Jack Caravelli

Beyond Sand & Oil

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To Chris Caravelli and Artyom Caravelli.
They are a source of pride and joy.

Contents

Preface

In summer 2009, I taught a course on nonproliferation issues at Franklin College. Located in the idyllic city of Lugano, Switzerland, Franklin College is an American-accredited college with an impressively diverse international enrollment. Its highly dedicated faculty and administrators convey an almost old-fashioned commitment to personal interaction and respect for their students, creating an environment highly conducive to learning.

My experience there taught me a number of lessons that have been brought forward into this book. In preparing the lectures I was acutely aware that having served in various U.S. government positions that some of the students, particularly those from outside the United States, might harbor preconceived ideas that my presentations on such a politically charged topic as nuclear weapons in the Middle East would be biased in favor of those long supported by U.S. policy, beginning with Israel. In one respect they were partially correct; I long have respected the people and culture of that diminutive nation that to Israelis often appears as afloat in a sea of regional hostility. (That I harbor respect for, and had worked with, those in the Arab world also took several students by surprise.) But if there is any truism in assessing nuclear developments in the Middle East, it is that the way things appear on the surface often are bent in new directions through the prism of deeper reflection. For this reason I decided long before the first words flowed in the classroom that I would present as balanced a portrait of the region's nuclear programs—civilian and military—as possible, although I also was committed to conveying my assessment of the political dynamics underlying those programs. That

same approach has been carried into this book; the first chapter takes up the question of Israel's nuclear weapons program, a topic of considerable discomfort among some Israeli officials but one essential for telling a comprehensive story. At the same time, I believe telling the "nuclear story" completely cannot ignore the broader storyline of Middle East politics since the 1940s.

The second lesson learned for a former government official and new college professor was that finding a current scholarly work that in one place captured broad aspects of the nuclear story in the Middle East was at best highly difficult. There is no lack of available literature, for example, on aspects of Iran's nuclear ambitions, including those contained in my book, *Nuclear Insecurity: Understanding the Threat from Rogue Nations and Terrorists*. There also are some excellent works on Israel's programmatic efforts, including from some Israeli journalists. Much also was written about Iraq's putative nuclear ambitions in the 1990s, and then particularly as the Bush administration was responding to the September 11, 2001 attacks against the United States and subsequently using allegations about Iraq's nuclear plans as part of the justification for the U.S. invasion of Iraq in 2003. Nonetheless, the paucity of one contemporary source that endeavored to capture the diversity of various national nuclear weapons programs and the implications of an even broader emerging nuclear Middle East spurred me to take on this project.

The final lesson is that in the Middle East the intersection of politics and science forms an endlessly challenging palette for scholarly analysis. The scientific and technical requirements behind the development of civilian nuclear power or nuclear weapons programs may seem arcane to casual observers, but the political calculus that propelled the creation and direction of these programs in the Middle East is no less complex and every bit important to understand. Underpinning any nation's decision to develop a nuclear program and, potentially, move it in the direction of a nuclear weapons program are an amalgam of domestic political, strategic, scientific and resource considerations. This book endeavors to capture those considerations. But in many, not all cases, the factor of greatest importance in those national decisions is the assessment made by governments of their strategic environment suffused with particular emphasis on regional adversaries. Threat perceptions by their nature reflect culture and history as well as international and, as noted, domestic political factors. Israel's threat perceptions differ radically from those of Iran but each nation conducted in a secretive decision-making process its own threat assessments in undertaking nuclear programs that in their own ways have stirred such international controversy. The nuclear programs and nuclear weapons programs extant in the Middle East are best assessed in their fullest dimension by reference to the array of political issues that set them in motion.

Other political factors also must be added to the mix. As nations look beyond their borders and gauge their programmatic responses, so too does the international community look closely at the activities of nations embarking on nuclear programs. The international community does so most prominently through its multilateral creations and institutions, the Nuclear Nonproliferation Treaty (NPT) and the International Atomic Energy Agency (IAEA), the international atomic watchdog. The integrity and credibility of the international community's efforts to limit the spread of nuclear weapons has been strained by nations in other regions such as North Korea and Pakistan. Nonetheless, it is not difficult to envision the coming decade as the period in which the credibility and fate of the NPT, and the international community's efforts to stanch nuclear proliferation, will be even more sorely tested by events in the Middle East. Will Iran succeed in a decades-long quest to develop a nuclear weapons capability? Will other nations in the region turn, as many have announced, to the development of commercial nuclear programs, fully cognizant that such programs, while a wholly legitimate way of generating vast amounts of electricity in an era of rapidly expanding energy demand, also could, if they so desired, support the development of a nuclear weapons program? Is the nonproliferation regime, the broad array of agreements, regulations and policies, sufficiently robust to meet the proliferation concerns arising from a region where a dozen or more nations may develop commercial nuclear programs over the coming decade?

In addition to the international structures established to deal with proliferation issues, adding to the complexity of the nuclear Middle East are the diverse views of key nations outside the region. The Iran case illustrates this phenomenon convincingly. As information and insight into the scope and nature of Iran's nuclear activities accumulated, the challenge for building an international consensus for action became manifest. However, the U.S. government's efforts to build that consensus were thwarted repeatedly by the policies of Russia and China, nations for the most part heretofore unwilling to sacrifice their political and commercial relationships with Iran as part of concerted international action. Events in the first part of 2010 indicated the Obama administration had made some limited progress in securing enhanced cooperation from Moscow and Beijing for a new round of sanctions against Iran. In a world where national sovereignty remains paramount, individual national interests can trump, or at least undermine, the collective will of a large majority of nations. As a result, United Nations Security Council resolutions that imposed on Iran sanctions in 2006, 2007, and 2008 have the consistency of porridge. Moreover, expertise from individuals and entities in such countries as Russia and Pakistan have provided extensive illicit assistance to nuclear weapons programs in a number of Middle Easters nations. What would such

developments mean for regional political stability or the interests of other nations, beginning with the United States?

Perhaps more than any other corner of the globe, the Middle East has been the source of endless stereotypes, assumptions, and two-dimensional portrayals. For this reason I chose "sand and oil" as part of the book's title to convey that beyond the romanticized views of the region in old Hollywood movies (Lawrence of Arabia springs to mind) or simplistic views of some in the media who portray the Middle East as little more than sand covering a sea of oil, there is a deeper and more profound reality. Nuclear programs have been a much more prominent and enduring fixture in the region than commonly recognized and the likelihood is that over the next ten years the nuclear programs and possibly nuclear weapons programs in the region will increase. Change in this volatile region often appears to come slowly but it is inevitable; understanding the dimensions and direction of those changes on nuclear questions can provide a framework for informed policy decisions in years to come.

To achieve these objectives, the book is organized into two sections. The first provides a series of chapters devoted to the nuclear weapons activities and programs in Israel, Libya, Iraq, and Iran. The second section presents discussions of what I believe are the three salient and overarching topics for understanding over the next decade nuclear issues in the Middle East. Those are the future direction of the Iranian nuclear weapons program and options for dealing with it, the almost certain emergence of more nuclear programs in the region, albeit for ostensibly commercial purposes, and, finally, the challenge of those developments for preserving in the Middle East and beyond the international nonproliferation regime, the amalgam of institutions, policies and treaties erected since the end of World War II to limit the spread of nuclear weapons.

Before proceeding on this journey, two notes of clarification are appropriate. Throughout the chapters the phrases "nuclear programs" and "nuclear weapons programs" will appear frequently. Many will understand readily that those phrases convey, in some ways, two fundamentally different, but in other ways closely related concepts. The phrase "nuclear program" will be taken in this book to refer to efforts whose intent is to harness atomic power for commercial or civilian application such as a nuclear power generation. A "nuclear weapons program" denotes a nation's efforts for military purposes to acquire or produce sufficient amounts of fissile material to cause a chain reaction and nuclear detonation. It also is recognized that the capability to detonate a nuclear device requires additional steps to convert the device into a weapon of sufficiently small size and weight to be able to deliver it to a target through various means. I appreciate, and take into account, scenarios by which transnational or terrorist groups would attempt to acquire some type of nuclear capability and possibly ignore

the conventional means of delivering weapons—missiles and aircraft for example—and detonate a device through cruder methods.

The second clarification is to define what constitutes a working definition of "the Middle East." For our purposes the regional boundaries will be understood to be Turkey in the North, Yemen in the South, Iran in the East, and Egypt in the West.

As the reader takes on these issues I offer a frame of reference in formulating their own judgments. As noted, both the political and technical dimensions of the topics taken up herein are complex. Nonetheless, in drawing their own conclusions on the central question of any nation's nuclear activities, it is perhaps useful to judge those actions through three criteria. Those are strategic intent, break-out capability, and production or possession capability. Of the three, strategic intent, as policymakers have known for years, often is the hardest to assess. Nations, such as Libya and Iran, have gone to great lengths to obfuscate their long-range goals. Nonetheless, the question of strategic intent can be approached somewhat circuitously by looking closely at such data as the resources being expended, the length of time suspect programs have been underway, the existence of parallel long-range weapons delivery programs, and clandestine efforts to acquire suspect capabilities. Again, this approach is not foolproof but it can point in one direction or another. Such assessments, crucial for contemporary proliferation challenges such as those of Libya and Iran may well come to the fore again with a new generation of proliferation challenges from other Middle East nations.

