be politically unstable and that major nuclear powers might be called upon to act in such a situation (Waltz, More May Be Better, P 10; Barnaby, The Nuclear Arms Race, P6). The overall assessment of these risks of nuclear war based on the experience of the two Superpowers varies between low in the case of accidental use and high in the instance of escalation of conventional war to major nuclear war during a crisis and international tension (Kahn, On thermo-nuclear War, P 467; Independent Commission on Disarmament and Security Issues, Common Security, P 46).

However, most analysts believe the most plausible route to nuclear war is escalation of a local conventional war in a crisis situation and combination of risks leading to major nuclear war (Barnaby, Prospects for Peace, P 4; Jabber, A Nuclear Middle East, PP 92-93). The risks of nuclear war are higher when routes to nuclear war occur in combinations. Risks of war in a crisis situation prone to accidents and mistakes and loss of control are higher than a single incident. The involvement of the Superpowers in a local conflict in the Third World such as the Arab-Israeli conflict area could lead to escalation and global confrontation in a crisis situation due to loss of control of events and actions of allies and client states (Williams, Crisis Management, P 17; Snyder, Crisis Bargaining, PP241-2).

In fact, most analysts assume that proliferation would increase the probability of nuclear war because new nuclear weapons states might be ruled by leaders less capable of controling nuclear weapons and some of these potential states are not politically stable to ensure control of the weapons and their use. The major nuclear powers might be called to intervene more frequently in such a situation. Nuclear accidents and unauthorized use are believed to increase with proliferation as well as opportunities for nuclear terrorism (Dunn, Nuclear Proliferation and World Politics, P 98; Schelling, Who Will Have the Bomb, PP 84-86). In this context, the Arab-Israeli conflict is considered the most likely candidate for the outbreak of nuclear war .

Propositions Which Predict Probability of Nuclear War in the Middle East

In general, the probability of nuclear war is assumed to be substantially higher in the Middle East than anywhere else (Harkavy, Spectre of A Middle East Holocaust, P1). This prediction is based on several assumptions about the absence of formal relations and the lack of rules of nuclear conduct and the intense involvement of the two Superpowers. A long tradition of war and violence may lead to the use of nuclear weapons (Evron, Some Effect of Introduction of Nuclear Weapons, P 107). In contrast, there is another proposition which predicts the probability of war to decrease with the introduction of nuclear weapons in the Middle East. It is based on the evaluation of the experience of the Superpowers and that the fears expressed are exaggerated and unsubstantiated as well as that the long tradition of war would have no impact on patterns of behaviour (Feldman, Israeli Nuclear Deterrence, P 150; Waltz, More May Be Better, P 30). Both contrasting propositions predict different probabilities and likelihoods of the outbreak of war based on various assumptions and inconclusive evidence.

The first assumption upon which these predictions are made is the level of rationality among Middle Eastern leaders (Dowty, Israel and Nuclear Weapons, P 20; Evron, Letter to the Editor, P 6). The second assumption is that the level of conceptualization of use of nuclear weapons is low due to the lack of a code of nuclear conduct (Pragner and Tahtinen, P 3). These fears of a worse outcome were rejected on the grounds that this code could emerge after the development of the weapons as was the case of all previous nuclear weapons powers (Feldman Israeli Nuclear Deterrence, P 148). The third assumption is that the conflictual pattern of behaviour might have an impact on the likely behaviour of the political and military establishments (Evron, Some of the Effects of Introduction of Nuclear Weapons , P 107). This could lead to the development of a 'more of the same' attitude towards nuclear weapons and their use. The fourth assumption is that control of nuclear weapons would be weak and so increases the probability of accidental and unauthorized use of nuclear weapons. This risk is considered higher in the new nuclear weapons states than in the existing nuclear weapons powers because of the absence of a carefully designed chain of command and control system, weapons safety devices and the question of loyalty of the military to civilian control (Waltz, More May Be Better, P 12; Dunn, Nuclear Proliferation and World Politics, P 98). However, these fears are questioned on the basis that because nuclear weapons are small they are easy to protect and control and that political control decreases due to long chain of command (Rosen, A Stable System of Mutual Deterrence, P 1380). The fifth assumption is that command and control centres would be highly vulnerable to attack and might lead to adoption of an early-use strategy because these centres would be less sophisticated and less protected (Aron, The Great Debate, P 117). The sixth assumption deals with the difficulty of controlling escalation in a proliferated world as stability decreases with every increase in the number of powers in the system (Deutch and Singer, Multipolar Power Systems). This increase makes achieving a stable balance of forces difficult and creates further difficulty in controlling escalation (Kohl, French Nuclear Diplomacy, P 154). The seventh assumption is the problem of miscalculation in a multinuclear world created by the fact that the degree of attention each power in the system can allocate to each of the other powers decreases with every increase in the number of powers in the system. This situation leads to miscalculation. However, this assumption is rejected on the grounds that nuclear weapons make miscalculation difficult because of the mere fact of the damage nuclear weapons can inflict (Waltz, More May Be Better, P 30). The eighth assumption is catalytic war in which small powers might involve the Superpowers in a global confrontation against their will (Long, Nuclear Proliferation, P 52; Calder, Nuclear Nightmares, P 79) or unintended attack which might lead to war due to an incorrect perception (Beres, Apocalypse, P 87). The past pattern of behaviour of some Middle Eastern countries is believed to have preconditions for catalytic war behaviour (Evron, Some of the Effects of Introduction of Nuclear Weapons , P 116). The nineth assumption is nuclear terrorism which might lead to the accidental use of nuclear weapons (Wohlstetter, Terror on Grand Scale, PP 100-1). There are three views about the impact of nuclear weapons on terrorism: no impact, an increase in terrorism (Jabber, Israel and Nuclear Weapons, PP 204-6) and a decrease in terrorism (Feldman, Israeli Nuclear Deterrence, P 134). The tenth assumption is that the probability of pre-emptive and preventive strike increases with proliferation because of the temptation to knock out their small and vulnerable weapons (Intriligator and Brits, Nuclear Proliferation and Probability of Nuclear War, P 256). However this temptation would be prevented by political considerations and the difficulty of achieving success in accomplishing these strikes (Jabber, A Nuclear Middle East, PP 92-93; Waltz, More May Be Better, P 17). The eleventh assumption is the possibility of the development of a nuclear coalition of Arab states which Israel might not be able to match (Evron, Some of the Effects of Introduction of Nuclear Weapons , PP 116-20; Dowty, Nuclear Proliferation, P 99). This assumption is challenged on the basis that the relative vulnerability of Israel compared to the Arab states might not be true (Freedman, Israel's Nuclear Policy, P119).

Propositions About Superpower Opposition and Response to Nuclearization in the Middle East

The Superpower opposition to nuclear proliferation in the Middle East is based on several assumptions. The first one is that proliferation increases the likelihood of nuclear weapons use because proliferation increases the chances of accidental war (Williams, the U.S., India and the Bomb, P 7). The second is that small nuclear powers might involve the Superpowers in major nuclear war against their will (Long, Nuclear Proliferation P 52). The third one is that proliferation requires the Superpowers to intervene more often in local conflicts to avert the risk of nuclear confrontation (Rosecrance, The Dispersion of Nuclear Weapons, P 310). The fourth one is that proliferation might lead to a global redistribution of power and erosion of the bipolar system (Buchan, A World of Nuclear Powers, PP 3,92).

However, despite US opposition to nuclear proliferation in the Middle East because of fear of confrontation with the Soviet Union and its implication on the non-proliferation regime and US relations with its allies in the area, it is assumed that the US response to a nuclear-armed Israel would be limited (Feldman Israeli Nuclear Deterrence, P 211). This is based on the strategic importance of Israel in US policy and US inability to control Israel's nuclear development and the transfer of technology, arms and finance to Israel.

On the other hand, the Soviet response to a nuclear-armed Israel is assumed to be vigorous based on stringent and consistent Soviet opposition to proliferation (Fischer, Nuclear Issues, P viii). There are several assumed Soviet responses to this nuclearization. The first is that a pre-emptive or preventive strike against Israel's nuclear weapons is unlikely (Mangold, The Soviet Record in the Middle East, P 102). The second is that to supply the Arab states with weapons is doubtful (Quandt, A Decade of Decisions, P 193). The third is to offer the Arab states nuclear security guarantees on strict conditions (Freedman, Israel's Nuclear Policy, P 18). The fourth is to increase its level of political invovement in the Arab-Israeli conflict as a result of Arab pressure (Dowty, Nuclear Proliferation, P 193).

Furthermore, it is assumed that a joint Soviet-American response is plausible and possible in the shape of a joint intervention to remove Middle Eastern nuclear weapons, a compehensive agreement to ban nuclear weapons in the area and a joint declaration that they would act in concert against the first use of nuclear weapons (Gompert, Nuclear Weapons and World Politics, PP 234-35). However, this assumption of a possible joint Superpower intervention is challenged on the basis of constraints on Superpowers (Feldman Israeli Nuclear Deterrence, P 235) and that the Superpowers' interests in the area are at odds (Williams, the US, India and the Bomb, P 11; Nacht, The United States in a World of Nuclear Powers, P 164). But Gompert believes the situation would be radically different after the first use or serious threat to use nuclear weapons is made. Under such circumstances the cost calculations of the two Superpowers will be different and there is the possibility that they would cooperate in taking a joint action.

The overall impact of nuclearization on the Superpowers strategic balance is assumed to lead to global nuclear confrontation because of the Superpowers intense involvement in the Middle East and the risks involved in crisis management (Williams, Crisis Management, PP 108-9). The slide to global crises as a result of Superpowers commitment entails the risk of confrontation. However, this is dependent on the Superpowers' assessment of risks and gains and their willingness to take risks. In this sense, the

Middle East is a dangerous area for Superpower confrontation as a crisis situation can get out of control (events and client states' actions).

Propositions About Israel and the Arab States' Responses to Nuclearization

The response of Israel to the Arab states' nuclear quest is assumed to take the shape of a pre-emptive strike against Arab nuclear installations and weapons, an improvement of its nuclear weapons capability and the search for nuclear and security guarantees from the United States. On the other hand, the Arab states' response to a declared nuclear-armed Israel is assumed to take shape in different forms. The first is the development of chemical and biological weapons. The second is to launch a pre-emptive strike on Israel's nuclear installations and weapons. The third is the development of a nuclear weapons capability. The fourth is to seek a nuclear security guarantee from the Soviet Union (or USA). Finally, the Arab states may continue to seek the establishment of a nuclear-free zone in the Middle East.

In general, the introduction of nuclear weapons in the Arab-Israeli area is assumed to be destablizing because nuclear weapons might be used in a future war in a crisis situation rather than being procured as a deterrent. However, this assumption is challenged on the grounds that nuclear weapons would be procured as a deterrent to counter a nuclear threat, against a sudden use in a pre-emptive or disarming first strike and would only be used under extreme conditions (political survival being at stake and total defeat is eminent). Furthermore, the introduction of nuclear weapons could be a source of hope and stabilization of relations (Waltz, More May Be Better, PP 28,30; Feldman Israeli Nuclear Deterrence, P229).

Sample Survey Design

The survey carried out to assess the likelihood of the propositions of nuclear proliferation and risks of nuclear war in the Middle East was designed to yield a representative sample of specialist opinion. Because of the sensitivity and complete secrecy surrounding the issue of nuclear proliferation in the Middle East, the sampling frame (population) was confined to specialists who contributed to the subject of nuclear strategy, nuclear proliferation and Middle East politics in the literature. Thus government officials were excluded. The sampling frame includes individual specialists in universities, research institutes and organizations, media and other defence and peace organizations, writers and distinguished personalities from North America, Western Europe, the Middle East and South East Asia [around 5,000 specialists]. The sampling method involved a multi-stage design with two separate stages of selection. The first stage involved selection of countries from North America, Western Europe, the Middle East, Australia and Asia, namely, the USA, Britain, Egypt, France, India, Pakistan, Canada, Norway, Switzerland, West Germany, Sweden, Australia and South Africa. The criterion used for selection of countries is based on the number of publications, universities, research institutes and organizations, media, peace organizations, and spcialists in each main region in the field of nuclear strategy, nuclear proliferation and Middle East politics. The second stage involved selection of individuals in these countries from universities, research institutes, defence and peace organizations, newspapers, magazines, periodicals, television and radio stations, other organizations and independent personalities. The criterion used for selection of individual specialists (sample) is based on the institution to which the specialist belongs, his position in the institution and the number of publications and contribution to the literature related to the scope of the study. Identical mail questionnaires were sent by post to 176 individuals (sample size) during the period November 1985-March 1986. The sample size is considered large enough to guarantee the accuracy of the results within a margin of error calculated by the formula

$$n = \frac{\pi (1 - \pi)}{[S.E. (P)]^2} \qquad (1)$$

Where 'π' is an estimate of a proportion of the population with some particular attribute. Adequate means were taken to ensure anonimity of the respondents and hence increase the rate of response. The questionnaire did not include personal information about the respondents and was accompanied by covering and introduction letters. The response achieved was sufficiently high enough (60%) to draw tentative conclusions. The rate of non-response was mainly due to refusal (8%) and (10%) for being unsuitable to answer the questionnaire at all despite a second reminder. However, there were regional variations in achieved response but it did not affect the overall precision of the results. This is because there is no significant difference in results obtained from different regions and taking into account the overall weighted average of all regions. The high level were in Britain (67%) and (56%) in the USA and the lowest in Israel and Egypt (10%).

No sample reflects precisely the characteristcs of the population it represents because of sampling and non-sampling errors. As far as sampling errors are concerned, it is calculated of percentage, P, using the formula

$$S.E. (P) \frac{P(1-P)}{n} \qquad (2)$$

Where 'n' is the number of respondents on which the percentage is based. Once the sampling error had been obtained, it would be a straight forward exercise to calculate a confidence interval for the true population. For a 95% confidence interval, it would be given by the formula

$$P \pm 1.96 \times s.e\ (P) \qquad (3)$$

For each item of the questionnaire calculations were made to determine the sampling error and confidence interval. As for the non-sampling errors, several measures to reduce these errors at different stages of the survey were undertaken. These included a carefully designed questionnaire, several calls and consistency checks. The questionnaire itself had been put to a pilot test with prospective respondents and every effort was made to ensure the elimination of bias and misunderstanding in the wording of questions, order of the questions, structure of the questions and length of the questionnaire. Also, the timing of sending the questionnaire and the number of contacts (calls) were made to ensure a high response rate. Anonymity and a letter of introduction were used to attract wider response, especially among reluctant respondents. So every possible effort was made to reduce the risks of sampling and non-sampling errors within the limitation of time and resources. The ideal situation, of course, would be to interview more than once (several questionnaires) all the specialists (population).

Considering the size of the sample and the sampling errors and confidence interval of all key questions in the questionnaire, and the consistency checks made, the findings of the survey provide sufficient grounds for confidence in the results of the survey. Though there is no reference made to independent sources to confirm the findings of the survey (because there is no such external confirmation), the standard errors were low and consistency check showed no variations. The findings of most of the key questions asked confirmed a number of hypotheses properly made prior to the analysis. Thus the findings of the key questions of the questionnaire and the size of the standard errors provide adequate verification that the sample is reasonably representative of the population and that the information collected is accurate.

Analysis and Interpretations

The findings of the questionnaire which included eleven main questions, each with several sub-questions, can be divided into three main areas. The first area deals with the probability of nuclear war in the Middle East. The second area concerns the impact on and the response of the Superpowers to nuclearization of the Arab-Israeli conflict. The third area focuses on the response of Israel to the Arab states' nuclear quest and the response of the Arab states to a nuclear-armed Israel and the likelihood of this nuclearization. However, there is overlapping between the three categories and in some cases they are closely interrelated and interconnected.

The Probability of Nuclear War

The overall result of the probability of nuclear war in the Middle East is predicted to be substantially higher than anywhere else was as follows:

Q. The probability of nuclear war in the Middle East is predicted to be substantially higher than anywhere else: do you agree?

TABLE (1)
Overall Probability of Nuclear War

Agree	Disagree	Partly
35.5%	35.5%	29%

This indicates that the prediction of a substantially higher probability of nuclear war in the Middle East than anywhere else is not supported by this result.

However, the risks of nuclear war in the Middle East upon which the high probability of nuclear war is based give the following findings:

Q1: Because of the level of rationality (conceptualization of use of nuclear weapons) among Middle Eastern decision makers is low?

Q2: Because of the likelihood that nuclear weapons may be included in war fighting strategies?

Q3: Because the vulnerability of Middle Eastern nuclear weapons to attack is high?

Q4: Because of the problem of controling escalation in the multi-nuclear Middle East?

Q5: Because of the problem of miscalculation in a multi-nuclear Middle East?

Q6: Because of the possibility of catalytic war?

Q7: Because the vulnerability of command and control capabilities of nuclear weapons to attack is high?

Q8: Because the probability of nuclear terrorism is high?

Q9: Because of the existence of common border between Israel and some Arab states?

Q10: Because of shortness of distance betwee Israel and the Arab states?