Acknowledgments

The process of assembling a disparate set of thoughts, observations, and data on a subject as complex as the nuclear story in the Middle East into an informative, finished work may appear as an often solitary endeavor. The broader reality is that I am the beneficiary of the insights and support of many valued colleagues and friends. I am indebted, and gratefully so, for the unwavering contributions made by Steve Catalano at Praeger; Dr. Ian Wallace, Dr. Matthew Healey, and Colonel Rob Hyde-Bailes at the U.K. Defence Academy; and my former colleagues there, Professor Hugh Griffith and Dr. Phil Hutchinson, have been sources of support since my departure from the U.S. government. I am grateful. I also have benefited enormously from an equally accomplished group of friends and experts in Switzerland, including Dr. Georges Rocourt, Ed Flaherty, Bob Gephardt, Dr. Sara Steinert Borella, Dr. Armando Zanecchia, and Morris and Sima Mottale. I also am indebted heavily to Bob Frye, Professor Kai Barth, Mark Fitzpatrick, and John Jenner. Dr. Steve Tsang at Oxford University, and Dr. Will Sparks, Chris Smith, Dave Martin, and Dr. John Mason, are valued friends and have provided insights into this book in various ways. A special debt is owed to Mike Coffey, a long-time friend and colleague whose insights on many aspects of the topics discussed herein contributed enormously to the book. I hasten to add that I am solely responsible for the contents contained herein.

PART I

Programs

CHAPTER 1

Israel: Ein brera

History is replete with examples of religious persecution and persecution in the name of religion. Nonetheless, the shattering experience of the Holocaust and the murder of 6 million Jews at the hands of Nazi Germany in the 1930s and 1940s stands as a signal example of man's inhumanity. The birth of the state of Israel in May 1948 after the expiration of the British mandate in Palestine created—almost immediately in the minds of the new Israeli political leadership, beginning with David Ben-Gurion, Israel's dominant political figure and first prime minister—the question of how best to preserve the nation's security.[1] Ben-Gurion harbored what would become a lifelong angst about how to ensure the nation's survival and prevent a second Holocaust. The bitter memories of the Holocaust would never recede from Ben-Gurion's memory, but in carrying out the duties of prime minister, there was a more contemporary threat: hostile Arab neighbors. Without delving into the still murky political waters surrounding the evacuation of 700,000 Palestinians from what had become Israeli territory, the seeds were sown almost from the start of Israel's existence that it would be surrounded by implacable foes in the Arab world.[2]

Broader political issues also played a significant role in Ben-Gurion's threat perceptions. As an astute student of history he understood, and commented on, the vast differences for the people of the United States and Japan at the end of World War II. On one hand, the United States emerged from the war with its international prestige and military prowess greatly enhanced while Japan suffered the humiliation of defeat mixed with the physical destruction and psychological trauma wrought by the use of U.S. nuclear weapons over Hiroshima on August 6, 1945 and Nagasaki on August 9, 1945. The unprecedented destructive power of nuclear weapons seared into Bed-Gurion's consciousness not only the vulnerability of his tiny nation, but also the possibility that nuclear weapons could provide an equalizer, a deterrent against those Arab nations whose populations, resources, and much larger landmasses could never be matched by Israel.[3]

For Ben-Gurion there was a clear sense, and indeed moral imperative of ein brera, or no alternative, to the development of atomic weapons for Israel. How can Israel survive, he wondered aloud, in this Arab world?[4] By the late 1940s, it was readily apparent that nuclear weapons would become a permanent fixture on the international scene and that the growing enmity between the United States and the Soviet Union would have few geographical bounds; the emerging "Cold War" would be replete with security commitments and arrangements. For the Soviet Union, one of those strategic relationships was with Egyptian President Gamel Nasser, suffused with an unquenchable desire to lead the Arab world and all that implied for Arab-Israeli relations.

For Ben-Gurion, this confluence of events galvanized what would become through the rest of his life an unshakable resolve to ensure that Israel would never fall victim to a second Holocaust. In more practical terms, to the Israeli leader the best means to that end was for Israeli acquisition of nuclear weapons and the means to deliver them. Ben-Gurion calculated—correctly as events would prove—that Israel's scientific and technical prowess was far superior to that found anywhere in the Arab world and that this advantage could be translated into the development and possession of the ultimate weapon.

Ben-Gurion's burning desire for Israel to develop nuclear capabilities was not necessarily matched by senior Israeli military leaders at the time; they played a minimal role in shaping the bomb's early development. However, Ben-Gurion required scientific experts who not only shared, but also were able to translate his dream into reality. Within the Israeli scientific community at the time, there was no more respected figure than Dr. Ernst David Bergmann, a chain-smoking organic chemist and son of a prominent Berlin rabbi. From an early age, Bergmann showed unusual potential as a scientist, turning down an offer to teach at the prestigious University of Oxford before moving to the United States during World War II where he continued his career in Brooklyn before finally settling in Israel in the late 1940s.[5] Almost immediately his scientific and administrative skills gained the attention of senior Israeli political officials. In later years there would be those who claimed that Bergmann's greatest contributions to Israeli military capabilities came in the chemical and biologic weapons areas but it was Bergmann who would lead the nuclear effort and also convince Ben-Gurion that nuclear power could be harnessed in support of Israel's defense requirements.[6] Bergmann occupied a senior scientific position at the Weizmann Institute south of Tel Aviv but also served in various official capacities. In 1948, he became head of the science department of the newly created Israeli Defense Forces (IDF), served as a science advisor to Ben-Gurion and became head of the newly created Israeli Atomic Energy Commission in 1952. Regardless of job title, Bergmann would hold throughout the last stages of his life the unshakable

belief that Israel would "never again be led as lambs to the slaughter."[7] Under his leadership, Israeli scientists would make a series of important breakthroughs, including developing a new method of producing heavy water that is used in certain types of nuclear reactors to breed plutonium, a fissile material used to make nuclear weapons.

For Bergmann, there was no ambiguity about the purpose of Israel's nuclear research; it would be oriented to the production of nuclear weapons. He described his perspective in an interview later in his life, "it's very important to understand that by developing atomic energy for peaceful uses you reach the nuclear option."[8] Political commitment and scientific expertise are essential elements in any nation's path to nuclear weapons but in Israel's case, as in others to follow, those elements were insufficient. What Israel needed were two additional elements, both received from external sources. Financial resources that would enable the fledgling and financially strapped Israeli state to undertake a highly expensive undertaking as challenging as developing a nuclear weapons infrastructure from scratch came from a number of wealthy U.S. benefactors, notably New York businessman Abe Feinberg, who also raised considerable sums of money for the Democratic Party.[9]

The second external source of support came from Ben-Gurion's desire to find a long-term international science and, ideally, political partner. In 1945, the Arab League had been established in Cairo with Egypt, Iraq, Lebanon, Saudi Arabia, Syria, and Transjordan (named Jordan in 1960) as founding members.[10] Egyptian President Nasser would use the Arab League as a forum to promote his vision of Pan Arabism. Four short years later, the United States would lead establishment of the North Atlantic Treaty Organization (NATO). Regional groupings of nations sharing a common purpose—the Soviet Union in 1955 would create the Warsaw Pact as a counter to NATO—had become a salient feature of the international system but it was apparent that Israel was destined by geography, politics, and religion to remain outside such political mechanisms. In Ben-Gurion's eyes, the next best thing was a security alliance with the United States and he would go to considerable lengths to secure such an arrangement that, he hoped, would have a nuclear commitment at its core. President Harry Truman was reluctant to enter such an "entangling alliance," even refusing Israel's offer to send troops in support of United Nations military actions in South Korea. Truman's successor, Dwight Eisenhower, received similar attention as well as an offer of US basing rights in Israel in exchange for a U.S. "nuclear umbrella." Eisenhower also did not choose to enter into a formal alliance.[11]

Israel's desire for security guarantees from the United States might have been thwarted but during this period the Tel Aviv government also achieved its second major requirement for advancing its nuclear weapons program—extensive outside technical assistance. France

would become the source for nothing short of an extraordinary level of broad technical assistance for Israel's nuclear program but also benefit from collaboration with Israel's scientific elite. The Israeli-French connection—which probably began in 1949 when Francis Perrin, a leading French nuclear physicist, invited Israeli scientists to study at France's new nuclear research site at Saclay—became an early example of how the confluence of individual national interests would stoke the fires of proliferation. Most importantly, the French would provide extensive resources for the construction of the Dimona facility in the Negev desert, destined to become the heart of Israel's nuclear weapons program.

France's motivations at the time are not hard to discern. France was engaged in a bitter civil war in Algeria and valued any regional political support it could secure. There also existed in France considerable sympathy for the plight of the Jews in World War II. Perhaps most importantly as viewed from Paris, the blossoming relationship between the United States and Great Britain on nuclear issues would relegate France to unacceptable second power status at a time when France sought membership in the nuclear club but lacked its own technical expertise to reach that status quickly. That France, imbued with a perpetually high regard for its independence, also would strike a distant posture toward working inside NATO's military structure (among other issues France resented that NATO provided no support for its disastrous military undertakings in Vietnam) hardly was the political approach best suited to galvanize Washington's willingness to cooperate with France on nuclear issues. Israeli scientists were of the first rank and their expertise was of considerable value to France in the absence of similar collaboration with the Americans or British.

Even with the financial and scientific support elements settling into place, it was unclear that Ben-Gurion's dream of an Israeli nuclear weapons capability would become reality. A recurring if not always formidable obstacle to the program's ultimate success came from within the Israeli political establishment. The scope and nature of the work at Dimona was a closely held secret but its outlines were known to various senior Israeli officials. Within that small circle there existed considerable difference of opinion about Dimona. Some believed that Jews, of all people, should never develop the means to inflict mass death and destruction on others. Other opposition can be sourced to more practical concerns such as those of finance minister Levi Eshkol about the long-term costs of the project, not only in financial terms (the duration of the U.S. funding stream could never be taken for granted) but in the extensive demands Dimona imposed on Israel's skilled but numerically limited scientific and technical labor pool. Israel was in the midst of building a nation, not just a nuclear weapons program.

These naysayers notwithstanding—and their voices were lowered at least temporarily by the Canadian 1955 decision to build a heavy water research reactor in India that was seen as precedent setting by Ben-Gurion and Bergmann—Israeli-French cooperation took on multiple dimensions. By 1955, the newly installed socialist French government led by Guy Mollet began selling military aircraft to Israel while the Israelis, with excellent intelligence on regional activities, began providing reporting on the Middle East and North Africa to their French counterparts trying to preserve their colonial outpost in Algeria.[12]

The centerpiece and most sensitive aspect of the bilateral relationship by far was in the nuclear area. Building on the growing relationships forged in previous years by the initiative of French scientist Francis Perrin, bilateral nuclear research cooperation began in earnest in 1953 under the auspices of Ernst Bergmann, taking on new dimensions in ensuing years. Convinced it could not count on US scientific assistance, France turned to Israeli experts for help in the development and building of France's first nuclear facilities, a heavy water reactor and chemical reprocessing plant at Marcoule.[13] In ensuing years Israeli nuclear experts would be granted almost unfettered access to the fledgling French nuclear establishment. For France the relationship also yielded valuable insights into heavy water production and the low-level enrichment of uranium.[14] For Israel, that cooperation would serve as an important prelude for its ultimate objective, securing French assistance in the design and construction of a large heavy water research reactor and chemical reprocessing plant about eight miles from the town of Dimona in the Israeli desert.[15] In 1957, with Shimon Peres playing a leading role on the Israeli side, an intense year of bilateral negotiations, conducted in considerable secrecy, ended successfully. In 1958 construction began at Dimona.[16] The work at Dimona was modeled extensively, although certainly not surprisingly, on France's program.

The Dimona project was developed in many aspects by Saint-Gobain, a large French company that brought scores of French construction workers and technical assistants to the site, most of which was constructed underground.[17] At the height of French involvement there were about 2500 French nationals on site, creating a de facto French enclave in the nearby town of Beersheba. Undertaking a project of such political and technical complexity posed a series of challenges, some more substantial than others. The mix of cultures and lifestyles created by French experts at Beersheba working side by side with Israelis as well as Jews from North Africa brought in to perform much of the physical labor created some inevitable tensions. The French were deemed by some of their Israeli hosts as arrogant while a not uncommon French perspective was that the highly intelligent Israelis lacked cultural sophistication. All participants in the Dimona work, including the French, were under tight security restrictions

regarding communication with family and friends, similar to the practices of those managing the secret U.S. Manhattan project during World War II. Even more important was the ability of the project managers to acquire without undue notice critical products and materials from abroad. Specialized equipment, such as the reactor tank, was cleared through French Customs by the phony claim that it was being sent to Latin America. Heavy water, originally sold to France by Norway, the leading producer of heavy water with the stricture that such sales would never be transferred to a third country, were ignored by the French Air Force who brought as much as four tons of heavy water to Dimona.[18]

The overall close working relationship with Israeli experts still yielded at least one significant surprise for French technicians. The formal bilateral agreement negotiated in 1957 called for France to assist in the development of an 18-megawatt thermal research reactor and plutonium separation technology. However, once work commenced they were presented blueprints by their Israeli counterparts for a 24-megawatt reactor and for considerably larger than anticipated cooling ducts and waste facilities. The actual and ultimate capacity of the reactor would be significantly higher than what had been envisioned originally and because the reactor was not connected to a turbine for power production, the sole purpose of its larger size was only to increase plutonium production.[19] French experts could have had no doubt about the purpose of their work at Dimona.

The early 1960s ushered in significant events for French-Israeli cooperation. With the express approval of Charles de Gaulle who had become president of the Fourth Republic in 1958, perhaps the most dramatic event occurred on the morning of February 12, 1960 when France conducted its first nuclear test (code named Gerboise Bleue or blue jerboa—a jerboa is a desert rodent) in the Sahara desert near the town of Raganne in southwest Algeria. In so doing France became the fourth nuclear weapons state, joining the United States, the Soviet Union, and Great Britain in the expanding nuclear club. The weapon, suspended from a tower as was the practice for the first U.S. nuclear weapons test at the Trinity test site in the New Mexico desert in 1945, produced a large yield of 70 kilotons, the equivalent of 70,000 kilotons of TNT, a much larger blast than the weapon tested by the United States at Trinity or the two weapons used in World War II against Japan. Two other successful tests were conducted by the French later in the year, one in April and one in December.

Even at that time it was well understood by nuclear scientists that for any nation embarking on a nuclear weapons program it was of critical importance to assess the reliability and performance of its weapons design. (In the French case this was a fission design using plutonium.) This requirement was accomplished for many years by testing the weapons design through detonation and measuring the data for various performance parameters such as yield (or destructive power) of the detonation. In the 13-year span

of 1945 to 1958, for example, the United States carried out nearly 200 tests of various types—atmospheric, underground, and surface blasts—in support of its nuclear weapons program.[20] Israeli scientific experts attended the first and some subsequent French nuclear tests and, just as important, were given unlimited access to the critical test data, a telling sign of the level of cooperation between the two nations.[21]

Whatever satisfaction may have been derived by either nation's scientific elite from the level of cooperation on such sensitive issues was stanched by international politics, again with de Gaulle playing a leading role. During much of the 1950s the French, engaged in a protracted conflict in Algeria in which the Egyptians were supporting rebel forces, found it useful to have Israel as a regional political ally. However, this imperative diminished as French involvement wound down in Algeria. De Gaulle calculated that French standing in the Arab world, already on shaky ground because of Algeria, would suffer another body blow if the extent and nature of France's nuclear support to Israel was exposed. De Gaulle was hardly the first and would surely not be the last political leader who would seek to place a political "distance" between sensitive activities being carried out by his nation and a foreign partner. An incident shortly after the first French nuclear test in 1960 may have contributed to de Gaulle's desire to redefine French-Israeli nuclear cooperation. Albeit anecdotal, a story circulated that during an early 1960 visit to the French nuclear facility at Saclay, the French president saw a Citroen automobile with red diplomatic license plates parked nearby. When told it was the car of a visiting Israeli scientist, de Gaulle reportedly exploded in a not unusual wave of anger.[22]

What is more reliably reported is that de Gaulle, increasingly concerned about the "improper military collaboration" between the two nations, in the first part of 1960 discussed with his Israeli counterpart, David Ben-Gurion, the future of the Dimona work in considerable detail. Following a May 1960 conversation between French Foreign Minister Maurice Couve de Murville and the Israeli ambassador in Paris in which the French surfaced the idea that the Dimona program should be made public, De Gaulle proposed an even more sweeping and substantial revision of existing arrangements, offering to sell Israel fighter aircraft as recompense for French cessation of its work at Dimona. Israel also would be asked to assure the French that it would not make nuclear weapons, would not process plutonium, and would reveal the existence of the reactor and open it to international inspection. Whether de Gaulle felt this proposed new arrangement also would serve the ancillary purpose of reducing the likelihood of Egypt, increasingly suspicious of activities at Dimona, seeking to become a nuclear weapons state is unclear.[23]

De Gaulle may well have been pleased with the proposed new approach to bilateral cooperation. As quoted by one source, de Gaulle claimed that

he had, "put an end to abusive practices of collaboration established on the military level . . . and which introduced Israelis permanently to all levels of staff and French services . . . there was a stop to the aid provided by us near Beersheba, for a plant to transform uranium into plutonium for which on some fine day atom bombs could arise."[24] Nonetheless, Israeli officials, beginning with Ben-Gurion, the program's longest and staunchest proponent, were not so easily thrown off their nuclear pursuits. The French and Israeli leaders had a cordial personal relationship and Ben-Gurion had no reluctance in accepting the offer of advanced French aircraft. However, Israel was not prepared to put Dimona up for negotiation regardless of the proffered prize. Ultimately, the two governments continued negotiating a path forward and, at the end of the day, little changed. Contracts were honored and the French presence at Dimona continued unabated. De Gaulle's fulminations and carefully laid plans had the Faulknerian effect of signifying nothing. In 1964 the reactor would go critical, that is, being able to sustain a chain reaction.

Israel's early pursuit of a nuclear weapons capability brought it inevitably into a series of interactions—some less pleasant than others—with the United States and a series of U.S. presidents. When Dwight Eisenhower, a career military officer, became president, he readily understood the awesome power of nuclear energy and realized that the secrets of nuclear power would not last forever. Committed to the view that at least some of those secrets could and should be made available to democratic nations, Eisenhower on December 8, 1953 proposed in a speech at the United Nations the creation of the Atoms for Peace program. In so doing, Eisenhower stood past U.S. obsession with nuclear secrecy—in reality, the Soviet Union had penetrated U.S. security practices through a series of successful espionage operations that contributed greatly to Moscow's own acquisition of nuclear weapons—on its head in favor of unprecedented openness.