Table (2)
Risks of Nuclear War
in the Middle East

		Agree	Agree partly	Disagree partly	Disagree
Level of rationality in					
	Israel	-	10%	20%	70%
	Egypt	-	3%	34%	60%
	Iraq	7%	27%	27%	36%
	Libya	20%	33%	13%	34%
	Syria	-	17%	37%	43%
	Algeria	-	10%	17%	63%
Inclusion of nuclear weapons in war fighting strategies in					
	Israel	29%	32%	13%	26%
	Egypt	-	16%	32%	42%
	Iraq	3%	52%	10%	29%
	Libya	19%	45%	10%	23%
	Syria	3%	32%	19%	39%
	Algeria	-	10%	29%	51%
Vulnerability of nuclear weapons to attack		26%	42%	6%	25%
Difficulty of controling escalation		65%	19%	3%	13%
Miscalculation		35%	45%	7%	13%
Catalytic War		19%	19%	29%	36%
Vunlnerability of command and control centres to attack		25%	32%	11%	32%
Nuclear terrorism		23%	16%	29%	32%
Existence of common borders		13%	42%	10%	35%
Shortness of distance		19%	42%	13%	36%

The conclusion to be drawn is that the high probability of nuclear war in the Middle East (Table 1) comes mainly from the risks of controlling escalation, miscalculation and vulnerability of weapons and command and control centres to attack (Q. 4,5,3 & 7 Table 2). It is interesting to note that the existence of common borders and shortness of distance between Israel and some of the Arab states play a role in this high probability of nuclear war.

At the same time, the likelihood of use of nuclear weapons by Israel and some Arab states in case of political survival being at stake and when total defeat is imminent, seems to be high.

Q1. Nuclear weapons would be used militarily in case the political survival of the nation being at stake?

Q2: Nuclear weapons would be used militarily in emergency (total defeat is very likely)?

Table (3)
Use of Nuclear Weapons

		Agree	Agree partly	Disagree partly	Disagree
Use of nuclear weapons in case of political survival by					
	Israel	75%	21%	-	3%
	Egypt	39%	23%	8%	14%
	Iraq	48%	23%	8%	6%
	Libya	47%	24%	5%	6%
	Syria	40%	18%	5%	6%
	Algeria	32%	13%	6%	21%
Use of nuclear weapons when total defeat is imminent by					
	Israel	66%	22%	5%	4%
	Egypt	29%	25%	15%	24%
	Iraq	46%	25%	12%	9%
	Libya	53%	19%	8%	10%
	Syria	37%	25%	12%	19%
	Algeria	22%	22%	14%	29%

The conclusion of the likelihood of use of nuclear weapons by Israel and some Arab states (Q.1 & 2 of Table 3) seems consistent with the results of the previous assessment (Q 2 of Table 2) which indicates high probability of use of nuclear weapons in extreme cases by Israel, Iraq and Libya. Furthermore, the above conclusion is reinforced by the results of the questions of the deterrent effects of acquisition of nuclear weapons by Israel and some Arab states. It concludes that acquisition of nuclear weapons would have significant deterrent effects.

Q1: Nuclear weapons would be procured as a deterrent by Israel to counter Arab nuclear threat?

Q2: Nuclear weapons would be procured as a deterrent by Israel to deter a disarming first strike?

Q3: Nuclear weapons would be procured as a deterrent by Israel to deter a pre-emptive strike?

Table (4)
Deterrent Effect Of Israeli
Nuclear Weapons

		Agree	Agree partly	Disagree partly	Disagree
Procurement of nuclear weapons by Israel to counter Arab nuclear threat of					
	Egypt	73%	19%	3%	3%
	Iraq	80%	13%	-	4%
	Libya	79%	16%	-	3%
	Syria	79%	11%	5%	3%
	Algeria	55%	19%	11%	11%
By Israel to deter Disarming First Strike by					
	Egypt	60%	15%	9%	11%
	Iraq	64%	22%	2%	9%
	Libya	65%	18%	5%	9%
	Syria	68%	15%	4%	9%
	Algeria	48%	15%	11%	17%
By Israel to deter Pre-emtive Strike by					
	Egypt	55%	19%	9%	12%
	Iraq	63%	14%	10%	9%
	Libya	63%	12%	14%	9%
	Syria	67%	9%	10%	10%
	Algeria	45%	12%	16%	19%

This table points clearly that Israeli acquisition of nuclear weapons would be to deter Arab nuclear threat, especially that of Iraq, Libya and Syria. This conclusion is consistent with the previous result (Q2 table 2) which indicated the probability of inclusion of nuclear weapons in war fighting strategies of Israel and (Q 1 table 3) which showed high probability of use of nuclear weapons in case of political survival being threatened.

On the other hand, the conclusion of the deterrent effects of Arab states acquisition of nuclear weapons to deter an Israeli nuclear threat was as follows:

Q4: Nuclear weapons would be procured as a deterrent by the Arab states to counter an Israeli nuclear theat?

Q5: Nuclear weapons would be procurred as a deterrent by the Arab states to deter an Israeli pre-emptive strike?

Q6: Nuclear weapons would be procurred as a deterrent by the Arab states to deter an Israeli disarming first strike?

Table (5)

Deterrent Effect of Arab States

Nuclear Weapons

		Agree	Agree partly	Disagree partly	Disagree
By the Arab States to deter Israeli nuclear threat by					
	Egypt	11%	29%	24%	24%
	Iraq	24%	50%	14%	7%
	Libya	22%	35%	21%	12%
	Syria	17%	50%	15%	9%
	Algeria	-	14%	29%	34%
By the Arab states to deter Israeli Pre-emptive Strike by					
	Egypt	13%	25%	18%	33%
	Iraq	24%	33%	16%	18%
	Libya	26%	22%	19%	20%
	Syria	20%	29%	16%	24%
	Algeria	2%	9%	30%	35%

Table (5) cont'd

		Agree	Agree partly	Disagree partly	Disagree
By the Arab States to deter Israeli Disarming first strike by					
	Egypt	11%	27%	16%	33%
	Iraq	22%	33%	14%	20%
	Libya	25%	24%	16%	20%
	Syria	16%	29%	13%	27%
	Algeria	-	14%	31%	35%

The conclusion of this table indicates that the same Arab States (Iraq , Libya and Syria) which represent most serious nuclear threat to Israel are the Arab states which might acquire nuclear weapons to counter the Israeli nuclear threat (Q. 1 & 2 & 3 of table 4). It is interesting to point out that the probability of the procurement of nuclear weapons as a deterrent is perceived to be higher (greater than 50%) among Israel, Iraq, Libya and Syria because these are the same countries which are most likely to use nuclear weapons when political survival is at stake and in an emergency (Q 1 & 2 of table 3).

B. Response of Israel and Arab States to Nuclearization

The results of Israel's likely responses to the Arab states' nuclear quest to acquire nuclear capabilities and nuclear weapons are a pre-emptive strike on Arab nuclear installations and improvement of its nuclear weapons capability

Q1: **Some people believe that Israel's response to the Arab states' nuclear quest would be a pre-emptive strike on the Arab states' nuclear installations?**

Q2: **To improve its nuclear capabilities and/or weapons?**

Q3: To encourage the Arab states to go nuclear to enhance stability?

Q4: To seek nuclear-free zone Middle East treaty?

Q5: To sign the NPT and accept safeguards?

Q6: To seek a nuclear security guarantee from the USA?

Table (6)
Israeli Response to Arab Nuclear Quest

		Agree	Agree partly	Disagree partly	Disagree
Pre-emptive strike against Arab nuclear installations of:					
	Egypt	29%	25%	27%	16%
	Iraq	68%	24%	-	5%
	Libya	69%	21%	2%	5%
	Syria	64%	24%	2%	5%
	Algeria	22%	30%	20%	13%
Improve nuclear weapons capability		67%	22%	3%	3%
Encourage Arab States to go nuclear as					
	Egypt	5%	3.5%	3.5%	88%
	Iraq	3.5%	3.5%	-	93%
	Libya	3.5%	3.5%	-	93%
	Syria	3%	2%	2%	93%
	Algeria	2%	3%	3%	92%
Seek nuclear-free zone treaty		13%	13%	22%	52%
Sign NPT and accept safeguards		5%	12%	10%	73%
Seek nuclear security guarantee from USA		25%	35%	7%	29%

This indicates that Israel would continue its present nuclear policy of denying the Arab states developing nuclear capability (attack on Iraqi nuclear reactor in 1981) and improving its nuclear capability.

On the other hand, the possible Arab states' response to a nuclear-armed Israel is varied ranging from developing capabilities, seeking security guarantees and pushing for a nuclear-free zone treaty in the region. However, the most likely sustained responses would be the development of nuclear weapons and seeking nuclear security guarantees from the Soviet Union (and the USA) as follows:

Q1: Some people believe that the Arab states' response to a nuclear-armed Israel would be the development of chemical and biological weapons?

Q2: To launch a pre-emptive strike on Israeli nuclear installations and/or weapons?

Q3: The development of nuclear capabilities and/or weapons

Q4: To seek nuclear and/or security guarantee from the Soviet Union?

Q5: To seek nuclear and/or security guarantees from the USA?

Q6: To seek a nuclear-free zone Middle East treaty?

Table (7)
Arab States Response to Israeli
Nuclear Weapons

		Agree	Agree partly	Disagree partly	Disagree
Development of chemical and biological weapons in					
	Egypt	7%	23%	10%	38%
	Iraq	22%	37%	2%	24%
	Libya	19%	24%	5%	27%
	Syria	12%	31%	2%	31%
	Algeria	3%	16%	8%	37%
Launch pre-emptive strike against Israeli installations by:					
	Egypt	-	2%	16%	79%
	Iraq	3%	12%	19%	64%
	Libya	3%	12%	14%	66%
	Syria	3%	7%	17%	71%
	Algeria	-	3%	10%	84%
Development of nuclear weapons by					
	Egypt	20%	39%	14%	20%
	Iraq	50%	29%	13%	4%
	Libya	50%	25%	16%	4%
	Syria	31%	27%	24%	9%
	Algeria	5%	10%	22%	43%
Seek nuclear security guarantees from the Soviet Union by					
	Egypt	10%	15%	26%	38%
	Iraq	35%	36%	17%	7%
	Libya	41%	35%	5%	9%
	Syria	51%	40%	2%	5%
	Algeria	14%	25%	12%	28%

Table (7), cnt'd

		Agree	Agree partly	Disagree partly	Disagree
Seek nuclear security guarantees from the USA by					
	Egypt	35%	44%	3%	14%
	Iraq	4%	12%	23%	47%
	Libya	2%	3%	16%	67%
	Syria	3%	9%	25%	51%
	Algeria	7%	16%	23%	38%
Seek nuclear-free zone Middle East treaty by					
	Egypt	39%	39%	5%	14%
	Iraq	20%	28%	20%	22%
	Libya	17%	22%	15%	34%
	Syria	20%	31%	20%	20%
	Algeria	27%	37%	8%	19%

It is important to point out that there is almost unanimous agreement among respondents that Israel has the capability to produce nuclear weapons at any time (if it has not already produced a sizeable stockpile of nuclear weapons) as follows:

Q1: Israel has the capability to produce nuclear weapons in a short period: Do you agree?

Table (8)
Israel Nuclear Weapons
Capability

	Agree	Agree partly	Disagree partly	Disagree
Israel has the capability to produce nuclear weapons	92%	9%	-	-

As for the Arab states, some of them would probably have the capability to produce nuclear weapons by the 1990s as follows:

Q2: These Arab states might have capability to produce nuclear weapons?

Table (9)
Arab States Capability to
Produce Nuclear Weapons

	1980s	1990s	2000s
Egypt	19%	21%	33%
Iraq	17%	36%	20%
Libya	13%	13%	35%
Syria	1%	8%	42%
Algeria	2%	6%	32%

These conclusions (tables 8 & 9) indicate that nuclearization of the Arab-Israeli conflict area has already taken place and would be widespread by late 1990s or early 2000s. The most likely Arab candidates to have the capability to produce nuclear weapons (Egypt, Iraq and Libya) are the same countries that would produce nuclear weapons in case of a nuclear-armed Israel (Q 3 table 7).

The overall conclusion that can be drawn from the likely responses of Israel and the Arab states (tables 6 & 7) and the likelihood of the nuclearization of the Arab-Israeli conflict area (tables 8, 7, 9) would not be highly destabilizing as is often predicted (tables 1 & 2). Considering the time required for this nuclearization to take shape (1990s), there would be enough time for Israel and the Arab states to adjust to the new situation. This conclusion is reinforced by the conclusion of the deterrent effects of the acquisition of nuclear weapons (tables 4 & 5) which indicates that Israel and the Arab states would procure nuclear weapons as a deterrent. Furthermore the assessments of the risks of nuclear war (Q 1,2,6,8 of table 2) reinforces the above conclusion. However, the assessments of other risks of nuclear war (Q 3, 4, 5 7 of table 2) and the probability of use of nuclear weapons (Q 1 & 2 of table 3 and Q 1, 2 & 3 of table 4) indicate that these risks would remain a major source of concern and instability.

C. Impact and Response of the Superpowers to Nuclearization

There are several explanations given to the opposition of the Superpowers to nuclear proliferation in the Middle East. The results of the survey show that the fears of an accidental and catalytic war, the global redistribution of power and intervention in the local conflict were the main reasons for this opposition.

Q1. Nuclear proliferation is opposed by the Superpowers because the spread of nuclear weapons increases the likelihood of accidental war?

Q2: Because the increase in proliferation requires the Superpowers to intervene more often in local conflict to stop escalation?

Q3: Because the Superpowers believe proliferation will lead to global redistribution of power to their disadvantage?

Q4: Because of the fear of catalytic war?

Table (10)
Superpowers Opposition to Proliferation

		Agree	Agree partly	Disagree partly	Disagree
Fear of accidental war by					
	USA	57%	35%	5%	3%
	USSR	62%	30%	5%	3%
Fear of frequent intervention by					
	USA	30%	33%	16%	21%
	USSR	26%	35%	18%	21%
Fear of global re-distribution of power to their disadvantage by					
	USA	36%	35%	21%	8%
	USSR	38%	33%	21%	8%
Fear of catalytic war by					
	USA	41%	41%	5%	13%
	USSR	47%	35%	5%	13%

This conclusion points out that fear of accidental and catalytic wars are the most likely percieved motivations of the *Superpowers opposition to nuclear* proliferation and that the perceived motivation of the USA and USSR is almost identical. It also shows that the Superpowers have a common interest in opposing nuclear proliferation in the Middle East.

US opposition to a nuclear-armed Israel is assumed to be, mainly: because of fears of the implications of this on the non-proliferation regime and the US relations with Arab allies and fear of confrontation with the Soviet Union.

Q1: The United States declared opposition to a nuclear-armed Israel is based on the fear that as Israel occupies a strategic position in US policy, this nuclearization could lead to the collapse of the non-proliferation regime?

Q2: Fear of nuclear confrontation and/or exchange between the Superpowers because of their inense involvement in the Middle East?

Q3: The deterioration of US's ability to influence her allies in the Arab world?

Table (11)
Us Opposition to Nuclear-Armed Israel

	Agree	Agree partly	Disagree partly	Disagree
Fear of collapse of NPT	20%	46%	12%	22%
Fear of Soviet Confrontation	27%	48%	8%	7%
Deterioration of US ability to influence Arab allies	27%	34%	25%	14%

On the other hand, the US response to a nuclear-armed Israel is assumed to be lenient because of several reasons as follows:

Q1: Some people believe that US response to a declared nuclear-armed Israel would be lenient: Do you agree?

Table (12)
Lenient US Opposition to Nuclear Armed Israel

Agree	Disagree	Partly
45%	25%	30%

This expected lenient US response is because of

Q3: The strategic importance Israel plays in US policy?

Q3: The inability of US to control the transfer of technology, arms and financial aid to Israel?

Q4: The inability of US to control Israel's nuclear development and persuade it to accept safeguards and sign NPT?

Table (13)
Reason for lenient US Opposition
to Israeli Nuclear Weapons

	Agree	Agree partly	Disagree partly	Disagree
Strategic Importance of Israel in US policy	36%	36%	5%	12%
Inability of US to control transfer of technology, arms to Israel	15%	43%	24%	18%
Inability of US to control Israel nuclear development	26%	35%	18%	18%

The conclusion to be drawn is that the US response to a declared nuclear-armed Israel would most likely be lenient after the initial period of harsh statements and strain in relations because of the strategic importance of Israel in US policy and the inability of the US to control Israel's nuclear development and influence it not to go nuclear.

The Soviet Union's opposition to a nuclear-armed Israel is assumed to be vigorous and stringent. However, the results of the survey cast strong doubt on this assumption as follows:

Q1: Some people believe that the Soviet response to a declared nuclear-armed Israel would be vigorous: Do you Agree?

Table (14)
Soviet Opposition to Nuclear-Armed Israel

Agree	Disagree	Partly
32%	45%	20%

However, there are several possible Soviet responses to a declared nuclear-armed Israel in the following way:

Q2: A pre-emptive strike on Israeli nuclear weapons?

Q3: To provide the Arab states with nuclear weapons?

Q4: To provide the Arab states with nuclear security guarantees?

Q5: To increase level of political and military involvement in the Middle East?

Q6: To disengage from the Arab-Israeli conflict?

Table (15)
Soviet Response to Nuclear-Armed Israel

	Agree	Agree partly	Disagree partly	Disagree
Pre-emptive strike on Israeli nuclear weapons	-	-	-	95%
Provide the Arab states with nuclear weapons	-	-	37%	59%
Provide the Arab States with nuclear security guarantee	22%	60%	7%	4%
Increase level of political and military involvement	25%	60%	4%	7%
Disengage from the Arab Israeli Conflict	-	4%	15%	74%

The conclusion to be drawn is that the Soviet response to a declared nuclear-armed Israel would not be as vigorous as expected, partly because the Soviet Union could not directly influence Israeli policies. However the most likely Soviet response would be to provide the Arab states with limited nuclear security guarantees (consistent with Q 4 of table 7) and increase its political and military involvement in the Arab-Israeli conflict.

Furthermore, it is assumed that a joint Soviet-American response to nuclearization in the Middle East is plausible and possible. It might take the form of intervention to disarm nuclear weapons, a joint agreement to ban nuclear weapons in the Middle East, force the states of the Middle East to join NPT and accept safeguards, a declaration that they will act in concert against any first use of nuclear weapons or disengage from the Arab-Israeli conflict. The results of the survey point out that the assumption of a possible joint Soviet-American response is not supported as follows:

Q1: Some people believe that a joint Soviet-American response to a nuclear-armed Israel and/or nuclear-armed Arab states is quite plausible: Do you agree?

Table (16)
Plausibility of Joint Soviet-American Response

Agree	Disagree	Partly
28%	41%	30%

When considering what form of a joint Soviet-American response to the nuclearization of Israel and Arab states that might take place, the results of the survey are as follows:

Q2: Intervention to disarm the nuclear weapons of Israel and the Arab states?

Q3: A joint agreement to ban nuclear weapons in the Middle East?

Q5: A joint declaration that they will act in concert against any state which intends to use nuclear weapons first?

Q6: Disengage from the Arab-Israeli conflict?

Table (17)
Joint Soviet-American Responses
to Nuclearization

		Agree	Agree partly	Disagree partly	Disagree
Intervention to disarm nuclear weapons of:	Israel	3%	10%	-	76%
	Egypt	3%	10%	7%	62%
	Iraq	7%	14%	10%	55%
	Libya	10%	21%	7%	52%
	Syria	7%	14%	7%	62%
	Algeria	3%	10%	7%	65%
Joint declaration to ban nuclear weapons in the Middle East		17%	47%	17%	13%
Force Middle Eastrn states to join NPT and accept safeguards		13%	34%	20%	23%
Declaration to act in concert against first use of nuclear weapons by	Israel	17%	27%	33%	13%
	Egypt	17%	27%	30%	20%
	Iraq	17%	30%	30%	17%
	Libya	17%	33%	30%	17%
	Syria	17%	30%	27%	20%
	Algeria	17%	27%	30%	17%
Disengage from the Arab-Israeli Conflict		-	-	17%	77%

The conclusion to be drawn is that a workable joint Soviet-American response to nuclearization of the Arab-Israeli *conflict would be most unlikely. However, the only possible* response open to the Superpowers would be, after an initial period of harsh statements, to sign an agreement against possession and use of nuclear weapons in the Middle East. It is worth mentioning that this conclusion is consistent with previous results (Q. 1,2,3,4 of table 13 and Q 2,3 of table 15) and that the two Superpowers would not disengage from the Arab-Israeli conflict. (see Q 6 table 15).

On the other hand, the overall impact of the use of nuclear weapons by any of the states of the Middle East on the Superpowers strategic balance of terror is assumed to lead to a breakdown of this balance. The result of the survey on this very important question casts strong doubt on this assumption.

Q1: The Superpowers nuclear balance of terror would not withstand use of nuclear weapons by third parties among themselves: Do you agree?

Table (18)
Impact of Use of Nuclear Weapons
on Superpowers Strategic Balance

		Agree	Agree partly	Disagree partly	Disagree
Superpower balance of terror would not withstand use of nuclear weapons in					
	Anywhere	7%	12%	28%	48%
	Middle East	8%	15%	32%	40%

The conclusion to be drawn is that the use of nuclear weapons in the Middle East would be a regional catastrophe but not necessarily affect the Superpowers strategic balance in a fundamental way. There are several explanations for this conclusion such as the common interest of the Superpowers to avoid nuclear war and contain dangerous situations and often expressed fear that the Superpowers would probably use nuclear weapons against each other if one is convinced that the other is about to launch a nuclear attack upon it. Perhaps the use of nuclear weapons by Middle Eastern states would reinforce rather than weaken Superpower reluctance to use nuclear weapons.

CONCLUSION

The survey, in general, gives clear indications on most of the questions asked about the risks of nuclear war in the Middle East. First it casts doubt on the widely accepted assumption in the literature that the probability of nuclear war in the Middle East is substantially higher than anywhere else (Q 1. table 1) which reinforces another view which says that this assumption is exaggerated and unsubstantiated. This conclusion is reinforced by other conclusions that the assumptions of a low level of rationality, inclusion of nuclear weapons in warfare strategies, accidental and catalytic war and nuclear terrorism (Q1,2,6 & 8 of table 2) are less worrisome than often expressed. However, the risks of the difficulty of controlling escalation, miscalculation, vulnerability of weapons and command and control centres to attack (Q 3,4,5 & 7 table) would remain high risk areas. Equally, the probability of the use of nuclear weapons by Israel and some Arab states - Iraq and Libya - appears to be high under extreme conditions of political survival and total defeat. The reasons for the likelihood of nuclear war in the Middle East stem from the fact that the Middle East has unique historical, cultural, geographical, psychological and political set-up and the Superpowers are intensely involved in the region and that Israel probably has deployed nuclear weapons.

Second, the survey provides strong support for the assumption that the process of nuclearization of the Arab-Israeli conflict area is underway and would probably be more visible in 1990s when some of the Arab states would have the capability to produce nuclear weapons. The previous detailed examinations of nuclear development in the Middle East confirm this conclusion. This process could be destabilizing as there are clear indications that Israel would continue its policy attacking Arab states' nuclear installations and to improve its nuclear weapons capability (Q 1&2 table 6) and creating a huge capability gap between Israel and the Arab states. In fact this has been the policy of Israel and was demonstrated by the Israeli attack on the Iraqi nuclear reactor. The options available to the Arab states, at this stage, are to continue efforts to develop nuclear and chemical weapons capabilities and seek Soviet nuclear security guarantees. There is evidence which points out that the Arab states are pursuing these options at various degrees. Iraq attempted to acquire a nuclear and chemical weapons capability and Syria is believed to have Soviet nuclear security guarantees.

Third, the survey gives support for the assumptions that the US response to a nuclear-armed Israel would be lenient while it throws doubt on the assumption that the Soviet response would be vigorous. However, it supports the assumptions that the likely Soviet responses would be to provide the Arab states with limited nuclear security guarantees and increase the level of its political and military involvement in the Arab states. Furthermore, there is no support for the assumption that a joint Soviet-

American response to nuclearization in the Middle East is plausible and possible. The most likely option available as a joint Superpower response would be an agreement against possession and use of nuclear weapons in the Middle East. Close examination of past Soviet and US non-proliferation behaviour suggests that the two Superpowers knew about the Israeli nuclear weapons capability but did nothing about it as was the case with the Indian nuclear explosion. Israel is an important strategic consideration in US policy while the Soviet Union has no direct positive influence on Israel and has been extremely cautious and shown less willingness than the USA to take unnecessary risks in the Middle East.

The survey also gives no support to the assumption that the Superpowers strategic balance would not withstand the use of nuclear weapons in the Middle East. Such an event would constitute an unprecedent regional tragedy but would probably not change fundamentally the central strategic balance. Indeed, the Middle East provides a particularly dangerous area for the Superpower confrontation since both sides have a great deal at stake. But the past Superpowers behaviour in the Middle East during the 1967 and 1973 crises suggests the Superpowers have passed the test because of their caution, determination and accomodation. However, no one can be certain of the outcome of such radical prospect of nuclear war in the Middle East on Superpower response.

Finally, predicting the future is a difficult task to undertake, especially if there is no previous comparable experience. This is because the future is not predetermined and alternative futures are possible and 'surprise' comes from the unexpected. However, without explicitly recognizing some important characteristics of the future, it is difficult, if not impossible, to obtain useful information about it. The utltimate goal of this risk assessment is to reduce the amount of unpleasent and costly surprises the Middle East might experience. The assessment points to key areas of the risks of nuclear war in the Middle East and their magnitude. A word of caution is appropriate about the limitations of the survey. It is assumed that the judgement given by the specialists corresponds to reality of an event which has not happened and reflects their real perception of these risks of war. Also, the survey was carried out mainly among English speaking specialists and most of the opinions expressed cluster around circumstances which are difficult and impractical explicity to identify.

CHAPTER SEVEN

THE IMPLICATIONS OF THE NUCLEARIZATION OF THE MIDDLE EAST

The Nature of Arab-Israeli Conflict

The Middle East conflict has many facets including the Arab-Israeli conflict and the Iraqi-Iranian dispute, as well as minority problems in Lebanon, Algeria, Morocco, Sudan, Libya, Syria, Iran, Iraq and Israel. However, the Arab-Israeli conflict continues to be the central issue in Middle East politics. The primacy of the Arab-Israeli conflict is because of the nature of the conflict itself, its relations to the central strategic balance and the extent of violence and level of armament associated with this conflict. The Arab-Israeli conflict is unique in character and causes. First, there is the problem of the legitimacy of Israel as perceived by the Arabs, and the legitimate rights of the Palestinian people rejected by Israel. Second, the conflict has deep-rooted historical, political, economical, cultural, ideological and religious origins. Islam, Arabism, Zionism and Judaism all play a part in this very complicated conflict. President Sadat argued that the Arab-Israeli conflict in its origin is a conflict between Arab civilization and Zionism which can never be reconciled and which was created by colonialism

> "Colonialism has left the Arab region leaving us the problem of Palestine which in its origin is

> not only usurption of an Arab land
> but a challenge of civilization by
> Zionism to the Arab world."[1]

However, after his historical visit to Jerusalem in November 1977 he acknowledged that the Arab and Jewish civilizations have to learn to cooperate and coexist.[2] Thirdly, the Arab-Israeli conflict exists in an area of great strategic importance and the Great Powers have important strategic interests in the area which have direct influence on the central strategic balance

> "The conflict is a very dangerous one for world society as a whole. Its propensity to draw outsiders is high since the Superpowers were quickly drawn into opposing firing lines in the 1973 October War. Yet they are in no sense in control; the events of 1967 and the difficulties experienced by Dr Kissinger after the October War merely to stabilize the firing lines bear eloquent witness to this. Extrication is just as difficult for outside powers. In this respect the Middle East of the

(1) President Sadat's Speeches and Interviews, op. cit., Vol 5, p.125; See Vol 1, p.354.

(2) Al-Ahram, 21 November 1977.

> 1970s bears a relation to world society similar to that of the Balkans to the European state system of 1914. It is an area where the unintended and unthought of consequences of a conflict could lead to a major threat of escalation towards, in this case, the nuclear holocaust."[3]

Fourthly, the Israelis and the Arabs have fought in the battlefield five times in the last thirty eight years, a long standing war not found elsewhere in modern history. Also, Israel and the Arab states have maintained large scale armies with the most advanced weaponry in a limited geographical area. So the role of force and coercion has been one of the most visible features of the Arab-Israeli conflict. Finally, the Arab-Israeli conflict has been complicated by the presence or potential presence of nuclear weapons in the area. The relationship between nuclear weapons and the Arab-Israeli conflict is summarized by an Israeli scholar

> "Everyone seems to share the belief that the Middle East may well become nuclear, so the thinking is, we would better solve our regional

(3) Groom, AJ. R., 'Conflict Analysis and the Arab-Israeli Conflict', University of Kent, Canterbury, 1974, p.28, reprinted in Janoes Barber, Josephine, Negro, and Michael, Smith (eds), <u>Politics Between States: Conflict and Cooperation</u>, (Milton Keynes: Open University Press, 1975).

> problems before our 'enemies' have
> a nuclear capability."[4]

The Arab-Israeli conflict seems to be burdened by two contrasting views. One view contends that the Cause of Palestine is central to the Arab-Israeli conflict and is the cause of all Arab states. The first Arab Summit of the Arab League held in Cairo in May 1946 underlined in its final communique that the Cause of Palestine was the cause of all the Arabs and emphasized the necessity of defending the rights of the Palestinian people.[5] President Sadat explained in his historic speech addressing the Israeli Knessett on 10 November 1977.

> "The problem is not Egypt and Israel...Any separate peace between Egypt and Israel or between any Arab confrontation state and Israel will not bring permanent peace. Rather even if Peace between all the confrontation states and Israel were achieved in the absence of a just solution to the Palestinian problem there would never be the durable and just peace upon which the entire world today insists....As for the Palestinian

(4) Quoted in Fine, Melinda., 'Transforming Superpower Policies' New Outlook, Feb / Mar 1985, p.30.

(5) Egypt and the Palestinian Question, op. cit., p.9.

> Cause, nobody could deny that it is the crux of the entire problem. Nobody in the world today could accept slogans propagated here in Israel, ignoring the existence of the Palestinian people and questioning even their whereabouts. The cause of the Palestinian people and their legitimate rights are no longer ignored or denied today by anybody...even the United States, your prime ally ... has opted to face up to reality and admitted that the Palestinian people are entitled to legitimate rights and that the Palestinian problem is the core and essence of the conflict."[6]

According to this view of the Arab-Israeli conflict, the core of any solution to the conflict is the resolution of the Palestinian problem. Others argue that the solution of the Palestinian problem by the creation of an independent state in the West Bank and Gaza Strip would make no difference to other issues of the Middle East such as the Iraq-Iran war, civil war in Lebanon and Syrian involvement in Lebanon.[7] There are many interrelated problems of which the issue of independence of the Palestinian people is only

(6) Ibid., p.25; Al-Ahram, 21 November 1977.

(7) Seymor, David., 'On Some Middle East Fallacies', New Outlook, Dec 1984/ Jan 1985, pp.21-24.

one. According to this argument the creation of an independent Palestinian state will solve one crucial problem for the Palestinian people but will not necessarily solve other Middle East conflicts including the Arab-Israeli one. Given that the cause of the legitimate rights of the Palestinian people has been a partially unifying factor in inter-Arab politics, its removal from the agenda could even complicate underlying intra-Arab tensions. The second view argues that the Palestinian problem does not exist.[8] There is a problem of a Palestinian minority and refugees and until 1967 a separate Palestinian nationalism or an independent state for the Palestinians was hardly heard of. This view holds that the question of Palestinian nationalism and an independent state is a creation of the Arab states, a Trojan horse, designed to disrupt and destroy the State of Israel.

> "If Palestinian nationalism always existed, and if the Palestinians always existed, and the Palestinians deserved a state of their own. Why did the Arabs not do anything about it when they had the chance? Why indeed did the Palestinians themselves not demanded it? On the other hand, if the demand for independence is only made because Israel occupied the

(8) Ibid.,p.21.

> West Bank, then Israel is obviously going to suspect that the whole concept of Palestinian nationalism and the demand for an autonomous state is an invention of the Arab World designed to get at Israel. In this case, Israel will not take it upon herself to solve the Arabs' internal problems and will not be more moral than the Arabs themselves regarding Palestinian nationalism, because that would endanger her own security."[9]

In other words, there is no Palestinian problem but a problem of control over the West Bank and Gaza Strip and how these two occupied areas can affect the security of Israel.

In the Arab World there are two schools of thought regarding the Arab-Israeli conflict and its solution.[10] The first school's starting point was 1948 since Israel has usurped an Arab land which was Palestine and the existence of the state of Israel itself is illegitimate and must be eliminated. It contends that the current balance of power is overwhelmingly favourable to Israel and that the outcome of a negotiated settlement dictated by this balance is bound to be humiliating. In this view the US-Israeli alliance constitutes a greater threat to the Arab World; holding out

(9) Golda Meir quoted in Ibid., pp.21-22.

(10) Ahmed, President Sadat and Disarmament Issues, op. cit., p.34; Khalidi, W., 'Homeland and Sovereignty', New Outlook, Mar/April 1984, p.18.

in the long run, even if this leads meanwhile to the loss of the occupied territories, the desired outcome would be achieved. This is because geography, demography, oil as well as the spread of education and technology all seem to work in favour of the Arabs. The second school's starting point is 1967 since it accepted the UN Security Council resolution number 242 which implies the recognition of the existence of the State of Israel. On this view the main aim of the Arab states is to liberate occupied Arab land after 1967 War and the establishment of an independent Palestinian state on the occupied Palestinian land, namely the West Bank and Gaza Strip. The methods of peaceful solution are accepted but at the same time military preparations are to continue to liberate the occupied Arab territories by force if peaceful effort for a negotiated settlement failed. The second school argues that there is no alternative to a negotiated settlement, largely because any gains on the Arab side of the balance of power would be cancelled by US actions in favour of Israel; negotiations have a good chance of success since a negotiated solution would strengthen the peace movement in Israel and encourage the USA to take the necessary steps towards a peaceful settlement of the Arab-Israeli conflict.

On the other hand, the Israelis continue to view the Arab-Israeli conflict as one of survival in face of an Arab call for the total destruction of the state as one leading Israeli personality, Shlomo Gazit, explained.

> "There is only one state in the
> world which is faced with a

military threat to its very existence as a state, threatening its very right to exist, and endangering the chances of survival of the residents of that state. Sadly, that is the threat hanging over the state of Israel among all the states of the world which is faced with this threat."[11]

This deep concern for security focuses on the need for a strong defence posture by the maximum use of Israel's limited resources and the support of at least one Western Power for the supply of weapons to act as a deterrent to a possible Soviet intervention on the side of the Arabs during times of war.[12] Because of the numerical advantage of the Arab states, there is awareness among Israelis that a permanent military victory is not possible against the Arabs, so Israel must deter its enemy through decisive, temporary victories fought on Arab territories. By demonstrating superior military force and instant retaliation against aggression by Arab armed forces and Palestinian guerrillas, Israel hopes the Arabs will eventually be convinced of the futility of further armed struggle and thus peace could be achieved. Before 1967 the Israeli strategists ruled that Israel must transfer military action to its enemy's territories because of the lack of

(11) Speech Delivered by Gazit at Tel Aviv University Law School, 25 Mar 1982.