There is little evidence that Israel had developed anything even remotely resembling a nuclear strategy or long-term plan, but it was eager to embrace the U.S. offer of technical assistance, and became the second nation, behind Turkey, to sign the Atoms for Peace initiative.[25] Israeli officials were offered a small U.S. research reactor but tested the limits of U.S. willingness to cooperate with Israel when Ernst Bergmann, among others, stated that Israel would be more interested both in buying a "real" reactor and producing small amounts of plutonium, a proposal that generated no interest or support among U.S. experts.[26] Nonetheless, the level of cooperation and assistance offered by the United States moved forward and on May 2, 1958 this cooperation was formalized when Israel "signed an Atoms for Peace contract with American Machines and Foundry Atomics to build a small, one megawatt research reactor at Nahal Soreq, outside Rehovot."[27]

It would be the major nuclear reactor program at Dimona, not the small one at Soreq, that would be central to the future direction of Israel's nuclear weapons ambitions and the U.S.-Israeli relationship on nuclear issues. The 1950s was a period that avoided the global conflagration of the previous decade but it also was a time of constant anxiety over the growing political enmity that was the Cold War. Beneath this thin veneer of peace existed an intense Cold War rivalry between NATO, led by the United States, and the Warsaw Pact, the reflection of the Soviet Union's attempt to use the captive nations of Eastern Europe to provide a political and military security umbrella. At the heart of this struggle was the use of expanded and in some cases new intelligence collection methods in the United States driven by advances in technology as well as an unrelenting Washington policy interest in prying the veil from Soviet efforts to disguise and obfuscate its military capabilities.

Early in his first term as president, Dwight Eisenhower authorized the development of a new type of aerial reconnaissance program. Aerial reconnaissance was an important means of collecting information on, for example, the results of bombing raids in World War II. What Eisenhower envisaged, however, was a joint project involving the Central Intelligence Agency (CIA) and U.S. Air Force that would "be able to fly and glide for almost 11 hours—covering more than 5,000 miles—at heights greater than 65,000 feet . . . Special lenses, cameras and thin film were developed. That aircraft's designation, U-2, went operational from a secret base in Germany on July 4, 1956."[28] The new aircraft's primary mission from the start was intended to be as a collector of information against the Soviet Union but its range and unique capabilities made it equally useful for a number of other missions. One of those missions would be to fly over the usually clear skies of the Middle East. Intelligence on that part of the world, particularly any that shed light on possible military preparations or the construction of military-related facilities, was deemed of high value in Washington. For example, the Israeli military buildup in the run-up to the Suez War in late 1956 instilled in Eisenhower and his senior advisers a desire to use the U-2 not only to minimize the chance of unpleasant surprise by its Soviet adversary, but also by America's ally, Israel.

As a result of this policy perspective, from its earliest days the U-2's collection capabilities would undertake missions in the Middle East. Experts tasked with analyzing the photographic results had little difficulty in realizing soon after the start of digging at Dimona in early 1958 that something of considerable consequence was underway. One expert bluntly remarked, "What the hell was that big of a plant, with reinforced concrete, doing there in the middle of the desert?"[29] Rhetorical flourishes notwithstanding, those viewing the U-2's product at first surmised that they were seeing the initial signs of an ammunition test site. However, the high likelihood that the Israeli construction was for a nuclear reactor

would take a prominent place in their thinking because of the size and scope of what the U-2 was watching.

The collection of intelligence is best understood as a means serving the end of providing policy and military leaders with critical information or insights into the plans or thinking of others. There was never any doubt that what was being collected over remote parts of Israel by the United States' newest reconnaissance aircraft and analyzed by a skilled cadre of experts would have to be passed to senior U.S. officials, beginning with President Eisenhower. The photo interpreters did their job, presenting the information, including examples of the actual photography, to President Eisenhower; Secretary of State John Foster Dulles; his brother Allen Dulles, the CIA Director; and Lewis Strauss, chairman of the Atomic Energy Commission.[30] In a very real sense intelligence presented to senior officials "belongs" to them at least in the sense that it is their responsibility to choose how to use it, how much weight to give it, or whether to set it aside or even dismiss it. Those decisions form the backdrop of the decision-making process in the U.S. government and the evidentiary base derived from the U-2, and how it was treated, is an example of this process at work. For reasons that remain at least partially shrouded in mystery, Eisenhower and his senior advisers displayed little inclination to push their intelligence experts hard once they began briefing on the Dimona program.

Reconnaissance was an important but not the only source of information on Israel's project in the Negev desert. One element of U.S. embassies, and the one in Tel Aviv was no exception, is the presence of highly trained military attaches who perform a variety of functions, including the collection of military-related information. Their methods may be overt or covert but their importance can be considerable. Regarding Dimona, U.S. attaches made various forays to the Negev desert, attempting to collect whatever bits of information, such as soil samples that could indicate the presence of a radioactive source in the area, that might be available about the project. Israeli officials, already aware of the U-2 missions, began taking precautions to deny the attaches anything of obvious value by planting shrubs and establishing a security perimeter that made the attaché work highly frustrating.[31]

It was not until the final months of the Eisenhower administration that official U.S. interest in Dimona began to accelerate. In response to a summer 1960 request from the U.S. embassy in Tel Aviv about the site, the first in a series of Israeli obfuscations was offered, describing the site as a "textile plant." Over the next few months the British government would convey its judgment to Washington that reactor construction was underway at Dimona.[32] U.K. authorities also may have conveyed their belief that Norway was the source of a large amount of heavy water being sent to Israel. Still other information began to accumulate from U.S. scientific

sources. In November 1960, University of Michigan Professor Henry Gomberg visited Dimona as a consultant to the Israeli Atomic Energy Commission. Gomberg came away from the visit convinced that Israel "was pursuing two parallel nuclear paths, one aimed at scientific research at the Soreq reactor and another aimed toward producing weapons grade plutonium at Dimona." For Gomberg, Israel's interest in plutonium as reflected in his exchanges with Israeli scientists was telling and he reportedly estimated that Israel could become a nuclear weapons state within 10 years.[33]

As official Washington was becoming more focused on the Dimona project, so too were various media outlets in the United States and Great Britain. On December 16, 1960, the London Daily Express reported that Israel was developing some type of nuclear capability.[34] Three days later, on December 19, a front page *New York Times* story described how Israel, with possible assistance from France, might be developing atomic weapons.[35] Several days later the official Israeli interpretation of the Dimona project was offered by the Israeli ambassador to Secretary of State Herter. Herter was assured that the project was for peaceful purposes only and that scientific research was the project's raison d'etre.

For both the U.S. and Israeli governments, the slow unfolding of the veil shrouding the Dimona project had at least two significant implications. The first and most obvious was that Israel's most secret and important military project was being exposed to the harsh light of official scrutiny. The second, and no less significant, was that the reaction of the Arab world to Israel's nuclear ambitions could be tumultuous and unpredictable, hardly a welcome occurrence in either capital. For Israel the time had come to speak to the project and Ben-Gurion did so on December 21 to the Israeli Knesset. In part he said that, "We are also engaged at this time in the construction of a research reactor with a capacity of 24,000 thermal kilowatts, which will serve the needs of industry, agriculture, health, and science . . . This reactor, like the American reactor at Soreq, is designed exclusively for peaceful purposes." No mention was made of the significant French involvement at Dimona.[36]

This state of affairs was far from ideal for John F. Kennedy, the young and inexperienced president. What Kennedy might have lacked in experience at the start of his presidency he often more than made up for in both instinct and intelligence. From his earliest days in office, Kennedy worried about the implications of Israel's activities, not only for the bilateral relationship, but also for the prospects for some semblance of stability in the Middle East. Kennedy would become an unrelenting champion of the nonproliferation of nuclear weapons—and the attendant objective of banning atmospheric nuclear testing—as a core U.S. foreign policy objective through the course of his presidency, a perspective doubtless seared into his psyche by the jarring events of

the October 1962 Cuban Missile Crisis. In practical terms, Kennedy decided that the best way to test Israeli assertions about Dimona's "peaceful purpose" was to send inspectors to the site. As with many elements of a very complex bilateral relationship, the simple act of getting a few Americans to Dimona was fraught with complexity. The personal relationship between Kennedy and Ben-Gurion was hardly close, a result of Kennedy's perception that the aging Israeli leader was patronizing toward his relative youth. After a series of high-level exchanges between Washington and Tel Aviv in early 1961, Israel officially extended an invitation for an American visit to Dimona that would commence in mid-May. Selected to represent the United States was Ulysses Staebler, a senior member of the Atomic Energy Commission and Jesse Croach, a heavy water expert from Savannah River, site of a U.S. nuclear laboratory.[37] Israel's newly professed transparency was anything but open. Israel's strategy for the inspections has been summarized as follows:

> Ben-Gurion took no chances; the American inspectors would be provided with a Potemkin village of deception and never know it. The Israeli scheme, based on plans supplied by the French, was simple: a false control room was constructed at Dimona, complete with false control panels . . . there were extensive practice sessions in the fake control rooms to avoid any slips when the Americans arrived . . . One big fear was that the Americans would seek to inspect the reactor core physically, and presumably discover that Dimona was utilizing large amounts of heavy water . . . and obviously operating the reactor at far greater output . . . It was agreed that the inspection team would not be permitted to enter the core for safety reasons.[38]

The Israeli deception worked as the U.S. visitors reported that most, if not all, of their suspicions, had been allayed. President Kennedy may have been mollified temporarily as well but his concerns about activities at Dimona never were allayed completely. He did not allow other important parts of the bilateral relationship, including the U.S. government's sale of Hawk air defense missiles to Israel, to suffer unduly. Kennedy was a pragmatist who understood that Israel not only was a valued partner in the Middle East, but also that within the Democratic Party U.S, Jews were major financial contributors. Throughout his short term in office, Kennedy would continue to press, along with senior administration officials, for the continuation of inspections at Dimona, proposing that a semi-annual series of visits be established. This led in spring 1963 to more friction with Ben-Gurion, now on the cusp of resigning for various reasons. Kennedy also ordered the state department to make clear to both Israelis and Egyptian officials that any pursuit of a nuclear weapons capability by either side would be viewed in Washington as deeply alarming.