(12) Israel, A Country Study, op. cit., pp.250-2.

strategic depth, and so adopt an offensive strategy. However, since the 1967 War and occupation of some Arab territories, the focus has shifted to adoption of what appeared to be a defensive strategy because of the buffer zone. The war of 1973 demonstrated that Israel was able to absorb a first strike and retaliate successfully.

Because of Israel's limited area and resources, it has little latitude for making concessions and for bargaining in a negotiated settlement with the Arabs.[13]

> "Israel because of its smallness enjoys very limited latitude on making concessions. Israel may suspect any territorial concession is of importance to the Arabs if it is calculated to weaken Israel as a step towards the final onslaught. Israel by the nature of her position will prefer existing dangerously rather than offering a concession incurring the danger of existence."[14]

Following the occupation of Arab territories since 1967, the Israeli latitude in making concessions to obtain a peace agreement has increased considerably. One Israeli view is that the ultimate Israeli security guarantee is to purpose a strong defence posture and a strong alliance with the USA and isolation of the Arabs by entangling them in internal

(13) Haikel, Mohammed H., 'Frankly Speaking' Al-Ahram, 15 October 1965.

(14) Ibid.

strife.[15] A second view is that by encouraging the Arabs to join the trend of economic and technological progress and attainment of harmonious foreign relations, there would be a greater chance of mitigating the 'Irrational hatred' and opening the road to peace.[16] As for the occupied Arab territories, one Israeli school of thought argues that peace with its Arab neighbours is the ultimate security guarantee and that considerable risks including the return of the occupied territories, are worth taking to obtain that end. One good example of this view was the peace treaty with Egypt in return for Sinai. The second school argues that the establishment of an independent Palestinian state on the West Bank would endanger the security of Israel in so far as the Palestinians do not recognize the State of Israel and their main aim is the destruction of Israel. The Israeli view of the Arab-Israeli conflict and its solution has many facets of a deep security concern, historical, religious reasons and mistrust and fear based on long experience of anguish and wars.

It seems from the previous analysis of the Arab-Israeli conflict that there is no easy way to reconcile the different views of the Israelis and the Arabs in reaching a negotiated peaceful settlement of the Palestinian problem. The experience of Camp David showed a partial peace treaty without solving the Palestinian problem. The prospects of peace today are remote despite the five wars fought between

(15) 'Three Israeli Views', New Outlook, May 1982, p.51.

(16) Ibid.

Israel and the Arabs.

It seems that the role of force and violence in the Arab-Israeli conflict area will remain predominant in the foreseeable future. Furthermore, as George Ball former US Under Secretary of State, pointed out that there were two assumptions held in the USA and Israel foreign policies which operate as a deterrent against any efforts to resolve the conflict.[17] The first assumption is that if the USA assists Israel to build military strength superior to any Arab state or combination of Arab states, Israel's neighbours will eventually grow reconciled to its continued occupation of the Arab territories. The second assumption which tends to reinforce the first one is that the USA continues to provide enough arms and economic aid, Israel will be able to defeat any combination of Arab states that challenges its position. However, these assumptions are challenged on the basis that the Arab states will never be reconciled to Israel's current boundaries. In fact the continued increase in the US supply of arms to Israel leads to more arms building in some Arab states and the outbreak of wars. Ball estimated that by 1995 Israel would lose the arms race to the Arabs since the expected Arab quantitative advantage would outstrip by three times the maximum strength of the Israeli army.[18] In such circumstances, Israel would have no alternative but to call for more US support and this could lead to increased Soviet involvement and the risks of global confrontation. At some point taking into account the

(17) Ball, George., 'Learning the Right Lessons' New Outlook, Feb/Mar 1985, pp.24-27.

(18) Ibid., (His estimate is based on combined Syrian and Jordanian forces).

Israeli obsession with security, Israel might find it necessary to use or threaten to use nuclear weapons. The Soviets would be under pressure to respond to the Israeli nuclear threat. The continuous and uncritical US support to Israel also facilitates continued Israeli occupation of the Arab territories and undermines US credibility in influencing some Arab states to respond to a negotiated settlement of the Arab-Israeli conflict. So it seems that maintaining stability between Israel and neighbouring Arab states based on superior Israeli military strength and US support would be counterproductive which Malcolm Kerr described as an 'Illusion' that

> "superior Israeli military strength backed by American support, could enforce the status quo on a long term basis, that the Arabs recognized their military helplessness would do nothing to shake the status quo and would eventually resign themselves to it."[19]

To sum up, it is more likely the role of force and violence in the Arab-Israeli conflict would remain of paramount importance for a long time to come.

Deterrence and Stability

The primacy of the role of force in the Arab-Israeli conflict assumes new dimensions with the introduction of

(19) Kerr, M. (ed), The Elusive Peace in the Middle East, (Albany: State University of New York Press, 1975).

nuclear weapons into the Middle East. Various studies have been carried out to assess the risks and the strategic implications of the possibility of Israel's possession of nuclear weapons capability.[20] Some argue that the introduction of nuclear weapons in the Middle East would have a deterrent effect by reducing the likelihood of an outbreak of war, while others believe that a nuclear Middle East would be inherently unstable and would thus be a destabilizing factor of unprecedented magnitude.

The deterrent effects of nuclear weapons in the political and military domain and destructive power in the physical sense have been a subject of continuing debate ever since the emergence of the nuclear age. The doctrine of nuclear deterrence relies on the threat of deadly retaliation and infliction of 'unacceptable damage' against an action of an adversary endangering vital security interests. It is a doctrine based par excellence on a threat system which hinges on speculative behavioural theory involving manipulation of risk, fear, punishment, brinkmanship and unpredictability.[21] Deterrence theory which was formulated in a setting of the Cold War is based on assumptions of two equal hostile actors who share a common conception of what

(20) Jabber, 'Israel and Nuclear Weapons', Chap XI; Feldman, Israeli Nuclear Deterrence, op. cit.,p.242; Harkavy, Spectre of a Middle East Holocaust, op. cit., pp.51-107; Rosen, 'Nuclearization and Stability in the Middle East', pp.166,157; Dowty 'Nuclear Proliferation: The Israeli Case' pp.79-120; Pragner and Tahtinen, A Nuclear Middle East, op. cit., p.3; Evron, Y., 'Some Effects of the Introduction of Nuclear Weapons in the Middle East', op. cit., pp.105-26.

(21) Jervis, 'Deterrence Theory Revisited', op. cit., p.7.

constitutes 'rational action'.[22] There are various kinds of deterrence based on the differences between responses to threats such as 'active', 'passive', 'countervalue' and 'counterforce'.[23] However, there are clear differences between the strategy of deterrence and strategy of war in the nuclear age in terms of objectives and capabilities.[24] The aim of war is victory or in a wide spread war, to survive while the goal of deterrence is the avoidance of the outbreak of war. The capabilities of a war strategy include counterforce while those of deterrence include a variety of means but with stress on countervalue means. Fighting capabilities are the means of war while deterrent capabilities depend on perception of it by the deterred adversary.[25]

For the strategy of deterrence to be successful, it must meet three requirements material, strategic and psycho-political requirements. The material conditions (capability requirements) are the availability of real capabilities with an appropriate amount of destruction and ability to inflict enormous destruction on an adversary by carrying out the threat of retaliation. Such a capacity depends on the vulnerability of the adversary's value

(22) Bull, 'The Future of Strategic Deterrence', op. cit., pp.24-30.

(23) Lider, J., Military theory: Concept, Structure, Problems (Aldershot: Gower, 1983), Chap 5.

(24) Bailey, Sydney D., 'Paradoxes and Predicaments of Nuclear Weapons', The World Today, Jan 1981, p.1.

(25) Freedman, Britain and Nuclear Weapons, op. cit., p.27.

targets.[26] Effective deterrence must also be guided by an appropriate strategy to deter various types of military challenges - and potential types of war. The psycho-political (credibility requirement) conditions depend on the fulfilment of the material and strategic conditions and on the communication to the enemy of the will to carry out the deterrent threat. This credibility of carrying out the threat depends on convincing the adversary that the deterring party has the capacity to carry out the threat, the strategy to do this and the will to execute it. The three conditions of successful deterrence are closely interrelated and the lack of any one of them would render deterrence ineffective. Furthermore, the requirements of successful deterrence are based on the assumption that an adversary is likely to act in a rational manner. Central to the theory of deterrence is the need to convince the adversary which means affecting his perception, then his intentions and actions. So deterrence has a psychological aspect and political aspect; good communication between governments enables them to assess accurately each other's intentions and capabilities.[27] Some argue that the will of the leaders of the deterring state to fulfil the deterrent threat is of central importance to the psycho-political requirement since the deterred state has to perceive that

(26) Martin, L., 'The Determinants of Change: Deterrence and Technology', Adelphi Paper No 161, (London: International Institute for Strategic Studies, 1980), pp.9-11.

(27) Williams, P., 'Deterrence' in Baylis, John et al., Contemporary Strategy: Theories and Policies (London: Croom Helm, 1975), pp.70-76.

such will actually exists.[28]

Others have replaced the condition of credibility by the condition of uncertainty in order to maximize caution.[29] This is the official British position.

> "In relation to any possible aggressor, we do not want to be too precise about the circumstances in which our nuclear forces might have to be used were be embarked on aggression. This is because flexibility to ourself and uncertainty for the aggressor are important factors in pressuring a deterrent effect."[30]

However, this view was criticized by some and described as 'nuclear nonsense' to believe that by increasing uncertainty one increases security.[31]

The theory of deterrence though seems plausible in the dissuasion aspect, its proposition cannot be fully validated nor are they subject to measurement. John Groom explains clearly this fundamental problem of deterrence theory by saying 'an empirically based theory of nuclear deterrence

(28) Kingston McCloughry, E.J., The Spectrum of Strategy: A Study of Politics and Strategy in Modern War, (London: Cape, 1964), Chap 7.

(29) Freedman, Britain and Nuclear Weapons, op. cit., pp.129-130; Bailey, 'Paradoxes and Predicaments of Nuclear Weapons,' op. cit., p.3.

(30) Testimony of the Secretary of State for Defence in the Sixth Report from the Expenditure Committee, The Future of United Kingdom's Nuclear Weapons Policies, Session 1978-9, 3 April 1979, Para 2.

(31) Speech by Lord Mounbatten in Strassburg on 11 May 1979, Pugwash Newsletter, Vol 17, No 4, 1980.

is lacking, and nuclear deterrence is perforce based on conceptions that are either essentially normative (usually of an retributive or mathematical nature) founded on unproven behavioral assumptions convenient for other reasons or a reflection of self-analogy'.[32] In history it has had a mixed record and its effects remain open to debate as leading UN experts explain

> "It is argued that deterrence has thus far prevented a world conflict, and consequently that deterrence has worked. Apart from the fact that many other factors of a historical, political and other nature have to be considered in that context, it is a truism to say that deterrence works, because that statement will hold true only until history disproves it."[33]

The theory has been criticized also because it encounters a number of difficulties and dangers concerned with the maintenance of a strategic balance to deter the outbreak of global war and Superpower intervention in Third World conflicts. The difficulties are related to the impact of and upon the central balance on such circumstances. There are other dangers inherent in the system of nuclear

(32) Groom, A.J.R., 'The Manipulation of Threats', in his book Strategic Studies and Conflict (forthcoming), p.4.

(33) UN, Comprehensive Study on Nuclear Weapons, op. cit., Para 297.

deterrence.[34] The first danger is that of a country going to war for the purpose of exploiting its nuclear superiority in a deliberate surprise and pre-emptive strike. The second is unintentional war resulting from escalation of threats and counter threats. The third is accidental war caused by human and machine errors. Bull argues that strategic deterrence between the Superpowers may only prevent a war that starts with a deliberate or calculated attack assuming rational actions by governments even at a time of an acute crisis.[35] Deterrence is a strategy for preventing wars but it does not include the proper choice of political ends nor does it tell what modifications have to be made when one needs to relax one of its basic propositions of two actors, intense hostility and rational behaviour. Jervis pointed out that rationality is neither necessary nor sufficient condition for deterrence and it might even make it less effective.[36]

Furthermore, deterrence is argued to be a stimulant of the arms race and hence leading to periodical disturbances of the 'balance' on which it is based.[37] Even if one assumes that deterrence is based on 'uncertainty' more than the technological balance between the two adversaries, both sides must always maintain invulnerable retaliatory

(34) Buchan, War in Modern Society, op. cit., Chap 5; Strachey, On Prevention of War, op. cit., pp.76-95.

(35) Bull, ' Future Conditions of Strategic Deterrence', op. cit., pp.14-15.

(36) Jervis, 'Deterrence Theory Revisited', op. cti., pp.289 - 324.

(37) Martin, 'The Determinants of Change: Deterrence and Technology', op. cit., pp.13-15.

capability; this also requires constant adjustments. The periodical instability entails the risk of outbreak of war. There is another problem related to the spread of nuclear weapons which makes it difficult to preserve the strategic balance based on nuclear deterrence.[38] Several dangers and risks are thought to be associated with nuclear proliferation such as a lack of control on weapons and use of weapons.[39] Waltz argues that on the contrary, the spread of nuclear weapons 'will promote peace and reinforce international stability'.[40] This is because nuclear weapons if 'used' responsibly would make wars hard to start and this holds for small as for major powers.[41]

Finally, apart from the prevention of an all out war, nuclear deterrence is thought to deter lesser wars, especially in the Third World.[42] In the 1960s and 1970s, the debate over the effect of strategic nuclear balance on outbreak of lesser wars focused on two dangers. The first was that due to technological development in weapons systems, the possibility of waging limited and controlled attack was created. The second was that the stability of the central balance may affect stability in the Third World by creating conditions favouring rather than discouraging

(38) Buchan, War in Modern Society, op. cit., p.166 .

(39) Bull, 'The Future Conditions of Strategic Deterrence', op. cit., pp.16; Williams, 'Deterrence', op. cit., pp.85-6.

(40) Waltz, 'The Spread of Nuclear Weapons: More May Be Better', op. cit., p.28.

(41) Ibid.

(42) Lider, Julian., Problems of Classification of War, (Stockholm: Swedish Institute of International Affairs; 1980), pp.34, 43.

the occurrence of local wars there.[43] However, nuclear deterrence does not cover all the contingencies as it was feared that the Superpowers could conduct limited war but the fear of escalation to an all out war led them to continue avoidance of limited war.[44] The door is still open, however, for the Superpowers for a wide range of lesser moves, and they retain freedom of actions below the point at which fear of nuclear war has immediate and greater impact.[45] One has to distinguish between the risks of war and confrontation in relation to the level of action of the Superpowers. There is a level of activity in fact at which the risks they incur are not risks of war but risks of confrontation.

Nuclear Deterrence in the Middle East

These aspects of nuclear deterrence are of special importance in a regional context, in parts of the world which abound with conflict, which have a precarious balance of power and are noted for actors with irrational behaviour, the case of the Arab-Israeli conflict. There are two main schools of thought regarding the effects of nuclear deterrence on a regional context. The first school argues that nuclear deterrence in the central balance and regional context which aims to control the adversaries by threat of

(43) Martin, 'The Determants of Chance: Deterrence and Technology' op. cit., pp.12-13.

(44) Bull, H., 'War and International Order', in Alan James (ed), The Bases of International Order, (London: Oxford University Press, 1973), p.125.

(45) George, A. and Smoke, R., Deterrence in Foreign Policy: Theory and Practice (New York: Colombia University Press, 1974), pp.534-48.

punishment is an inherently instable system. Frank explains this psychological dimension.

> "Since it depends on rational calculations of both parties as to the relative benefits and costs of performing or refraining from the act in question, it breaks down when one of the parties calculates, correctly or incorrectly, that the potential benefits of the forbidden action outweigh the probable costs, or when emotional tensions reach such a pitch that leaders throw caution to the windows. This is the point when, as Bertrand Russell puts it, the desire to destroy the enemy becomes greater than the desire to stay alive oneself" [46]

In a regional context, deterrence is further complicated when both adversaries adopt doctrines calling for early use of nuclear weapons.[47] In times of crisis each party will fear that other party's early use strategy will lead it to use its small nuclear force first, then mutual temptation to pre-emption will be considerable. Hence the introduction of small nuclear forces will result in high temptation for

(46) Frank, Jerome D., 'Survival in a Nuclear World: Some Psychological Considerations' in E. Laszlo and D. Keys (eds), Disarmament: The Human Factor, (New York: Pergamon Press, 1981), p.94.

(47) Kohl, French Nuclear Diplomacy, op. cit., p.154.

pre-emption and greater instability. Dror argues that Third World countries operate in an environment dominated by the Superpowers which add more complications which could lead to possible intervention by the Superpowers.[48] Groom summarises the nature of regional deterrence

> "The requirements of regional deterrence are clearly different from those of the trilateral world nuclear framework in terms of types of weapons and delivery systems and first or second strike capabilities. We have no real idea of the modalities of regional nuclear deterrence in the Middle East, Southern Africa or the Indian sub-continent. Nor do we have even an inkling of the way in which regional deterrence systems might be related either to the world's system or each other. Of course, it would be easy to construct abstract models, but we do not appear to have any relevant data against which to test them"[49]

The second school argues that nuclear deterrence could

(48) Dror, 'Nuclear Weapons in Third World Conflict', op. cit., p.154.

(49) Groom, 'The Manipulation of Threats', op. cit., p.26.

lead to regional stability because it makes wars hard to start and remove the use of force in diplomacy. This argument is based on the assumption that the alternative to nuclear weapons for some countries 'may be ruinous arms races with high risk of their becoming engaged in debilitating conventional wars and that the claims against the stabilizing effects are exaggerated, and not substantiated.'[50] Furthermore the basic assumption of rationality has been challenged on the basis that deterrence, at times, may be the product of irrational fears of a nuclear holocaust which *causes paralysis even when* rationality would indicate that an action is possible and could be taken with less liabilities. Feldman argues that 'sensitivity to cost' is sufficient substitute for rationality and even more the concept itself is difficult to prove.'[51] The assumption of stability based on a second strike capability is questioned by the argument that a perfect successful first strike is highly unlikely and the uncertainty surrounding this in itself deters the attacker.[52] Beaufre provided the most convincing argument for small nuclear forces in describing multiple decision centres as an added source of uncertainty to the aggressor.

> "Everything possible should be done to ensure that the threat should remain that minimum of spontaneous

(50) Waltz, 'The Spread of Nuclear Weapons: More May Be Better', op. cit., pp.28,30.

(51) Feldman, Israeli Nuclear Deterrence, op. cit., p.147.

(52) Ibid., pp.101-2.

> risk which leads to that prudence indispensable to the maintenance of the risk."[53]

The concept of proportional deterrence provides a rationale for regional nuclear deterrence because 'what matters was not absolute size but the threat posed in relation to the value at stake it was defending'[54]
To sum up, the second school which argues for the stabilizing effects of regional 'balance of terror' is based on a questioning and challenging of the basic assumptions and argument of the first school which views that a regional balance of terror is an inherently unstable system.

On both sides of the Arab-Israeli conflict, there are two main arguments about the likely effect of nuclearization in the Middle East. In the Arab world, one school of thought argues that the introduction of nuclear weapons in the Middle East would not lead to regional stability for several reasons.[55] First, during the transitional period of the development of the Arab states nuclear capabilities, Israel will continue threatening this development by carrying out pre-emptive strikes, and so the risks of war and destruction increase. Second, even when a nuclear balance is introduced, low level war can be fought without

(53) Beaufre, Andre., 'The Sharing of Nuclear Responsibilities: A problem in Need of Solution', International Affairs, Vol 31, No 3, July 1965, pp.38-43.

(54) Gallois, The Balance of Terror, op. cit., 120.

(55) Huweidi, The Arab-Israeli Conflict Between Conventional and Nuclear Deterrence, op. cit., p.200.

fear of nuclear escalation because nuclear forces would be small in size and number to be used with exception as a weapon of last resort. Thirdly, the possibility of intervention by Superpowers to prevent the use of nuclear weapons would also limit the chances of escalation of conventional wars to nuclear confrontation. Fourthly, there is a belief the Israeli security predisposition will lead it to use nuclear weapons in order to avoid a purely conventional defeat, an imbalance of risk-taking willingness in favour of Israel.

> "The conviction of the Israelis (or at least the majority of them) that any military defeat would mean the destruction of the State and would pose Israel's society with the danger of extermination. Thus the nuclear balance of terror, which is a consequence of the fear of extermination resulting from nuclear war would not bring about the non-use of nuclear weapons in the instance that Israel faces the danger of a complete conventional military defeat. This is due to the fact that in the Israelis' opinion the result in both cases would be the same: extermination

> and physical liquidation of the
> State and its citizens"[56]

Finally, the creation of a 'balance of terror' in the Middle East would freeze the Arab-Israeli conflict rather than solve it and create the feeling that there will be no peaceful settlement to the conflict in the future.[57]

The second Arab school of thought contends that the introduction of nuclear weapons would neutralize the possibility of Israeli nuclear threats and blackmail and neither the Arabs nor Israel would go to war because of fear of destruction which might lead Israel to give up the occupied Arab territories and the Arab states to recognize Israel.

> "When Israel gets the Atomic bomb
> there will be a 'stalemate' ....
> Egypt will also get atomic weapons
> and then neither country will dare
> attack the other and the sands will
> have run out for the Arabs."[58]

It is thought that nuclear deterrence will provide Israel with sufficient security along the 1967 border lines as an Egyptian commentator explained that 'declaration of Israel as a nuclear state eliminates its excuse about secure

(56) Al-Ayubi, 'The Truth About the Nuclear Challenge Between Egypt and Israel' op. cit.

(57) Al-Sayyad, 26 Feb 1976.

(58) Khalidi, Ahmed Samih., 'An Appraisal of the Arab-Israeli Military Balance', Middle East Forum, Vol 42, No 3, 1966, pp.55, 63.

borders.'[59] Haikel argues that Israel would not use nuclear weapons unless the Arabs penetrated the pre-1967 borders:

> "[He] does not believe Israel can use [nuclear] bombs in this age in view of the universal prohibitions, such as the world balance of power and the influence of public opinion, except in the case of an Arab penetration inside the pre-1967 territory which Israel could not stop."[60]

Some leading Arab strategists and commentators believe that nuclear deterrence could lead to a detente between the Arab states and Israel as a result of regional balance of terror since only nuclear weapons would compensate Israel for withdrawal from Arab territories and historical fears and psychological worries.[61]

In Israel there are also two broad schools of thought about the likely implications of the introduction of nuclear weapons in the Arab-Israeli conflict. The first school contends that a nuclear balance of power is a source of hope not fear as Shimon Peres explains.

> "The main danger of missiles (and whatever said about missiles is true for similar type of weapons)

(59) Baha Aldin, Ahmed., 'Declaration of Israel as a Nuclear State Eliminates Its Excuse About Absolute Borders', Al-Ahram, 28 November 1978.

(60) Haikel, 'The Bomb', op. cit.

(61) Al-Nasir, 'The Arab Nuclear Programme ,. When and Where?' op. cit.

is that the aggressive side - the Arabs - will have them. On the other hand, if both sides own such weapons, their aggressiveness might be limited and the danger of war averted ... because the truth is that both sides will be vulnerable enough not to play the idea of war....Peace will not come by itself ... will not be brought about by foreign powers ... [and] will not sprout in the present political soil of the Middle East, but Israel can bring it closer if she convinces the Arabs that with the help of science, we can eliminate their chance of defeating us, not only in the present, but also in the future"[62]

Dayan contended that a declared nuclear-armed Israel would facilitate a solution to the Arab-Israeli conflict including Israeli territorial concessions to Egypt and Syria without jeopardizing Israeli security and also slow down the conventional arms race.[63] Since there are few urban centres in the Middle East, any nuclear confrontation with its

(62) Peres, The Next Phase, op. cit., pp.122, 216, Also Peres, David's Sling, op. cit., p.254.

(63) Ha'aretz, 15 March 1976.

lethal danger would not justify the use of nuclear weapons.

> "A nuclear confrontation in the Middle East will be averted mainly because of the lethal danger it embodies. Both relatively and absolutely there are few urban centres in the Middle Eastern countries without which culture and society in the area would retrogade significantly. In each Arab state there are two or three of such centres populated by many millions of people and the whole of Israel is but one single concentrated nuclear target. In a state of terror such as this, it would be extremely difficult for either side to find a reason or aim that would justify the destruction and ruin contained in the event of nuclear confrontation"[64]

Another completely different view is taken by leading Israeli policy makers. According to this view, the strategy of nuclear deterrence is useless as regards the types of security problems confronting Israel at the present and those that she is likely to confront in the future. This is because it cannot deter the Palestinians from carrying out

(64) 'Three Israeli Views', New Outlook, May 1982, p.46.

terrorist activities, and, also, it cannot be employed against border incidents and small scale warfare carried out by regular Arab forces.[65] Allon asserts that conventional weapons are much more reliable means of deterrence than nuclear weapons and being more rigid, nuclear deterrence creates a situation of 'either/or' since nuclear arms are considered to be weapons of last resort.'[66] So it is possible for the Arab countries to launch a limited war in which Israel would not be able to make use of its nuclear superiority and this weakens the credibility of nuclear deterrence and increases the Arabs' freedom of action. The Superpowers might even use 'gun-boat' policy to neutralize the Israeli nuclear weapons. He rejected the idea of comparing the balance of terror between the Superpowers with the Arab-Israeli conflict because of 'irresponsibility' of some Arab leaders.[67] Others argue that a balance of terror might cause Israel to lose its political freedom of action as some parts of the Arab World would be in danger of destruction in the event of a nuclear war, while for Israel this would mean total annihilation.[68]

In between the two main schools of thought on the effects of introduction of nuclear weapons in the Middle East, there are arguments about the withdrawal of Israel from occupied

(65) Flapan, S., 'A Nuclear Free Zone in the Middle East. The Only Solution', New Outlook, May 1982, p.10

(66) Arnson, 'Conflict and Bargaining in the Middle East, op. cit., pp.52-53.

(67) Ibid.

(68) Pail, Meir., 'If Nuclear Threat Should Become Part of the Arab-Israeli Conflict, New Outlook, May 1982, pp.59-60.

Arab territories in which one group from both schools advocates this withdrawal as one advantage of nuclearization.[69] Nimrod summarized the nuclear debate in Israel by saying.

> "These factors - total destruction, sophistication, reciprocity - essentially shaped the major powers' conception that stirred up the controversy among Israeli specialists as to the possible contribution of nuclear weapons to Israel's security. On the other hand, there are those who assume the same model of mutual deterrence 'the balance of terror' which exists between the Superpowers to our region. On the other hand, there are those who held that this model cannot be reproduced elsewhere, given that large open spaces, the requisite resources and technology are unavailable in a limited area; and for these reasons the dynamics of introducing nuclear weapons will necessarily differ .... The dynamic in our region will be that of a pre-emptive strike in

(69). Feldman, Israeli Nuclear Deterrence, op. cit., p.229.

> the shadow of the Superpowers' presence. With such a strategy, the chances of success are infinitesmial, and the dangers are lethal."[70]

To sum up, it seems there is a parallel between the nuclear debate in Israel and the Arab world. The starting point of both advocates and opponents of nuclear weapons is the effectiveness of conventional weapons in deterring attacks and aggression taking into account the assumed qualitative advantage to the side of Israel and the quantitative one to the side of the Arab states.

Stability in A Nuclear Middle East

To what extent could Israel and some Arab states deter nuclear attack by themselves by going nuclear? And what effects would such a move have on their national security? One needs to examine two principal issues of nuclearization in the Middle East. The first is whether the 'balance of terror' model which exists between the Superpowers can be applied in the Middle East. The second is whether the basic conditions (requirements) of successful deterrence can be developed and maintained in a nuclear Middle East situation. The two issues are closely interrelated because if the conditions of successful deterrence can be developed and maintained then the model of the Superpowers' balance of

(70) 'Three Israeli Views', New Outlook, May 1982, p.49.

terror' can be applied to the Middle East. Dror argues that the Western concept of mutual deterrence do not apply to Third World situations or apply only with different interpretations because the basic assumptions of shared logic, values and calculation cannot be taken for granted.[71] Bull pointed out that deterrence theory which was formulated in a setting of the Cold War between East and West reflects four basic assumptions: two actors, roughly comparable, hostile to each other and sharing common conceptions of 'rational action.'[72] But the theory does not tell what modification needs to be made if one or more of the basic assumptions are relaxed. In a nuclear Middle East some of these assumptions have to be relaxed, such as the number of actors and rational action. Furthermore, a regional 'balance of terror' in the Middle East will operate in the shadow of the strategic balance. Waltz raised two important questions of whether the spread will complicate international politics by transforming a bipolar world into a multipolar one? And whether the widespread belief that the diabilities of some of the new nuclear states and the delicacy of their nuclear forces will work against safe keeping of peace and for the fighting of nuclear war is correct? [73] The answer to the first question he argued is 'no' because 'The non addivity of nuclear forces means in our bipolar world efforts of lesser states cannot tilt the

(71) Dror, 'Nuclear Weapons in Third World conflict', op. cit., pp.24-30.

(72) Bull, 'The Future of Strategic Deterrence', op. cit., pp.3, 10.

(73) Waltz, 'The Spread of Nuclear Weapons: More May Be Better', op. cit., pp.3, 10.

strategic balance'[74]. His answer to the second question is also 'no', because new nuclear weapons will be able to construct and protect deliverable nuclear weapons and deterrent threats backed by second strike forces raise the expected cost of war to level that war becomes unlikely because of uncertainty of response.[75]

The evidence presented in the previous chapter about the risks of war in a nuclear Middle East suggests that introduction of nuclear weapons would not necessarily lead to an increased risk of nuclear war nor would it lead inevitably to a nuclear catastrophe. However, the risks of nuclear war in the Middle East are likely to be less certain than that between the Superpowers either by accident, deliberate act or through uncontrolled escalation and miscalculation. There is no evidence to suggest that the level of rationality among Middle Eastern statesmen is the same as often expressed against proliferation of nuclear weapons in the region. Secondly, for the capability of effective deterrence, invulnerable second strike capability, the evidence suggests that the risks of vulnerability of the second strike capabilities of the Middle Eastern to internal loss of control are less worrisome than the risks of pre-emptive and preventive strikes and vulnerability of command and control centres. The capability requirements of the effective deterrence in the Middle East will remain major sources of concern and danger despite the low level of

(74) Ibid., p.3.

(75) Ibid., pp. 17,21.

the probabilities of these risks. The Israeli preventive attack on Iraq's nuclear reactor is a case in point and set the precedent in the nuclear era in the Middle East. The physical requirements of nuclear deterrence are not difficult to obtain in the Middle East but the risks associated with maintaining an effective capability are probably higher than that of the central balance due to technological, financial and organizational reasons. Thirdly, the main risk of nuclear deterrence in the Middle East as the evidence suggests would be the difficulty of controlling escalation and miscalculation, unlike the case of the Superpowers, due to the limitation of space, lack of communication, mistrust, existence of common borders and contrasting perceptions about security threats, psychological and ideological reasons. For historical, psychological and ideological reasons, Israel is concerned with the security of survival. President Sadat argued that 70% of the origin of the Arab-Israeli conflict is psychological and that the state of psychological sensitivity between the Arabs and the Israelis could lead to the outbreak of war in the future.[76] The majority of the Arab states consider Israel as an alien in the Arab world and are more than reluctant to accept the reality of the existence of the State of Israel. In the Arab world, perception of security is based on the sense of liberation

(76) President Sadat interviews with Tunisian and American ABC televisions, reported in Al-Ahram, 30 November and 12 December 1977.

of occupied Arab territories and that total defeat of the Arabs is not possible.

> "The Arabs will not be totally defeated .... We can absorb more defeats as it was the case in 1967 and prevail and the invader will be compelled to surrender at the end of the day as all invaders had done in history."[77]

On the other hand, the Israeli concept of security of a state besieged is rooted in Zionist tradition as a result of long history of Jewish suffering. Several qualifications follow from this basic security concept. The most important one is the need for strong defence stance by the maximum use of its limited human and physical resources. Accordingly, Israel felt the need for the support of, at least, one Western power for the supply of arms and financial aid and to act as a deterrent to possible Soviet intervention on the side of the Arabs during times of war. The USA has fulfilled this role since the sudden loss of France's arms supply in 1967 as Israel is considered a reliable and powerful ally and strategic asset to US policy in the Middle East.[78] This special relation between Israel and the USA complicates the Arab-Israeli conflict and reinforces the Arabs perception that Israel is a US imperialist bridge in

(77) President Sadat Interviews and Speeches, op. cit., Vol 3, P 112.

(78) Spiegel, S., 'Israel as a Strategic Asset', in The Israeli Yearbook, op. cit., pp.248-58.

the Arab world and the conception of a foreign 'conspiracy.'[79] All these factors added together would probably make escalation control difficult and complicates calculation.

Finally, in the Middle East, it seems that the credibility of Israel and the nuclear deterrent threats of some Arab states would not depend only on invulnerable second strike capabilities but also on uncertainty of response. The devastating risks of retaliation and nuclear attacks on the few urban centres of the Middle East would mean the end of civilization for both parties of the conflict. This reinforces the credibility of a nuclear threat because there would be no possibility of prevailance and survival. No one can be certain that a first strike would be completely successful otherwise the horrific costs of such attacks would not justify any political objective. The credibility of a nuclear deterrent threat would be reinforced by the fear of Superpower intervention on the side of their client states. Uncertainty about the likely response of the Superpowers to a nuclear exchange in the Middle East would encourage caution and moderation because the aggressor would probably face retaliation not only from the victim state but also from the supporting Superpower. The long successful Israeli experience of credible retaliation against conventional attack by the Palestinian guerrillas and regular Arab armed forces and the Arabs'

(79) President Sadat Interviews and Speeches, op. cit., Vol 11, pp.95, 98,99,; Vol 2 pp.274-75; 63; Vol 3, p.81.

perception that she would certainly hit back if her survival is at stake, would add to the credibility of Israeli nuclear threat in the nuclear era. On the other hand, the Israeli perception of inferiority in a nuclear 'balance of terror' vis-a-vis The Arab World and that the Arabs are seeking her destruction, would also add to the credibility of the Arab's nuclear threat.

> "It was this serious and troubling diagnosis that pushed Israel's Prime Minister, Menahem Begin, to approve the bombing of the Iraqi nuclear reactor in June 1981, out of a deep conviction that even if Israel had a nuclear option and even if Israel should possess actual nuclear weapons, that is not a sufficiently substantial answer to the Arabs' ability to threaten and deter Israel should they have the nuclear weapons to do so"[90]

Nuclearization of the Arab-Israeli conflict might increase the intensity of the arms race because of the need for further development of sophisticated nuclear forces and improved command, control and communication arrangements which would be a destabilizing factor. This could be true

(90) Pa'il, 'If a Nuclear Threat Should Become Part of the Arab-Israeli Conflict' op. cit., p.60.

considering the obsessive concern for security and as long as Israel holds the West Bank and Gaza Strip. The cost of mounting sophisticated nuclear forces could weaken existing conventional military capability and thus accelerate escalation to nuclear confrontation in the events of a crisis and high tension.