One of President Kennedy's final interactions with Israeli officials—in this case the redoubtable Shimon Peres—provided what would be a defining moment on the Israeli depiction of its nuclear weapons program. On April 5, 1963, Kennedy met with Peres at the White House and again Dimona figured prominently in their conversation. As he had done repeatedly since taking office, Kennedy expressed the hope that Israel would not become a nuclear power. According to one account, it was at that moment that Peres offered this commitment that would be used by future Israeli officials on countless occasions, "I can tell you clearly that we will not introduce nuclear weapons to the region, and certainly we will not be the first."[39] Levi Eshkol and subsequent Israeli prime ministers would use almost identical rhetorical formula for years to come. Lost on all but the most astute observers was that the now shop-worn Ben-Gurion claims of Dimona serving "peaceful purposes" and Israel's scientific needs had been set aside.

As with many other policy directions and initiatives embraced by John Kennedy, it is interesting to speculate how the president's dealings with Israel on Dimona would have evolved at the end of his term or if he had been afforded the opportunity to serve a second term. Of course those possibilities were removed by assassin's bullets on a beautiful morning in Dallas, Texas on November 22, 1963. Kennedy's successor, Lyndon Johnson, would inherit an enormous set of foreign policy challenges, beginning with the question of future U.S. military presence in Vietnam. For Johnson, the Israeli reactor problem would not be high on his list of immediate concerns.

Lyndon Johnson wasn't the first and surely would not be the last vice president who, upon becoming president, had revealed to him many previously unknown details of U.S. foreign policy. The existence of the program at Dimona and U.S. concerns about its purpose was on that list and Johnson was understandably miffed at Kennedy's decision not to bring him into the policy deliberations on that issue. A superficial observation of the tall Texan's life might suggest little in the way of emotional commitment to Israel; Texas politics is not a hot bed of Jewish political activism. Nonetheless, Johnson had been a national political figure for a number of years and during that time developed relationships with a number of prominent U.S. Jews. Perhaps more importantly, Johnson had visited the Nazi concentration camp at Dachau shortly after World War II as part of a congressional fact-finding mission. He returned irreparably shaken by the horrors forced upon Dachau's countless victims, an experience that drove into his psyche a future unwavering commitment to Israel.[40] As president, Johnson would harbor his own concerns about Israel's nuclear aspirations and continued Kennedy's policy of pressing for inspections of Dimona, including by representatives of the International Atomic Energy Agency. At least part of Johnson's motive was to tamp down possible provocative

actions or worse from the Arabs—Egypt's Nasser from time to time had threatened to attack Dimona—that might arise if they became convinced that Israel was developing a nuclear weapons capability. Johnson also became the first U.S. president to sell Israel offensive arms as a means to counter the growing military Egyptian relationship with the Soviet bloc.

By the mid-1960s, Israel was facing a series of decisions regarding Dimona. The reactor had gone critical—able to sustain a chain reaction—in 1964 although some sources place that date as early as 1962. The chemical reprocessing plant also was being completed in 1964, the final technical hurdle before the path was cleared for the serial production of sufficient quantities of plutonium to produce nuclear weapons. (For our purposes the amount of plutonium required to produce one weapon may be set at eight kilograms. However, in more practical terms the actual amount would be determined by a number of factors, including the skill of the bomb makers and the efficiency of the design used to ensure the weapon detonated.)

After 15 years at the center of Israeli politics, David Ben-Gurion turned to what might be called an active political retirement, in 1963 leaving center stage to the new prime minister, Levi Eshkol. Eshkol long had been concerned about the resource drain and social tradeoffs required to keep the Dimona project moving apace, estimated in the 1960s as about $500 million annually. For this reason it is ironic that it was Eshkol, not Ben-Gurion, who had to make the momentous decision whether to give the go-ahead with the production of nuclear weapons now that the technical capability to do so was at hand. The complexity of the decision was compounded by the still looming presence of Ben-Gurion, who even from the less influential perch of former prime minister, continued to convey his ongoing support for the production of nuclear weapons.[41]

Eshkol, in a series of meetings at a secret facility outside Tel Aviv in late 1964-early 1965, framed the issue as representing a choice between three options. The first was the so-called (and undeclared) bomb in the basement, which would provide the fastest nuclear weapons capability; the second would be to manufacture but not assemble nuclear weapons components; and the third was to continue research.[42] Eshkol chose the research option, the least provocative choice and one likely influenced by official Israeli assessments that no nation in the Arab world would be technically capable of becoming a nuclear power in the foreseeable future. The sharp elbows of Israeli politics surfaced almost immediately; Eshkol was pilloried by Ben-Gurion among others as compromising the security of the Israeli state.

Despite the intense debate generated by the choice confronting Eshkol about how quickly to push forward with the production of nuclear weapons, there were other related programmatic decisions that also had to be addressed by Israeli officials. Dimona was the critical facility in

providing Israel the fissile material required to make nuclear weapons but a nuclear weapons program also has other essential elements. The first is a nuclear weapons design and manufacture, a process that requires precise machining, shaping the fissile material into a spherical shape while incorporating electronics and conventional high explosives, arranged to compress or implode the core, triggering the detonation. Fissile material, once it has been weaponized, also requires a delivery means. Through the years, nuclear weapons states have developed multiple means for delivering nuclear weapons to targets, ranging from battlefield artillery shells, cruise missiles, aircraft, and both short- and long-range missiles. In Israel's case both the development of a reliable weapons design and means of delivery were in their nascent stages in the mid-1960s but progress in meeting each of the final requirements for weapon design and delivery means were being addressed. For example, Israel turned once again to its French ally for missile technology, signing a contract with the French manufacturer Dassault for "the development of a two-stage, solid propellant ballistic missile capable of carrying a 750-kg warhead."[43] The missile project, known as Jericho, in 1966 was tested successfully.[44] Israel was putting the pieces of its program together. Events would soon demonstrate to the Israeli leadership the practical limits of the capabilities being developed at Dimona.

The June 1967 Six-Day War, like so many conflicts before and after, was the product of miscalculation by both Israelis and Arabs. Soviet intelligence reports passed to its client state Egypt in mid-May of that year claimed that there was a sizable Israeli military buildup underway along the Syrian border. The extent to which this was true is in some dispute. What is not disputed is that President Nasser by May 16 was moving three Egyptian Army divisions into the Sinai. This was done openly, possibly as a signal to Israel as well as the Arab world. Israeli security planning and policy long had considered such developments as justification for triggering a concerted military response but the first Israeli reaction was one of caution, a posture in part that reflected pressure from Washington that Israel not take hasty or precipitous action. Events soon took on a more dangerous element, however, when on May 17 two Egyptian reconnaissance aircraft flew over Dimona without being challenged.[45] Nasser had been conveying a growing confidence to his inner circle through the year, as had his military commanders to him, that Egypt was now capable of inflicting a military defeat on Israel. Was the overflight of one of arguably Israel's most sensitive facilities a deliberate attempt to goad Israel into war? A definitive answer is lacking but any provocative action against Dimona must have been seen by both sides as at the very least a possible prelude to war. Later on the same day the Israelis called up a large number of reserves.

According to one well-informed source, "Israel's military thinking was built on preemption, holding that if war was unavoidable, Israel must

strike first, choosing the time and place to destroy the enemy's threat on his own territory."[46] Consonant with this thinking, and after a great deal of internal debate in Israel over whether to initiate hostilities in the first place (Eshkol was accused of underestimating the immediacy of the threat posed by the Egyptian troop movement) that led to the formation of a coalition government in which Moshe Dayan and Menachem Begin joined Eshkol's cabinet, and on June 5 Israel launched a preemptive, conventional force strike. In less than one week Israeli forces captured large and politically sensitive swaths of territory, including the Sinai Peninsula, Gaza, the Golan Heights from Syria, and the West Bank.[47] Dimona was not attacked as some had feared and some reports claim that during the war as a form of contingency planning that Israel assembled two improvised nuclear devices.[48] There is no indication that Israeli political or military officials in any way planned or had any intention of using or integrating these still untested devices into their operational planning. Moreover, Israeli officials chose not to inform or even hint to Washington that even a few crude nuclear weapons were in their possession and no warnings of the same nature were ever conveyed to the Egyptians during the war. To do otherwise could have triggered unpredictable and possibly uncontrollable consequences in the United States or the Arab world. Israel was beginning to learn what the United States, Soviet Union, and other nuclear powers had come to understand in their own relationships, namely, the harsh reality that the utility of nuclear weapons had distinct limits in the context of the Middle East's complex politics.

Senior Israeli officials, including Moshe Dayan who had recently become defense minister, took up the question of the role nuclear weapons could play in Israel's overall security planning. Dayan would emerge a hero after the war. He also was quick to realize that the military victory, albeit impressive, would no panacea for Israel's enduring political problems. Moreover, he appears to have realized that new political problems would arise by virtue of Israel now controlling large areas in which more than 1 million Arabs lived. As if that weren't enough, it had to be anticipated that the Soviet Union would not sit idly by and lose prestige in the region without seeking to re-establish Egypt's military capabilities.