The nuclearization of the Arab-Israeli conflict would have a dramatic effect on the local strategic environment of the region. Other states in the region could be expected to reconsider their level of national security and those who feel their national security is directly affected might decide to acquire nuclear weapons capability, countries such as Iran, Pakistan and Turkey.

The nuclear weapons proliferation process, once established in the Middle East, would be very difficult to reverse.

This further proliferation would complicate the problem of escalation and calculation by widening the circle of states that might be involved. Furthermore, a nuclear escalation in the Middle East would certainly involve the Superpowers as was the case during the Middle East crises of 1967 and 1973 and the prospects for Superpowers confrontation in such circumstance one would expect to be of grave consequences to regional and global security. This, however, does not mean that a Superpower nuclear confrontation is certain but it would almost increase the risks of war either because of uncontrolled actions of Israel and Arab states or loss of control of events.

Concluding Remarks

In conclusion, the implications of nuclearization of the Arab-Israeli conflict are difficult to assess in a precise manner since there is no comparable experience to learn from, and the experience of the great nuclear powers developed in circumstances which might not materialize in the future. One can judge the possible implications from the logic of nuclear deterrence and the likelihood of the risks involved in such a process. The logic of deterrence presupposes that nuclear weapons make the costs of war seem horrifically high and thus discourage states from starting any war that might lead to the use of such weapons. The theory is based on the threat of deadly retaliation and infliction of unacceptable damage in the case of action by the adversary endangering vital security interests. A regional deterrence is based on the notion that what is good for the Superpowers is good enough for the Middle East. A balance of terror, therefore, will ensure that neither side will be willing to risk an all-out war. As a result, conventional wars may also be avoided. The experience of the Arab-Israeli conflict has shown that both sides are sensitive to the cost of war, and one would expect them to be more cautious in a nuclear Middle East than they were in a pre-nuclear era. However, the risks associated with such nuclearization of the conflict are not insignificant. Some of these risks taking shape seem to be far less than often expressed, others such as difficulty of controlling escalation, miscalculation, vulnerability of command and control centres and pre-emptive and preventive strike would remain high risk factors. Thus, the nuclearization of the Arab-Israeli conflict would probably create a high degree of uncertainty in the short term but would not necessarily lead to nuclear war. In the long term, the two parties would probably learn to 'live with the bomb' through what Nacht called 'adaptive continuity'.[81]

Nuclearization of the Arab-Israeli conflict would involve the Superpowers in higher levels of risks of intervention and escalation but not necessarily lead to nuclear confrontation and exchange. Though the incentives against a Superpowers' nuclear confrontation as a result of a nuclear conflict in the Middle East would be high, no one can be certain of the outcome. The nuclearization of the Arab-Israeli conflict would, most likely, be associated with high levels of uncertainty and some risks of war, but the end result could be fewer wars and some degree of stability and detente as described by a leading Egyptian scholar.

> "It is correct to assume that the Arab-Israeli conflict is marching into the nuclear era with all its implications in the realm of diplomacy, politics and warfare ... Nuclear diplomacy has created what is called 'international detente'

(81) Nacht, 'The United States in a World of Nuclear Powers', op. cit, p.159.

... [which] means the ability to control conflicts and contain them before they pass certain thresholds. International detente did not solve international disputes. Rather it 'froze' them within certain controlled frameworks"[82]

A stable outcome of the nuclearization of the Arab-Israeli conflict might be a happy regional success story while an unstable outcome that triggers a chain of uncontrollable events could have serious consequences on regional and global security. Though this nuclearization might have unprecedented consequences, it does not seem likely to alter the problem of global security and stability in a fundamental way.

(82) Ahmed, Mohammed Sayed., 'The Future of the Arab-Israeli Conflict after the October War', Shu'un Filastiniyya, March 1976; See his After the Guns Fall Silent, (London: Croom Helm, 1976).

CONCLUSION

The possibility of a major nuclear war triggered off by a conventional war in a nuclear Middle East is a matter of growing concern. In fact the proliferation of nuclear weapons to any country is a matter of serious concern to the world. The introduction of nuclear weapons in a volatile region such as the Arab-Israeli conflict area, not only would be severe blow to worldwide efforts at non-proliferation but would wreck many years of attempts to settle this long standing problem. The acquisition of nuclear weapons by countries of the area would have to be treated as a grave threat to the security of the region and international peace. Hence the main theme of the study has been to explore the relationship between proliferation and stability in the Middle East. The conclusion of this study is in two parts. First an analysis of how proliferation is taking place in the Arab-Israeli conflict area and then an assessment of the risks involved in this nuclearization and its implications on the conflict.

The preceding study of nuclearization and stability in the Middle East reveals that nuclear proliferation is the product of technology and politics. One has to draw a distinction between the spread of nuclear technology as a technological and economic process and the proliferation of nuclear weapons as a politico-military process and that there is a link between the two processes. The technological aspects are fairly stable and predictable overtime while the political ones are not. When the two aspects converge and meet the proliferation of nuclear weapons takes place. At the heart of this study is the contention between two very different notions regarding the fundamental cause of the proliferation of nuclear weapons. Systematic analysis of historical evidence of capabilities and intentions support both. Technology is one of the two necessary ingredients of the nuclear proliferation process. Distinct motivational profiles taken in conjunction with adequate technical abilities can produce proliferation events. The greatest weight is carried out not only by a technological or only by a political factor but by a combination of the two, both pointing in the same direction. The study has attempted to demonstrate that the clear-cut image of proliferation of earlier decades, centring round a single nuclear explosion, no longer corresponds to technical realities nor can it be anticipated to be the same as was the case in the past. In addition, the terminology used to describe the problem, having been inherited from a previous era, may be unhelpfull in the search for a contemporary understanding and solution to it.

There is ample evidence that during the late 1980s and 1990s, the problems associated with proliferation are going to be of different order from what they were in the past due to vast technological advances taking place. The availability of nuclear technology means that indigenous capabilities are no longer formidable barriers which prevent some countries from going nuclear. Low levels of scientific, technological and economic capabilities can be overcome through international nuclear exchange including the emerging new trading system outside the non-proliferation control system. The international nuclear energy market is a multi-billion dollar transnational rivalry which pushes hard to penetrate the potential Third World markets. Furthermore, the marketing of short lead time technologies for obtaining fissile material undermines the IAEA detection efforts and speeds up the proliferation process. However, proliferation of nuclear weapons will be a gradual process though in the long-run probably irreversible. It is unlikely that nuclear weapons will spread with a speed that exceeds the ability of the new nuclear weapons states to adjust to them. One should look at nuclear proliferation in the Middle East as a process which passes through different stages of acquiring nuclear knowledge, building nuclear infrastructure and facilities, open adoption of nuclear deterrence, testing and developing nuclear forces. In the Middle Eat there have been clear indicators that this process is taking place for over thirty years. Israel has the technological skills and expertise and fissile material as well as technical infrastructure to manufacture nuclear weapons. There are significant indicators that it has reached the threshold of being a nuclear weapons state. Israel's official statements regarding possession of nuclear weapons have been described as deliberate ambiguity. However, various politico-military considerations may have prompted it to acquire nuclear weapons. As for the Arab states, Iraq, Libya, Egypt and probably Algeria and Syria will be able to have the technological capabilities to go nuclear by 1990s. Some of them, Iraq, Libya and perhaps Egypt have strong political and military reasons to develop nuclear weapons. If these strong motives will persist by the mid 1990s, then one would expect proliferation to take place.

On the other hand, proliferation entails several risks of nuclear war which are difficult to assess in a very precise manner though the likelihood of these risks can be defined under certain conditions, actors and circumstances. The adoption of nuclear deterrence in the Middle East clearly involves a measure of risk. Irrational decision makers may upset optimistic expectations, lack of proper conceptualization about the use of nuclear weapons may lead to their misuse, inability to maintain control over weapons may lead to unauthorized use, vulnerability of command and control centres, nuclear weapons and installations may lead to war and destruction as well as inherent difficulty of making calculation and controlling escalation. In addition, a measure of risk involved in possible US and Soviet response to regional nuclearization and Superpowers involvement in local nuclear conflict and eventual escalation to global confrontation.

However, some of these risks in a nuclear Middle East appear to be less worrisome than the others, in general most of them are of less level of probability than often expressed. Though these risks can not be dismissed lightly, they are actually less significant than most analysts believe. Moreover, though the Superpowers would not applaud the contemplated change in the Middle East, their competing interest will moderate their adverse responses under certain circumstances. But since the potential destruction involved in these risks is so high, ignoring them would be a highly irrational thing to do. Furthermore, the situation might be radically different after first (or threat to) use of nuclear weapons to assume the possibility of vigorous Superpower intervention.

There is no substantiated evidence that the new nuclear weapons states in the Middle East will be less responsible and have less self control than the existing nuclear weapons powers. The conclusion to be drawn is that in the nuclear era, the states of the Middle East would have to weigh very carefully the risks involved should they initiate significant offensive operations. However, while nuclear proliferation in the Middle East may increase the risks of local or regional nuclear confrontation, it is unlikely that this type of nuclear war would lead to major nuclear war involving the Superpowers. Nuclear proliferation will probably increase instability in the Middle East and might lead to regional devastation but not necessarily alter the problem of the Strategic Nuclear Balance in a fundamental way. Nuclear weapons of the Middle East will not matter in the central strategic balance in the immediate future but they will complicate it.

In general, there can be no decisive answer over the effects of proliferation in the Middle East. Particular outcomes may differ. Some cases may be a happy regional surprise, an unstable outcome that triggers a chain of proliferation events could have serious consequences on regional and global security. The process of nuclearization has implications on the Arab-Israeli conflict in terms of dealing with the conflict and the associated risks. By providing effective deterrence, nuclear weapons have the capacity to reduce the likelihood of war because of fear of devastating retaliation and escalation of conventional war to nuclear exchange. Effective deterrence may enhance stability and promise peace but a major breakdown of deterrence may have untold consequences. However, there is no simple procedure available for solving the complexity arising from the uncertain nature of benefits derived from acquisition of nuclear weapons which are exacerbated by the importance attached to the perception of power which nuclear weapons are said to impart. But the possibility of making nuclear peace in the Middle East under certain circumstances does exist. Furthermore, one must stress that there is no simple answer to the above mentioned difficulties.

The constant repetition of overused phrases in resolutions on the need for peaceful settlement of the Arab-Israeli conflict whether in form of partial peace agreements, declarations or conventions appear to have little impact. Perhaps a comprehensive and just peaceful settlement of the

Arab-Israeli conflict, however remote it is today, will be the most reasonable alternative to pursue today. Meanwhile, the nuclear option will remain on the table with all its risks and unpredictable consequences.

Appendix (A)

WORLD NUCLEAR POWER INDUSTRY (1985)

	1955		1960		1965		1970		1975		1980		1985		1990*	
	NO	MW	NO	MW	NO	MW	NO	MW	NO	MW	NO	MW	NO	MW	NO	MW
Argentina	-	-	-	-	-	-	-	-	1	335	1	335	2	935	3	1627
Belgium	-	-	-	-	1	11	1	11	4	1675	4	1675	8	5486	8	5486
Brazil	-	-	-	-	-	-	-	-	-	-	-	-	1	626	3	3116
Bulgaria	-	-	-	-	-	-	-	-	2	816	3	1224	4	1632	6	3538
Canada	-	-	-	-	1	22	2	228	7	2538	10	5304	16	9521	23	15151
China	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	300
Cuba	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	408
Czechoslovakia	-	-	-	-	-	-	-	-	1	110	2	796	5	1980	13	5588
Finland	-	-	-	-	-	-	-	-	-	-	4	2310	4	2310	4	2310
France	-	-	2	79	4	329	8	1509	10	2662	22	14363	43	37533	64	61248
E. Germany	-	-	-	-	-	-	1	62	3	878	5	1694	5	1694	11	5126
W. Germany	-	-	-	-	1	15	7	851	9	3244	14	8625	20	16429	26	23014
Hungary	-	-	-	-	-	-	-	-	-	-	-	-	2	820	3	1640
India	-	-	-	-	-	-	2	396	3	598	4	800	6	1240	10	2120
Italy	-	-	-	-	3	563	3	563	3	563	4	1423	3	1273	6	3272
Japan	-	-	-	-	2	171	5	1271	13	6304	24	15021	33	23665	41	30933
S. Korea	-	-	-	-	-	-	-	-	-	-	1	556	4	2720	9	7412
Libya	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	440
Mexico	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1308
Netherland	-	-	-	-	-	-	1	56	2	508	2	508	2	508	2	508
Pakistan	-	-	-	-	-	-	-	-	1	125	1	125	1	125	1	125
Philippines	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	620
Poland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	880
Romania	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	1980
South Africa	-	-	-	-	-	-	-	-	-	-	-	-	2	1842	2	1842
Spain	-	-	-	-	-	-	1	153	3	1073	3	1073	8	5577	10	7497
Sweden	-	-	-	-	1	10	1	10	5	3155	8	5540	12	9455	12	9455
Switzerland	-	-	-	-	-	-	1	350	3	1020	4	1940	5	2882	5	2882
Taiwan	-	-	-	-	-	-	-	-	-	-	2	1208	6	4918	6	4918
UK	-	-	8	340	22	2442	27	3388	30	4470	33	6590	38	10120	42	12694
USA	-	-	2	361	5	745	17	6171	54	36491	70	51006	93	77851	119	107109
USSR	1	5	5	365	10	962	13	1486	23	5254	34	12678	50	26803	85	59572
Yugoslavia	-	-	-	-	-		-	-	-		-		1	632	1	632
World Total	1	5	17	1145	50	5270	90	16505	177	71819	255	134800	374	248577	528	385123
			NEW				GROWTH						MATURE			

*Egypt (2 X1000), Turkey (1 X 900) , Plans are in final stages and China awarded French Framatone 2 X 900 power reactors

Appendix (B)

WORLD POWER REACTORS

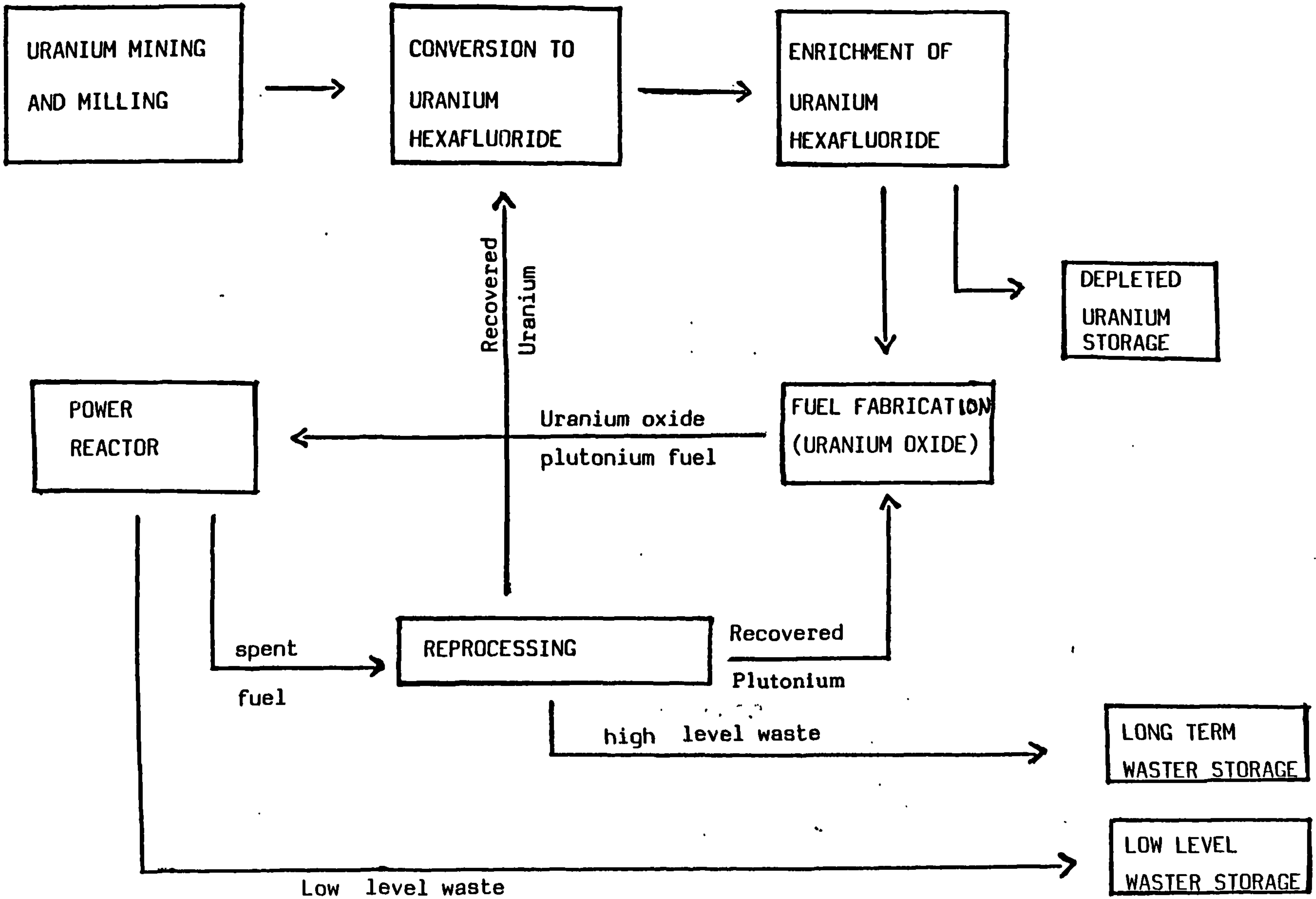
Export Markets (1965 - 1985)