As events would unfold, Moscow indeed was quite generous in resupplying Egypt, Syria, and Jordan after the 1967 war. A glimpse of how these considerations were beginning to affect Israel's nascent nuclear weapons planning may have been seen through the media. Two days after the war concluded, there was an article in *The New York Times* that drew upon alleged authoritative official Israeli sources (possibly Dayan) who claimed Israel was contemplating making the atomic bomb. Whether this was the outline of a much deeper debate within official Israeli circles regarding the best posture to assume as Dimona and associated elements of the weapons program advanced is not publicly well documented. At the same time

any hopes on either side of the divide that the prospects for peace would be enhanced after the Six-Day War were dashed when Arab leaders meeting in Khartoum concluded that there would be no negotiation, no recognition of Israel, and no peace settlement. Under these circumstances it is hardly surprising that Israeli officials pressed forward and by 1968 Dimona had produced the fissile material for and Israeli scientists had begun fabricating probably four to five nuclear devices per year.

For those within the Israeli national security establishment, the issue of how to resolve other policy issues related to its nuclear weapons capabilities simmered but did not boil. Nonetheless, a great deal of political angst came from a new and unexpected source.[49] The Nonproliferation Treaty (NPT), which opened for signature in 1968, was the most prominent and sustained effort of the Cold War era to address the problems posed by the proliferation of nuclear weapons. For their own reasons—some more altruistic than others—the superpowers set aside their antagonisms and political rivalries to support what would become a global effort to limit the spread of atomic weapons while preserving in treaty language the right of nations to access commercial nuclear power. Eisenhower's Atoms for Peace dream of using the benefits of nuclear power to support mankind did not die with the NPT but rather the use of nuclear energy for such civilian purposes would be tied to a near-global commitment to eschew the pursuit of nuclear weapons.

THE NONPROLIFERATION TREATY

Culminating two years of negotiation, on July 1, 1968, The Nonproliferation Treaty (NPT) was presented for signing in ceremonies in Washington, London, and Moscow. In all 65 nations signed on the first day. It was entered into force in 1970. The importance of the NPT is recognized in part because 189 nations are signatories, by far the largest number of nations committed to an arms control or disarmament accord. While not organized as such, the NPT may be described as having three key sections: those dealing with nonproliferation, the right to peaceful uses of nuclear power, and disarmament. The NPT defines nuclear weapon states as those possessing nuclear weapons at the Treaty's commencement; the United States, Soviet Union (Russia has assumed the former Soviet Union's treaty obligations), the United Kingdom, France, and China. All other nations are considered nonnuclear weapons states. The "grand bargain" between these two groupings is that nuclear weapons states will not take actions contributing to the development or acquisition of nuclear weapons or components by nonnuclear weapons states and, in turn, those nations will

not seek to acquire such weapons. In exchange, nonnuclear weapons states will have the unfettered right to enjoy the "peaceful benefits" of nuclear power for research or commercial purposes. As a confidence-building measure, the NPT establishes a safeguards system of inspections, conducted by the International Atomic Energy Agency, to verify treaty compliance. All parties also are called to move toward a world of nuclear disarmament, a lofty sounding goal that has been acknowledged since the Treaty entered into force more by word than deed.

The NPT also has distinct limits, beginning with the dual-use nature of nuclear power that makes distinguishing between nuclear power and nuclear weapons activities exceptionally difficult in many cases. Membership in the NPT, as with most international agreements, is voluntary, not mandatory. India, Pakistan, Israel, and North Korea (which was an NPT signatory before leaving the Treaty in 1993) are not NPT members and the nuclear weapons programs in each of those countries stirs considerable controversy. Other nations, including Libya, have been NPT members but have carried out their obligations in the breach, undertaking a proscribed series of nuclear weapons acquisition activities. Iran is following the same course. The NPT has no provision to punish or in any way sanction treaty violations, a process left to the international vagaries of the United Nations or the individual or collective actions of parts of the international community.

It is hard to imagine an issue more fraught with political implications at the time for Israel. For many years Israeli leaders in their declaratory policies and private assurances to Washington had expressed their unstinting commitment to the principle of nuclear disarmament. At the same time, it was not hard to envision their concerns, inter alia, about signing a treaty that would call for international inspections of Israeli nuclear facilities. These inspections almost certainly would go far beyond the routine and anodyne inspections being carried out for years by the small number of U.S. visitors to Dimona who continuously were deceived by Israel's set of elaborate hoaxes. The scope and nature of the Dimona facility, and by extension, years of Israeli obfuscation about it, would almost certainly be exposed to a very harsh international light if International Atomic Energy Agency inspectors were to be given access to the facility.

Adding to Israeli official anxiety over the Hobbesian choice looming before their leadership was the clearly stated view of Johnson administration officials, including not only the president himself, but also his secretary of state, Dean Rusk, that Israel should become a treaty signatory. By this time, Washington had become almost wholly convinced that Israel had in fact become a nuclear power; in no small measure a report by the eminent U.S. scientist Edward Teller who had visited Israel and reported his judgment of Israel's

nuclear achievements was highly persuasive in removing any lingering doubts in Washington. Ironically, even during this period when the NPT was being touted as a major international achievement, which it was in many respects, the U.S. State Department took a sober view of the prospects that some signatories may deliberately violate the treaty's core provisions. A State Department report dated May 28, 1968 served as a harbinger of concerns that hang over the nonproliferation regime to this day when in part it concluded:

> After the NPT, many nations can be expected to take advantage of the terms of the treaty to produce quantities of fissionable material. Plutonium separation plants will be built . . . It is possible that experimentation with conventional explosives that might be relevant to detonating a nuclear bomb core may take place. In this way, various nations will attain a well developed option on a bomb. A number of nations will be able to detonate a bomb within a year following withdrawal from the treaty.[50]

The initial Israeli response to Washington's repeated entreaties was to suggest, if not overtly state, that Israel would sign the treaty. However, within a month of the July 1968 signing, Israeli commentary began surfacing objections to the NPT, beginning with the factual claim that Israel had not been consulted in the final draft and therefore needed more time to study the treaty.[51]

External events would provide Israel some unexpected but certainly welcomed, political breathing room. In late August 1968, the Soviet Union invaded Czechoslovakia, casting a pall over the (relatively) good feelings that had pervaded the international community over the signing of the NPT just a month earlier. The U.S. Senate, which had responsibility for ratifying the NPT, soon found itself in no rush to do so. Several months passed and the Israeli government still made no decision about signing the NPT. Israel also was pressing the Johnson administration for more combat aircraft but even as that sale was being negotiated Secretary of State Rusk was not prepared to drop the NPT issue from the bilateral agenda. Lyndon Johnson weighed in with a letter to Prime Minister Eshkol reiterating the administration's view that Israel should sign the treaty. The tone of the letter was matter of fact, even a bit friendly and conversational. Johnson made none of his characteristic threats or bluster. He apparently was not prepared to tie any US arms transfers to the nuclear issue nor was he inclined to apply undue pressure to the United State's most important Middle East ally. In practical terms, by the fall of 1968 the Johnson administration was planning its January 1969 departure from office and its ability to exert leverage on Israel had faded considerably. Shortly after the November 1968 presidential election in the United States, Israel made it clear it would not sign the NPT and more than 40 years later, remains outside the NPT.

In countless ways John Kennedy was a much different person—and president—than was Richard Nixon, Lyndon Johnson's successor. Nixon's great

interest and professional pride was in his foreign policy prowess, aided to a considerable degree by former Harvard professor Henry Kissinger, his national security adviser. For our purposes, what is most important is the different attitudes they took, compared with their Democratic party predecessors, upon entering office regarding Israel and the nuclear issue. For Kennedy, distrust of Israel over its nuclear ambitions never remained far from the forefront of his thinking on the bilateral relationship, in no small measure driven by Kennedy's general commitment to nonproliferation. Nixon and Kissinger saw the world, and Israel's place in it, in a much different light that has been characterized by scholars as reflecting the realpolitik school of international politics by which the national interest is the paramount objective. A pragmatic and largely nonideological policy is viewed as the means to that end. In short, nonproliferation for Kennedy was a bedrock policy to be applied with equal vigor to friends and foes alike. On the other hand, Nixon and Kissinger distinguished between the United State's international partners and its rivals on nuclear questions. Beginning with Israel, some nations pursuing a nuclear weapons capability would be seen in a far more favorable light than others.

The Nixon administration would put a public face of support on the NPT, including pushing in 1969 for the Senate to ratify the treaty. However, in early February, 1969, just a few weeks from taking office, the White House issued classified National Security Decision Memorandum 6, which directed a much different official stance on the NPT and stated in part, "there should be no efforts by the United States government to pressure other nations to follow suit. The government, in its public posture, should reflect a tone of optimism . . . while clearly disassociating itself from any plan to bring pressure on those countries."[52] Nixon and Kissinger almost certainly viewed Israel as "better off" with nuclear weapons (and may have felt that way about Japan as well) and would take no actions that would indicate otherwise.

The political landscape also was changing in Israel. A lengthy illness had forced Prime Minister Eshkol from functioning effectively as head of the government for months and Golda Meir, the former foreign minister and labor minister, was chosen Prime Minister of Israel on March 17, 1969. Nixon and Meir, with Kissinger close by in the wings, would forge a mutually beneficial relationship. The United States would continue to chant the mantra of belief in the universality of the NPT while Israel would take no overt steps that would undermine Washington's willingness to turn a blind eye to its ongoing nuclear weapons development activities. This became the de facto codification of the policy of ambiguity. In the occasionally strange world of international politics in which trust often is bent through the prism of political expediency, two deliberately misleading policies led to one mutually agreeable outcome.

The return of open conflict in the Middle East again had significant implications for Israel's nuclear weapons program. The 1973 Yom Kippur

War, as it is known in Israel, and the Ramadan War, as it is known in the Arab world, is but one of many examples where a major conflict erupts as a result of unsettled issues from a previous conflict. The outbreak of World War II, for example, in many ways is attributable to the harsh "victor's peace" imposed on Germany and exploited by Adolf Hitler after World War I. In not dissimilar ways the intense fighting that erupted on October 6, 1973 when combined Egyptian and Syrian forces, aided by military contingents from Iraq, Saudi Arabia, Algeria and Kuwait, startled Israel by quickly seizing territory taken in the 1967 Six-Day War on the Golan Heights and Sinai, reflected pent-up Arab frustrations in the region. Egyptian President Anwar Sadat had for several years been pushing for a diplomatic agreement, based on his interpretation of UN Security Council Resolution 242, of the Arab-Israeli ongoing political morass. He undertook an active and personal diplomacy, making appeals to the United States, Soviet Union, and various nations in Europe, all of which bore little fruit. Sadat wanted to reverse in particular the humiliating results for the Arab world of the 1967 Six-Day War. He also had made periodic threats to do so by threatening war in 1971 and 1972 and the buildup of forces in 1973 at first may have been viewed by Israeli intelligence officials as another bluff. It wasn't.[53]

The Yom Kippur War also is a classic case study in strategic surprise. For various reasons, including that Egypt and others had carried out large military exercises during Ramadan in the past and that Israel's military was superior to that of any Arab coalition, the Arab military buildup was largely dismissed as not being immediately threatening by the Israeli Defense Forces (IDF) and Israel's political leadership until almost the last minute. (In what may have been another brilliant deception, a year earlier Sadat tried to tamp down fears of war when he evicted from Egypt 30,000 Soviet advisers, many of whom were sent by Moscow without protest to Syria.) Israeli reserves were not called up until about six hours before fighting commenced. The consequences of Israeli delay and miscalculation almost proved catastrophic in the war's early stages. Egyptian forces scored sizable advances in the Sinai, and Syrian forces did the same on the Golan Heights—the pace and scope of the Arab offensive startled Prime Minister Meir and Defense Minister Dayan. At least one report claims that Dayan was in near-panic, telling the prime minister in highly agitated tones that the "destruction of the third temple is at hand."[54] Regardless of the accuracy of this reporting, Meir remained calm. A concerted Israeli ground and air counterattack reversed the flow of advance as the IDF began pushing deep into Egyptian territory, surrounding Egypt's Third Army by the tenth day of fighting, ultimately closing within 60 miles of Cairo while other Israeli forces advanced into Syria and toward Damascus.

Given that the Middle East long had been a region of intense superpower as well as regional rivalry, the Soviet Union was not prepared to sit

by idly while its Arab client states foundered. Moscow had been pursuing "détente" or a thawing in relations with Washington for several years but conflict in the Middle East pushed those policies aside temporarily. Moscow threatened to deploy airborne forces in relief of the embattled Egyptians and a Soviet ship in the area was suspected of carrying some type of nuclear cargo. According to various sources, U.S. nuclear forces were placed on high alert, known as Def Con-2, although Soviet nuclear forces may not have been placed on heightened alert. (Speculation remains that part of the U.S. motivation for the order to increase US nuclear alert status was the political crisis embroiling the Nixon administration, which was in political disarray because Nixon fired Archibald Cox who was prosecuting the Watergate incident.[55])

A related but different nuclear issue also confronted Prime Minister Meir. By October 9, the third day of the war, Israeli losses already had become draconian with the downing of 50 aircraft and the loss of 500 tanks. Defense Minister Dayan may have pressed Meir to prepare for the option of "last resort," the use or threatened use of nuclear weapons. Dayan also likely misread Egyptian President Anwar Sadat's true war aim which in hindsight appears not to have been the destruction of Israel, but the attainment of a victory of sufficient magnitude to bring Israel back to peace talks regarding the return of land seized in the 1967 war. In part, Dayan may have sought, at the very least, to raise alarm bells in Washington about this possibility in hopes of triggering U.S. material support, which indeed was delivered. Details are lacking but it is almost certain that this issue, raised at a moment of great crisis, stirred intense political debate. Israel's Jericho missiles, capable of carrying nuclear warheads, were placed on alert but there is no evidence or confirmation from authoritative sources they were ever equipped with such warheads. There also were subsequent reports in the German magazine *Stern*, also unconfirmed, that 13 small nuclear devices were taken out of secret bunkers in the Negev desert.[56] With support from several cabinet ministers, notably the highly respected 1948 war hero Yigor Allon, Meir decided not to bring Israel's nuclear capabilities into the mix of options for prosecuting the war nor did she use that possibility to "leverage" Washington's own decision making. As was the case during the Six-Day War in 1967, the nuclear option was kept well out of sight. Nuclear brinksmanship was avoided during the Yom Kippur War but a new type of warfare, this with an economic focus, emerged when the Arab-dominated Organization of Petroleum Exporting Countries, imposed an oil embargo and for the first time used oil as a political weapon.

Throughout this period Israel also continued to press ahead with its nuclear weapons program. It is reasonable to estimate that three or four nuclear devices were being produced annually. Reflecting the Nixon's administration's permissive attitude toward Israel's nuclear weapons ambitions, two supercomputers, essential for highly complex nuclear

simulations, were sent to the Weizmann Institute. Other parts of the U.S. interagency also became involved. Israeli officials asked for U.S. intelligence on targets in the Soviet Union, almost certainly as a means of enhancing Israeli targeting options against Soviet cities and facilities. Nuclear capable F-4 aircraft were sold to Israel. The department of defense was given permission to sell artillery cannons that were nuclear capable and kryptrons, sensitive electronic timing devices used to trigger nuclear devices, also were sold.[57]

At other times and with other U.S. administrations this level of cooperation might have stirred much greater controversy, but Israel's political problems with its nuclear weapons program came at the end of the decade. South Africa had been planning to carry out a nuclear test in the Kalahari Desert in 1977 before the United States and Soviet Union became aware of the preparations, resulting in diplomatic pressure that resulted in the test being canceled.[58] On September 22, 1979, a U.S. reconnaissance Vela satellite detected what one source described as "two distinctive flashes of light within a fraction of a second—a probable nuclear explosion" over the southern Indian Ocean.[59] Suspicion turned immediately to either South Africa, Israel, or both countries as close political and scientific relationships existed between the two nations that viewed themselves often as outcasts in the international system. According to this authoritative recount of the events, Israel and South Africa had collaborated during this period in late 1979 on perhaps as many as three tests of nuclear warheads for artillery shells. Lending credence to this interpretation is that there were Israeli ships in the area monitoring whatever was to occur.[60]

After hearing vehement denials from South Africa regarding any possible involvement in the test (for Israel's part Golda Meir had promised Richard Nixon a decade earlier that Israel would not carry out any nuclear tests), the U.S. government undertook an intensive series of reviews of all available data. There are various ways by which a nuclear test can be detected. One is by the detection of light flashes, which the Vela was equipped to do through two onboard sensors, with different sensitivities, known as bhangmeters. A second method is by seismic or acoustic detection; another is by measuring radioactive fallout in the atmosphere and still another is by other environmental sampling techniques. A presidential panel led by MIT Professor Jack Ruina reviewed all available data and in July 1980 concluded that the flashes detected by the Vela satellite were "more likely an artifact of a meteoroid hitting the satellite and sunlight reflected off particles ejected as a result of the collision."[61] Other U.S. government studies, using much of the same data, reached a different conclusion. Those studies performed by the intelligence community and at least one U.S. national laboratory concluded that a more likely explanation was that a nuclear test had been conducted.[62] Regardless of what the new U.S. president, Jimmy Carter, may have personally believed, he was not prepared to turn the

issue into a political melee with either Israel or South Africa. Carter's reticence illustrates what became a continuing theme between Washington and Tel Aviv beginning with Lyndon Johnson; namely, that other parts of the bilateral relationship were too important to sacrifice for the sake of bringing the nuclear issue into the light of day. Often overlooked by critics of U.S. policy on the matter is that Israeli acknowledgement or U.S. public policy attribution to Israel of a nuclear weapons capability would trigger cuts in U.S. aid to Israel under a U.S. law that prohibits such aid to any nation found to be a proliferator of weapons of mass destruction.

It is with no small irony that what brought Israel's nuclear weapons program into much greater public focus were the actions of an Israeli technician entrusted with working inside the program. "Insider access," as experts refer to the potential security problems posed by those working within or around sensitive facilities, is a recurring problem for all nuclear programs. For example, sensitive nuclear materials were illicitly removed on a number of occasions by insider collusion from Russian nuclear facilities.[63] U.S. nuclear laboratories have endured a nearly endless stream of security lapses arising from poor or indifferent security practices by those entrusted with access to those facilities. In one particularly shocking case that mixed poor security practices, deceit, and misplaced loyalty, Linton Brooks, a senior U.S. Department of Energy official responsible for overseeing the U.S. national laboratories, was fired for withholding information about security lapses at Los Alamos National Laboratory from the secretary of energy.