	USA		France		W. Germany		Canada		USSR		Sweden
	oper	const	oper	const	oper	const	oper	const	oper	const	oper
Argentina	-	-	(1) 335	-	-	(1) 692	(1) 600	-	-	-	-
Belgium	(6)3709	-	(2)1777	-	-	-	-	-	-	-	-
Brazil	(1) 626	-	-	-	-	(2)2490	-	-	-	-	-
Bulgaria	-	-	-	-	-	-	-	-	(4)1632	(2)1906	-
Cuba	-	-	-	-	-	-	-	-	-	(2) 880	-
Czechoslovakia	-	-	-	-	-	-	-	-	(5)1980	(8)3608	-
Finland	-	-	-	-	-	-	-	-	(2) 890	-	(2)1420
E. Germany	-	-	-	-	-	-	-	-	(5)1694	(6)3432	-
W Germany	(2) 342	-	-	-	-	-	-	-	-	-	-
Hungary	-	-	-	-	-	-	-	-	(2) 820	(2) 820	-
India	(2) 396	-	-	-	-	-	(1) 202	-	-	-	-
Italy	(2)1120	(3)1999	-	-	-	-	-	-	-	-	-
Japan	(11)7012	-	-	-	-	-	-	-	-	-	-
S. Korea	(3)2091	(3)2832	-	(2)1860	-	-	(1) 629	-	-	-	-
Libya	-	-	-	-	-	-	-	-	-	(1) 440	-
Mexico	-	(2)1308	-	-	-	-	-	-	-	-	-
Netherland	(1) 56	-	-	-	(1) 452	-	-	-	-	-	-
Pakistan	-	-	-	-	-	-	(1) 125	-	-	-	-
Philippines	-	(1) 621	-	-	-	-	-	-	-	-	-
Poland	-	-	-	-	-	-	-	-	-	(2) 880	-
Romania	-	-	-	-	-	-	-	(2)1540	-	(1) 440	-
S. Africa	-	-	(2)1842	-	-	-	-	-	-	-	-
Spain	(7)5097	(1) 930	(1) 480	-	-	(1) 990	-	-	-	-	-
Sweden	(3)2630	-	-	-	-	-	-	-	-	-	-
Switzerland	(4)1962	-	-	-	(1) 920	-	-	-	-	-	-
Taiwan	(6)4918	-	-	-	-	-	-	-	-	-	-
Yugoslavia	(1) 632	-	-	-	-	-	-	-	-	-	-
TOTAL	(59)28709	(10) 7690	(6) 4434	(2)1860	(2)1372	(4)4172	(4)1556	(2)1540	(18)7016	(24)12406	(2)1420
%TOTAL EX.MRKTS*	(63%) 63%	(24%)28%	(6%9 10%	(5%) 7%	(2%) 3%	(10%)15%	(4%) 3%	(5%) 5%	(19%)16%	(57%) 45%	2% 3%
%WORLD CAPACITY	(16%) 12%	(6%) 6%	(2%) 2%	(1%) 1%	(0.5%)0.5%	(3%) 3%	(1%)0.6%	(1%) 1%	(5%) 3%	(4%) 9%	0.5% 0.5%

* This includes 1 x 153 and 1 x 159 British Reactors sold to Italy and Japan and 1 x 692 West German sold to Austria which was abandoned before commissioning.

APPENDIX (C)

NUCLEAR FUEL CYCLE



APPENDIX (D)
PRODUCTION OF NUCLEAR WEAPONS
MATERIAL - A GUIDE

The vast amount of energy released in a nuclear explosion originates in the nucleus of the atom. In the atom bomb, the process involved is the splitting of uranium or plutonium nuclei into lighter fragments, fission products, uranium-235 and plutonium-239. In a thermonuclear bomb, nuclei of heavy hydrogen isotopes, deuterium and tritum, are fused together at the very high temperature triggered by an atomic explosion. In order for this chain of reaction to be sustained, it is necessary to have a minimum of fissile material called the critical mass. Several studies indicted that 8 kilogrammes of plutonium-239 or 25 kilogrammes of highly enriched uranium-235 are the necessary minimum conditions for making an atom bomb of 20 kilton of high explosive. However, depending on the design sophistication and quality of material, this mass can range from 15 to 25 kilgrammes of uranium-235 and from 4 to 8 kilogrammes of plutonium-239.

Neither of these two materials occurs in nature, however, and highly complex and expensive facilities must be built and operated in order to make them. This process for Third World countries requires considerable transfer of nuclear technological skills, material and facilities from nuclear supplier countries. Uranium, as found in nature, is a mixture of uranium-238 (99.2%) and uranium-235 (0.7%). Only uranium-235 is fissile and so must be increased in isotope enrichment facility to 90-95% in order to be used in an atom bomb. There are 4 main enrichment processes, gaseous diffusion, centrifugation, jet-nozzle and laser. On the other hand, plutonium-239 is normally produced in a nuclear reactor. This process requires the capabilities to refine uranium, the fabrication of reactor fuel, a nuclear reactor and a chemical plant for plutonium extraction from spent fuel elements (reprocessing). Both processes of obtaining weapons-grade material are very expensive and require advanced technology and considerable amount of time and highly skilled nuclear scientists and engineers.

Finally, it is important to point out in this connection three several points of obtaining weapons-grade material. First, it is easier to construct and operate a dedicated plutonium production reactor than an electrical power producing reactor. For Third World countries this requires substantial transfer of advanced nuclear technology and material. Secondly, it is possible to mainipulate the operation of some power reactors to produce weapons-grade plutonium which makes diversion of materials difficult to detect and safeguard. Thirdly some large nucldar research reactors do produce small but significant quantities of weapons-grade plutonium and that some others are fuelled with weapon-grade uranium.

Source: U.S. Congress, Nuclear Proliferation Factbook [Washington D.C.: Government Printing Office, 1977] p382; U.S. Congress, Office of Technology Assessaent, Nuclear Proliferation and Safeguards [Washington D.C: National Technological Information Service, 1977] p154-1958; King John, (ed) International Political Effects of the spread of Nuclear Weapons [Washington D.C.: Central Intelligence Agency, 1979] p7; U.N., Coaprehensive Study on Nuclear Weapons [New York: U.N, 1980] Chapter 2).

APPENDIX (E)

Technical Details of the Survey
Sampling Error Calculations

	% (P)	Standard Error P(%)	95% Confidence interval
Q_3 Probability of Nuclear war in the Middle East	35.5	3.6	28.4 - 42.6
Q_{3a} Difficulty of controlling escalation	84	2.9	78.3 - 89.7
Q_7 US response to nuclear - armed Israel	45	3.7	37.8 - 52.2
Q_8 Soviet response to nuclear-armed Israel	32	3.5	25.1 - 38.9
Q_3 Joint Soviet-American response to nuclearization	28	3.4	21.4 - 34.6
Q_4 Impact of nuclear use on Superpower Strategic Balance	22	3.1	16 - 28

SAMPLING FRAME

Columbia University	U S A
Princeton University	U S A
Harvard University	U S A
University of California, Berkely	U S A
New York University	U S A
Geogetown University	U S A
University of Pittsburg	U S A
University of Southern California	U S A
University of Notre Dame	U S A
Stanford University	U S A
Pennsylvania State University	U S A
Johns Hopkins University	U S A
Chicago University	U S A
University of Maryland	U S A
Cornell University	U S A
University of California, San Diago	U S A
Willamette University	U S A
Claremont Mckenna College	U S A
Boston University	U S A
Massachussets Institute of Technology	U S A
University of California, Los Angeles	U S A
Yale University	U S A
University of Texas	U S A
American University	U S A
Calorado State University	U S A
National Defence University	U S A
City University of New York	U S A
University of Michigan	U S A
US War College	U S A
University of South Carolina	U S A
Brown University	U S A
Royal Military Academy	U K
Oxford University	U K

Newcastle -upon-Tyne University	U K
London University, Kings College	U K
Leicester University	U K
University of Wales	U K
Lancaster University	U K
University of Kent	U K
University of Keele	U K
University of Exeter	U K
Southampton University	U K
Cambridge University	U K
Bradford University	U K
Aberdeen University	U K
University of Birmingham	U K
Polytechnic of Central London	U K
London School of Economics	U K
University of Aston	U K
London University, SOAS	U K
University of Edinburgh	U K
Open University	U K
University of Bristol	U K
University of Manchester	U K
University of Sussex	U K
Cairo University	Egypt
Egyptian High War College	Egypt
Nasser Military Academy	Egypt
Hebrew University	Israel
Tel Aviv University	Israel
Technion	Israel
Weismann Institute of Technology	Israel
Norwegian Institute of International Affairs	Norway
Graduate Institute of International Studies	Switzerland
National University of Singapore	Singapore
University of Kuwait	Kuwait
Damascus University	Syria
University of Pretoria	South Africa
American University	Lebanon
Quad-I-Azam University	Pakistan

University of Karachi	Pakistan
Australian National University	Australia
University of Victoria	Canada
University of Waterloo	Canada
Dalhouse University	Canada
University of Montreal	Canada
University of Hyderabad	India
Centre for National Security Studies	U S A
Carnegie Endowment for International Peace	U S A
Brookings Institution	U S A
Peace and Common Security	U S A
Council on Foreign Relations	U S A
Hudson Institute	U S A
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International Institute for Strategic Studies	U K
Royal United Siences Institute for Defence Studies	U K
Royal Institute for International Affairs	U K
Arab Research Centre	U K
Society of Analytical Psychology	U K
Institute for Diplomatic Studies	Egypt
Centre for Political and Strategic Studies	Egypt
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Stockholm International Peace Research Institute	Sweden
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French Institute of International Relations	France
National Centre for Scientific Research	France
Middle East Institute	Jordan
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US House of Representatives	U S A
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US Nuclear Regulatory Commission	U S A

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Department of National Defence	Canada
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BBC Radio	U K
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Channel Four-TV	U K
New York Times	U S A
Science	U S A
Boston Globe	U S A
Los Angeles Times	U S A
Time	U S A
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Sunday Times	U K
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The Times	U K
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The Observer	U K
The Mirror	U K
The Middle East	U K
The Daily Telegraph	U K
The Guardian	U K
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Jane's Defence Weekly	U K
New Scientist	U K
Al-Ahram	Egypt
Akher Sa'a	Egypt
Akhbar Al-Usbu	Jordan
Al-Qabas	Kuwait
Shu'un Filastinyya	Lebanon

Al-Usbu Al-Arabi	Lebanon
Al-Majalla Al-Askarrya	Syria
Al-Nahar	Lebanon
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European Nuclear Disarmament	U K
Pugwash	U K
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United Nations	U S A
Dr H. Kissinger	U S A
F. Ikle	U S A
E. Rostow	U S A
W. Bader	U S A
B. Boskey	U S A
S. Kennan	U S A
P. Warnke	U S A
G. Ball	U S A
Dr Paul Jabber	U S A
Prof. M. Willrich	U S A
R. Mcnamara	U S A
S. Turner	U S A
R. Pagner	U S A
Prof. R. Wohlstetter	U S A
Prof. F. Barnaby	U K
J. Maddox	U K
Prof. W. Laqueur	U K
Lord Zuckerman	U K
Prof. J. Rotblat	U K
Lord Chalfont	U K
J.F. Boyd	U K
E. O'Ballance	U K

D. Watt	U K
Prof. A. Martin	U K
M.H. Haikel	Egypt
I. Fahmy	Egypt
A. Huweidi	Egypt
Prof. M.M. Mahfouz	Egypt
H. Schmidt	W. Germany
Jules Moch	France
B. Goldschmidt	France

QUESTIONNAIRE

Nuclear proliferation in the Middle East has caused widespread discussions and concern among experts and policy makers in many parts of the world because of the relationship between nuclear proliferation and the probability of nuclear war.

1. What is your response to the following: (mark ✓)

(a) Israel has capability "reactors, fissile materials and technological and scientific expertise" to produce nuclear weapons in a short period (less than one year)

Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know

(b) The following Arab countries might have capability to produce nuclear weapons by

	1985	1990	1995	2000	2000+	Do not Know
Egypt						
Iraq						
Libya						
Syria						
Algeria						

2. Nuclear weapons (1) could be used militarily by the following countries in future Arab-Israel confrontation assuming these countries acquired first and/or second strike nuclear weapons capability in the following circumstances

(a) In the case of the political survival of the nation being at stake

	Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know
Israel					
Egypt					
Iraq					
Libya					
Syria					
Algeria					

(b) To destroy the enemy in a surprise attack
(i) by Israel against

	Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know
Egypt					
Iraq					
Libya					
Syria					
Algeria					

(ii) by the following Arab countries against Israel

	Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know
Egypt					
Iraq					
Libya					
Syria					
Algeria					

(c) In emergency (total defeat is very likely), out of desperation when drastic actions need to be made by the following countries

	Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know
Israel					
Egypt					
Iraq					
Libya					
Syria					
Algeria					

(2) Nuclear weapons will be procured as a deterrent

(a) By Israel in case of acquisition of nuclear weapons by

	Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know
Egypt					
Iraq					
Libya					
Syria					
Algeria					

(b) By Israel against sudden use in a pre-emptive strike by

	Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know
Egypt					
Iraq					
Libya					
Syria					
Algeria					

(c) By Israel to deter a disarming first strike by

	Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know
Egypt					
Iraq					
Libya					
Syria					
Algeria					

(d) By the following Arab countries in case of acquisition of nuclear weapons by Israel

	Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know
Egypt					
Iraq					
Libya					
Syria					
Algeria					

(e) By the following Arab countries to deter a sudden use in a pre-emptive strike by Israel

	Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know
Egypt					
Iraq					
Libya					
Syria					
Algeria					

(f) By the following Arab countries to deter a disarming first strike by Israel

	Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know
Egypt					
Iraq					
Libya					
Syria					
Algeria					

(3) Nuclear weapons will be procured to blackmail the nuclear powers to ensure continued supply of arms and support by

	Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know
Israel					
Egypt					
Iraq					
Libya					
Syria					
Algeria					

(4) Nuclear weapons will be procured to encourage the enemy to be more amenable to a final peace agreement by

	Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know
Israel					
Egypt					
Iraq					
Libya					
Syria					
Algeria					

(5) Nuclear weapons will be procured to discourage third parties from getting involved in the Arab-Israeli confrontation by

	Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know
Israel					
Egypt					
Iraq					
Libya					
Syria					
Algeria					

(6) OTHERS

3. The probability of nuclear war in the Middle East is predicted to be substantially higher than anywhere else: Do you agree? (Mark ✓)

Yes No Partly Do not Know

If the answer is Yes is it

(a) Because the level of rationality among Middle Eastern decision makers is low (i.e. level of conceptualization about the use of nuclear weapons) in the event of acquisition of nuclear weapons by

	Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know
Israel					
Egypt					
Iraq					
Libya					
Syria					
Algeria					

(b) Because of the likelihood that nuclear weapons may be included in war fighting strategies by

	Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know
Israel					
Egypt					
Iraq					
Libya					
Syria					
Algeria					

(c) Because of the vulnerability of Israel's first strike capability to the combined nuclear forces of the Arab countries

Agree | Agree (with Reservation) | Disagree partially | Disagree | Do not Know

(d) Because the vulnerability of Middle Eastern nuclear weapons to attack is high, i.e. delivery vehicles such as missles, planes

Agree | Agree (with Reservation) | Disagree partially | Disagree | Do not Know

(e) Because of the problem of controlling escalation in a multi-nuclear Middle East

Agree | Agree (with Reservation) | Disagree partially | Disagree | Do not Know

(f) Because of the problem of calculation in a multi-nuclear Middle East, i.e. uncertainty of sources of attack

Agree | Agree (with Reservation) | Disagree partially | Disagree | Do not Know

(g) Because of the possibility of catalytic war, i.e. war triggered by a third party

Agree | Agree (with Reservation) | Disagree partially | Disagree | Do not Know

(h) Because the vulnerability of command and control capabilities of nuclear weapons is high

Agree | Agree (with Reservation) | Disagree partially | Disagree | Do not Know

(i) Because the probability of nuclear terrorism is high

Agree | Agree (with Reservation) | Disagree partially | Disagree | Do not Know

(j) Because of the absence of direct relations between the Arab countries and Israel (with the exception of Egypt)

Agree | Agree (with Reservation) | Disagree partially | Disagree | Do not Know

(k) Because of the existence of common borders between Israel and some Arab countries

Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know

(1) Because of the shortness of distance between Israel and the Arab countries

Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know

(m) OTHERS

If the answer is No explain why:

Do you think these problems are particular to the Middle East? (Mark ✓)

Yes	No	Partly	Do not Know

Explain why:

4. What is your response to the following: (Mark ✓)

The superpowers nuclear balance of terror would not withstand use of nuclear weapons by third parties among themselves

	Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know
(a) Any third party					
(b) Middle East third party only					

Explain Why:

5. Nuclear proliferation is opposed by the superpowers: (Mark ✓)

(a) Because the spread of nuclear weapons increases the likelihood of nuclear war, i.e. accidental war

	Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know
USA					
Soviet Union					

(b) Because the use of nuclear weapons anywhere will make them legitimate

	Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know
USA					
Soviet Union					

(c) Because the increase in proliferation requires the superpower to intervene more often in local conflicts to stop escalation

	Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know
USA					
Soviet Union					

(d) Because each believes proliferation will lead to global redistribution power to its disadvantage,i.e. loses control over small powers

	Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know
USA					
Soviet Union					

(e) Because of the fear of catalytic war through small powers

	Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know
USA					
Soviet Union					

(f) OTHERS

6. The United States declared opposition to a nuclear armed Israel is based on the fear that as Israel occupies a strategic position in US policy this nuclearization could lead to:

(a) The collapse of the non-proliferation treaty

Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know

(b) Nuclear confrontation and/or exchange between the superpower because of their intense involvement in the Middle East

Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know

(c) The deterioration of US's ability to influence her allies in the Middle East

Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know

(d) OTHERS

7. Some people believe that US response to a declared nuclear armed Israel would be <u>lenient</u>: Do you agree? (Mark ✓)

Yes No Partly Do not Know

If the answer is Yes is it because:

(a) Of the strategic importance Israel plays in US policy

Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know

(b) Of the inability to control the transfer of technology, arms and financial aid to Israel

Agree | Agree (with Reservation) | Disagree partially | Disagree | Do not Know

(c) Of the dimished ability to control a crisis in a regional conflict thus giving rise to a preference to leave this to regional powers as intervention in local conflicts by the superpower becomes more costly and dangerous

Agree | Agree (with Reservation) | Disagree partially | Disagree | Do not Know

(d) Of the inability to control Israel's nuclear development and persuade it to accept safeguards and sign the non-proliferation treaty

Agree | Agree (with Reservation) | Disagree partially | Disagree | Do not Know

(e) OTHERS

If the answer is No explain why:

8. Some people believe that the Soviet response to a declared nuclear armed Israel would be vigorous: Do you agree? (Mark ✓)

Yes | No | Partly | Do not Know

If the answer is Yes would it be:

(a) A pre-emptive strike on Israeli nuclear weapons

Agree | Agree (with Reservation) | Disagree partially | Disagree | Do not Know

(b) To provide the Arab countries with nuclear weapons

Agree | Agree (with Reservation) | Disagree partially | Disagree | Do not Know

(c) To provide the Arab countries with nuclear security guarantees

Agree | Agree (with Reservation) | Disagree partially | Disagree | Do not Know

(d) To increase political and military involvement in the Middle East

Agree | Agree (with Reservation) | Disagree partially | Disagree | Do not Know

(e) To disengage from the Arab/Israeli conflict

Agree | Agree (with Reservation) | Disagree partially | Disagree | Do not Know

(f) To intervene only after the use of nuclear weapons

Agree | Agree (with Reservation) | Disagree partially | Disagree | Do not Know

(g) OTHERS

If the answer is No explain why:

9. Some people believe that a joint Soviet-American response to a nuclear armed Israel and/or nuclear armed Arab countries is quite plausible. Do you agree? (Mark ✓)

Yes	No	Partly	Do not Know

If the answer is Yes would it be:

(a) Intervention to disarm the nuclear weapons of

	Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know
Israel					
Egypt					
Iraq					
Libya					
Syria					
Algeria					

(b) A joint agreement to ban nuclear weapons in the Middle East

Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know

(c) To force Middle Eastern countries to join the non-proliferation treaty and accept safeguards

Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know

(d) A joint declaration that they will act in concert against any one of the following countries which intends to use nuclear weapons first

	Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know
Israel					
Egypt					
Iraq					
Libya					
Syria					
Algeria					

(e) To disengage from the Arab-Israeli conflict

Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know

(f) To intervene only if they have a joint interest

Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know

(g) To intervene after use of nuclear weapons to stop the fighting

Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know

(h) OTHERS

If the answer is NO explain why:

10. Some people believe that the following Arab countries' response to a nuclear armed Israel would be (words and deeds): (Mark ✓)

(a) The development of chemical and biological weapons of mass destruction

	Agree		Agree (with Reservation)		Disagree partially		Disagree		Do not Know	
	Words only	Deeds	Words only	Deeds	Words only	Deeds	Words only	Deeds	Words only	Deeds
Egypt										
Iraq										
Libya										
Syria										
Algeria										

(b) To launch a pre-emptive strike on Israeli nuclear installation and/or weapons

	Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know
Egypt					
Iraq					
Libya					
Syria					
Algeria					

(c) The development of nuclear capabilities and/or weapons

	Agree		Agree (with Reservation)		Disagree partially		Disagree		Do not Know	
	Words only	Deeds	Words only	Deeds	Words only	Deeds	Words only	Deeds	Words only	Deeds
Egypt										
Iraq										
Libya										
Syria										
Algeria										

(d) To seek nuclear and/or security guarantees from the Soviet Union

	Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know
Egypt					
Iraq					
Libya					
Syria					
Algeria					

(e) To seek nuclear and/or security guarantees from the USA

	Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know
Egypt					
Iraq					
Libya					
Syria					
Algeria					

(f) To seek a nuclear free zone Middle East Treaty

	Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know
Egypt					
Iraq					
Libya					
Syria					
Algeria					

(g) OTHERS

11. Some people believe that Israel's response to the Arab countries' nuclear quest would be (Mark ✓)

(a) a pre-emptive strike on the following Arab countries' nuclear installations

	Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know
Egypt					
Iraq					
Libya					
Syria					
Algeria					

(b) To improve its nuclear capabilities and/or weapons

Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know

(c) To encourage the following Arab countries to go nuclear in order to enhance stability

	Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know
Egypt					
Iraq					
Libya					
Syria					
Algeria					

(d) To seek a nuclear free zone Middle East treaty

Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know

(e) To sign the non-proliferation treaty and accept safeguards

Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know

(f) To seek a nuclear security guarantee from the USA

Agree	Agree (with Reservation)	Disagree partially	Disagree	Do not Know

(g) OTHERS

Please return to:

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GLOSSARY

Advanced Gas-Cooled Reactor - the type of nuclear reactor chosen by the British Central Electricity Generating Board as a second generation follow up to the Magnox reactor.

Atomic Bomb - a bomb whose energy comes from the fission of uranium or plutonium with vast destructive power.

Boiling Water Reactor - a type of light water reactor which employs a direct cycle; the water coolant that passes through the reactor is converted to high pressure system that flows through the turbine.

CANDU - a nuclear reactor of Canadian design which uses natural uranium as a fuel and heavy water as a moderator and coolant.

Centrifuge Isotope Separation - an enrichment process that separates lighter molecules containing uranium-235 from heavier molecules containing uranium-238 by means of ultra high speed centrifuges. This process is successfully developed by the Urenco consortium.

Counterforce - an expression used to describe nuclear attacks directed against military targets.

Countervalue - an expression used to describe nuclear strikes aimed at civilian targets; cities and industrial complexes.

Enrichment - a process by which the concentration of fissionable isotope uranium-235 is increased above that contained in natural uranium.

Eurodif - a joinf venture including France, Italy, Belgium and Spain which operates gaseous diffusion plants in France.

Fast Breeder Reactor - a nuclear reactor that produces more fissile material than it consumes.

First Strike Capability - this is the capability to inflict a disarming or unanswerable first strike against a rival nation.

First Use - the initial employment of nuclear weapons in response to a conventional attack.

Fissile Material - materials composed of atoms which readily fission when struck by a neutron such as uranium-235 and plutonium-239

Fission - it is the subdivision of a heavy atom nucleus into fragments of about equal mass. For this to happen the atom must be inherently unstable, that is, its nuclear binding forces must be inadequate to hold it together.

Gaseous Diffusion - a method of isotope separation based on the fact that gas atoms or molecules with different masses will diffuse through membrane barriers at different rates. It is used to separate uranium-235 from uranium-238.

Heavy Water Reactor - a Canadian reactor that uses heavy water as its moderator and natural uranium as fuel.

Hot Cells - lead-shielded rooms with remote handling equipment for examining and reprocessing radioactive materials. In particular, they can be used for reprocessing spent reactor fuel..

Isotope - each atom of an element has the same number of protons in its nucleus, but the number of neutrons in it can vary and each variant is called an isotope.

Jet-Nozzle Enrichment Method - a process of uranium enrichment that uses both uranium hexafluoride and a light gas flowing at high speed through a nozzle along curved walls.

Kiloton - the yield of a nuclear warhead is expressed either in kilotons or megatons. A kiloton is the equivalent of 1000 tons of TNT.

Laser Enrichment Method - an experimental process of uranium enrichment in which a finely tuned, high power carbon dioxide laser is used to differentially excite molecules of various atomic weights. This differential excitation makes it possible to separate uranium-235 from uranium-238.

Launch-on Warning - politico-military decision to launch nuclear weapons upon warning of an enemy attack.

Light Water Reactor - a reactor that uses ordinary water as moderator and coolant and low enriched uranium as fuel. It was developed for use in US submarines.

Magnox Reactor - a type of first generation British reactor. It uses carbon dioxide gas for coolant on magnesium cladding and natural uranium as fuel.

Megaton - the yield of larger nuclear warheads is expressed in megatons of high explosives, one megaton equals one million tons of TNT.

Megawatt - one million watts of electricity, used to measure the rate of electricity produced in a nuclear power plant.

Mutual Assured Destruction - a concept of deterrence between the USA and USSR based on the principle that if one side makes a nuclear strike against the other, the country attacked can cause reciprocal retaliatory damage on such a scale as to cause massive destruction.

Natural Uranium - uranium as found in nature, containing 0.7% of uranium-235, 99.3% of uranium-238 and a trace of uranium-234.

Nuclear Fuel Cycle - during the nuclear cycle uranium passes from mining and milling, enrichment, fuel fabrication, reprocessing and back to enrichment for reuse as fuel for military purposes or transformed partly into plutonium for use in fast breeder reactors or bombs.

Nuclear Power - the production of electricity using fissionable fuel instead of fossil fuel.

Nuclear Reactor - a device in which a nuclear fission chain reaction can be controlled. The nuclear reactor is equivalent to the boiler in a conventional fossil fuelled thermal power station.

Nuclear Weapons - a collective term for atomic bombs and hydrogen bombs. Weapons based on nuclear explosions.

Plutonium - an entirely artificial substance formed by the decay of uranium-238 which has previously acquired an extra neutron by absorption in a nuclear reactor. Plutonium 239 is fissile and is employed in either nuclear fission bombs or in fast breeder reactors.

Preemptive War - conflict initiated on the basis of inconvertible evidence that an enemy attack is imminent.

Pressurized Water Reactor - a type of light water reactor in which water acts as both coolant, moderator and heat transfer agent. It uses uranium dioxide as fuel.

Preventive War - conflict initiated in belief that armed combat, while not imminent, is inevitable and that delay would involve greater risk.

Production Reactor - a reactor designed primarily for large scale production of plutonium-239 by neutron irradiation of uranium-238.

Reprocessing - chemical treatment of spent reactor fuel to separate the plutonium and uranium from the unwanted radioactive waste byproducts and from each other.

Research Reactor - a reactor designed primarily to supply neutrons for experimental purposes. It is used for training, materials testing and production of isotopes.

Second Strike Capability - it describes the ability of a nuclear weapons state to survive a nuclear attack sufficiently to be able to launch a retaliatory attack which would inflict unacceptable damage on the agressor.

Strontium - a biologically hazardous beta emitter, particularly strontium-90, which causes bone cancer. Strontium-90 is produced in uranium-235 fission.

Thermonuclear Weapons - a nuclear weapon which derives most of explosive force from the fusion of deuterium and tritium to produce helium, the release of one neutron and a vast amount of energy. The temperature required for a fusion reaction is so great that a small fission explosion is needed to trigger it.

Thorium - a fertile radioactive element that can be transmitted to fissionable uranium-233 by neutron irradiation.

Ultracentrifuge - a rotating vessel that can be used for enrichment of uranium. The heavier isotopes of uranium hexafluoride gas concentrate at the walls of the rotating centrifuge and are drawn off.

URENCO - a joint British, Dutch and West German organisation that operates centrifuge separation plants.

Warhead - that part of a weapon system which contains explosives

Waepons-grade material - material of suitable purity, quality and fissibility to be employed in the construction of nuclear bomb, uranium-235 and plutonium-239.

Worst Case Analysis - an enemy's capability is more or less known, his intentions can only be guessed. Worst case analysis assumes the very worst intentions of the enemy, estimates what he is capable of within his known nuclear strength and plans counter strategy and investment programmes in weapons systems, accordingly. Intentions are in effect collapsed into, and become identical with, capability.

Yield - released energy in a nuclear explosion expressed as equivalent in metric tons of TNT high explosive.

Yellow Cake - a solid material of mixed uranium oxides produced from uranium ore by the extraction process in uranium milling. It is the raw material of nuclear fuel.

ABBREVIATIONS

ADIU	Armament and Disarmament Information Unit
AEC	Atomic Energy Commission
AECL	Atomic Energy of Canada Ltd
AFESD	Arab Fund for Economic and Social Development
AGR	Advanced Gas-Cooled Reactor
BBC, SWB	British Broadcasting Corporation, Summary of World Broadcast
BWR	Boiling Water Reactor
CANDU	Canadian Deuterium-Uranium Reactor
CEA	French Commissariat for Atomic Energy
CIA	US Central Intelligence Agency
CIRUS	Canadian-Indian-US Research Reactor
ECWA	UN Economic Commission for Western Asia
EEC	European Economic Community
Euratom	European Atomic Energy Community
Eurodif	European Gaseous Diffusion Uranium Enrichment Consortium
FBIS	Foreign Broadcast Information Service
FBR	Fast Breeder Reactor
HTGR	High Temperature Gas-Cooled Reactor
HWR	Heavy Water Reactor
IAEA	International Atomic Energy Agency
IDCAS	Industrial Development Centre for the Arab States
INFCE	International Nuclear Fuel Cycle Evaluation
INFCIRC	Information Circular of IAEA
IISS	International Institute for Strategic Studies

KFAED	Kuwait Fund for Arab Economic Development
KWU	West German Kraft Wrek Union
Kt	Kiloton
LWR	Light Water Reactor
Mill	0.001 US Dollar
MEED	Middle East Economic Digest
MW	Megawatt
NATO	North Atlantic Treaty Organisation
NPT	Treaty on the Non Proliferation of Nuclear Weapons
OAPEC	Organisation of Arab Petroleum Exporting Countries
OECD	Organisation for Economic Cooperation Development
PLO	Palestine Liberation Organisation
PHWR	Pressurized Heavy Water Reactor
PWR	Pressurized Water Reactor
R & D	Research and Development
SIPRI	Stockholm International Peace Research Institute
SWU	Separative Work Unit
UAE	United Arab Emirates
UKAEA	United Kingdom Atomic Energy Authority
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
URENCO	Uranium Enrichment Company
USA	United States of America
USSR	Union of Soviet Socialist Republics

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Akhar Saa: Cairo, Weekly, Arabic
Akhbar Al Usbu: Amman, Weekly, Arabic
Al Alam: Rabat, Daily, Arabic
Al Amal: Beirut, Daily, Arabic
Al Anwar: Beirut, Daily, Arabic
Al Arab: London, Daily, Arabic
Arab News: Jeddah, Daily, English
The Atlantic: Boston, Monthly, English
Aviation Week and SpaceTechnology: New York, Weekly, English
Baltimore Sun: Baltimore, Daily, English
Al Baath: Damascus, Daily, Arabic
Boston Globe: Boston, Daily, English
Business Week: New York, Weekly, English
The Christian Science Monitor: Boston, Daily, English
Daily Telegraph: London, Daily, English
Ad-Dastour: London, Weekly, Arabic
The Economist: London, Weekly, English
Eight Days: London, Weekly, English
Encounter: London, Monthly, English
Evening Standard: London, Daily, English
Far Eastern Economic Review: London, Weekly, English
Financial Times: London, Daily, English
Foreign Report: London, Weekly, English
Fortune: New York, Monthly, English
The Guardian: London, Daily, English
Gulf Times: Doha, Weekly, English
Haartez: Tel Aviv, Daily, Hebrew
Al Hawadith: London, Weekly, Arabic
Al Hurriya: Beirut, Weekly, Arabic
Impact International: London, Weekly, English
International Herald Tribune: Paris, Zurich, Daily, English
Al Ittihad: Abu Dhabi, Daily, Arabic
JANA News Bulletin: London, Weekly, English
Jane's Defence Weekly: London, Weekly, English
The Jerusalem Post: Jerusalem, Daily, English

The Jerusalem Quarterly: Jerusalem, Quarterly, English

Jordan Times: Amman, Daily, English

Al Kifah Al Arabi: Beirut, Daily, Arabic

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Al Sharaq: Beirut, Daily, Arabic

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Stern: Hamburg, Weekly, German

The Sunday Times: London, Weekly, English

Al Thawra: Baghdad, Daily, Arabic

Al Thawra: Damascus, Daily, Arabic

Time: New York, Weekly, English

The Times: London, Daily, English

Tishrin: Damascus, Daily, Arabic

Al Usbu Al Arabi: Beirut, Weekly, Arabic

US News and World Report: Washington, Weekly, English

The Wall Street Journal: New York, Daily, English

The Washington Post: Washington, Daily, English

Washington Star: Washington, Daily, English

Washington Times: Washington, Daily, English

Al Watan Al Arabi: Paris, Weekly, Arabic

Al Yamama: Riyadh, Weekly, Arabic

News Agencies

Associated Press: (New York) AP

Inter-Press Service: (Rome) IPS

Jamahirya Arab News Agency: (Tripoli) JANA

Kuwaiti News Agency: (Kuwait) KUNA

Maghreb Arabe Presse: (Rabat) MAP

Reuters: (London) Reuters

Syrian Arab News Agency: (Damascus) SANA

Tunis Arabe Presse: (Tunis) TAP

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