For Israel, categorical proof to the Israeli public and world opinion of Dimona's scope and nature was a political and security nightmare that had been avoided for 30 years. The end of Israel's run of good fortune was a result of the deliberate violation of a security oath taken by Mordechai Vanunu, a low level and disgruntled technician. Vanunu's story reads like something from the pages of a thriller novel. Born in 1954 to Moroccan Jews who immigrated to Israel in 1963, Vanunu had what began as an unremarkable career in the Israeli Army. Shortly after his discharge, in 1976 he was assigned to and trained in the underground Machon-2 at Dimona, which is responsible for the production of plutonium, the fissile material used in Israel's nuclear weapons.[64] For reasons that remain murky, while assigned to Dimona, Vanunu became interested in and supportive of Palestinian positions on numerous issues. Vanunu's views became known to Israeli officials, who took no immediate actions. However, in 1985 he learned that he would be part of a reduction in force at the facility. Vanunu left voluntarily, allegedly to begin a long backpacking trip to the Far East, but not before snapping two roles of film capturing critical details of the equipment and operations, including plutonium production capabilities, at Dimona.

Vanunu's departure from his work at Dimona began rather than ended a sequence of dramatic events that would turn out very badly for him. Traveling to Australia, Vanunu befriended an antinuclear group that persuaded

him of the importance of publishing his film and accompanying information. Vanunu consented and met in Australia with a reporter for the *London Times* before traveling to London where he met with the newspaper staff. The paper's editors were cautious, understanding both the political sensitivity of the story as well as the importance of assessing Vanunu's technical claims. To accomplish the latter task, the *London Times* showed the material to two of the world's most eminent nuclear scientists, Theodore Taylor, an American nuclear weapons expert who studied under Robert Oppenheimer, the director of the Manhattan Project, and Frank Barnaby, a highly regarded British nuclear physicist. Both men concurred that Vanunu's information was genuine and based on what Vanunu provided they estimated that Dimona during this period, the mid-1980s, could produce enough plutonium annually to fabricate about 12 nuclear devices.[65] The due diligence on the part of the *London Times* staff required weeks of work, ample time to alarm Vanunu who had been warned by *London Times* correspondent Peter Hounam that a willingness to go public with the story could jeopardize Vanunu's personal security. Finally satisfied over the question of Vanunu's bona fides, and after vacillating two weeks about printing the story, on October 5, 1986, the Sunday *London Times* published a blockbuster front page article entitled "Revealed: The Secrets of Israel's Nuclear Arsenal."

Vanunu had succeeded in creating an international furor—and in Israel considerable anger and discomfort—by his revelations, but he was about to pay a commensurately high price for so doing. During his time in London, Vanunu was standing in Leicester Square, a popular tourist area, when he was approached by and struck up a conversation and subsequent relationship with an attractive blonde woman who introduced herself as "Cindy." She claimed to be an American Jew on vacation in London and a cosmetician by profession. In reality her name was Cheryl Bentov and she worked for the Israeli government.[66] They attended movies, visited art galleries, and enjoyed London's many charms. The relationship deepened quickly and Cindy suggested they go to Rome, where she claimed her sister had an apartment, for a romantic interlude. Despite a warning from Hounam that Cindy might be an intelligence operative, Vanunu agreed to the trip, boarding British Airways flight 504 to Rome on September 30, 1986 with plans to meet Cindy there. The flight arrived in early evening but within two hours Vanunu had been seized by Israeli Mossad agents, the victim of a classic "honey trap" in which a woman working for an intelligence service lures an unsuspecting gentleman into a dangerous or compromising situation.

The Israeli operation worked brilliantly. Under orders from Shimon Peres, then foreign minister and formerly a driving force in Israel's early nuclear weapons development, Mossad succeeded in taking Vanunu from Italy by boat (Peres apparently did not want the operation to take place on British soil because he valued British Prime Minister Thatcher's political

support and there had been some recent problems between U.K. and Israeli intelligence officials) to Israel where he was placed on trial. Vanunu was accused of both espionage and treason and sentenced to 18 years in prison. About half of the sentence was spent in solitary confinement. In April 2004, Vanunu was released from prison but ordered to remain in the country and forbidden to speak to foreigners. In 2007, he was sentenced to an additional six months of prison time for violating the terms of his release. Vanunu's case served as a powerful reminder that alleged acts of conscience would in no way mitigate the determination of Israeli authorities to uphold the secrecy oath taken by those entrusted with Israel's most precious secrets.

At the end of the 20th century and in the first decade of the 21st century, questions and controversies surrounding Israel's nuclear weapons program centered not on low level technicians, but on several prominent Israeli officials. On July 13, 1998, Shimon Peres, who played such a vital role in the early years of Israel's nuclear weapons development, spoke to a group of academics and the media in Amman, Jordan. During his remarks Peres said, "We built a nuclear option, not in order to have a Hiroshima but to have an Oslo."[67] During an interview with a German television station in late 2006, Israeli Prime Minister Ehud Olmert made what appeared to be the most unambiguous reference ever to Israel's nuclear weapons capability. Olmert was discussing Iranian President Ahmadinejad's inflammatory and wholly outrageous view that Israel should be wiped off the map. Olmert then stated, "Can you say this is the same level, when they are aspiring to have nuclear weapons, as France, America, Russia and Israel?"[68] Denials by his press spokeswoman that Olmert had asserted Israel's nuclear weapons capability followed quickly but were far from successful in quelling the outrage in official israeli circles over the prime minister's statements.

Regardless of the motives of both speakers, the furor surrounding the very mention of Israel's nuclear weapons capabilities underscores the lingering sensitivities of this issue a half century after it first surfaced. As we have seen, Israel's possession of nuclear weapons was of no political value during the 1967 war and, possibly, of limited deterrence value in the 1973 war. As Israeli leaders survey the security environment in the second decade of the 21st century, it would not be surprising if they ascribed a useful role to their nuclear capabilities. The Palestinian problem remains an unresolved problem but Israel understands well that nuclear weapons make it harder for outsiders to impose a solution to this decades-old dispute. More ominously, as this is being written 2010, Iran, albeit in the midst of internal political challenges to the ruling regime, also appears more determined than ever to resolve some lingering technical problems and more forward with a uranium enrichment program leading to the production of fissile material for nuclear weapons.

Under these circumstances Israel's nuclear capabilities may well in the coming years be compelled to serve as an even more visible deterrent along the lines developed, after hard experience, by the United States and Soviet Union for their nuclear forces during the Cold War. Israel has been a nuclear state for more than 40 years but has never had to use those capabilities against another regional nuclear weapons state. Nations in possession of nuclear weapons develop and evolve various strategies for how those weapons fit into the broader panoply of defense capabilities and, ultimately, might be used. These questions point to the heart of the current and fragile security environment in the Middle East It may be presumed that no Israeli official or political leader would contemplate the use of nuclear weapons except under the most extreme conditions. Nonetheless, Israel's nuclear capabilities would be a silent but looming sentinel if Israel launched a conventional forces attack against Iran.

As Israel entered a new decade the politics of nuclear weapons in the region continued to pose its own set of challenges for Tel Aviv. Arab nations in late September 2010 sought to have the IAEA vote in favor of a non-binding resolution to have Israel join the Nonproliferation Treaty which, as a consequence and in the unlikely event if acquiesced in by Israel would have resulted in international inspection of Israeli nuclear facilities and almost certainly formal revelation of Israel's nuclear wepons program. The resolution was defeated by a 51–46 vote with 23 abstensions. The US supported the Israeli position and voted agains the resolution. Despite the favorable political outcome at the IAEA, the issue will not recede any time soon. A nuclear free zone conference is scheduled for the Middle East in 2012 and the question of Israel's nucelar status doubtless will receive prominent attention from various Arab nations. Ultimately, the biggest challenge for Israel may come not from Iran or the Arab world but from within. As shown by the IAEA vote, Israel retains considerable global support for its policies of self-defense, including possession of a de facto nuclear weapons capability. Tel Aviv recognizes that international support is not immutable. In the run-up the the 2012 conference the pressure is likely to build, not recede, for Israel to become a more active participant in global nonproliferation efforts, including the Comprehensive Test Ban Treaty. Formulating policies that support and reflect a broad commitment to international norms presumably would place Israel on firmer political ground. Nonetheless, any modification of Israel's political and security posture should be undertaken only after Israeli officials have concluded that in so doing the nation's security interests have not been compromised. History shows that the Israeli perspective on this issue surely looks considerably different than in any other nation.

CHAPTER 2

Libya: Delusions of Grandeur

Libyan President Muammar Qaddafi would stand in the highest ranks of global political leaders if longevity in office were the sole measure of success. Since seizing power as part of the "officer's coup" in 1969 from the pro-Western King Idris, Qaddafi has taken Libya through a tumultuous political roller coaster marked by support of international terrorism, vituperative hatred of Israel and the United States, and myriad efforts to assert leadership of the Arab world. Libya also has been the target of long-standing U.N. Security Council and U.S. economic sanctions that imposed significant strains on the Libyan economy. The twists and turns of Libyan politics were capped in late 2003 by the announcement that its nuclear weapons program and long-range missile program, which Qaddafi had nourished with years of patient effort and hundreds of millions of dollars, were to be dismantled.

Like most rulers who seize power, regime survival becomes an almost overpowering imperative and likely was so for the young Qaddafi, who was almost certainly suspicious, if not fully aware, of Israel's nuclear work at Dimona and all it represented. Given the radical political path on which he was about to embark, Qaddafi must have known that diplomatic if not military confrontation with Israel and probably the West was inevitable. Shortly after seizing power, Qaddafi established a Revolutionary Command Council to serve as a central administrative body for the day-to-day governing of the country. Beyond that, Qaddafi, like most authoritarian rulers, chose to rely on a small circle of family and friends to shape the nation's policies and strategic direction. Domestic political support was bought through the use of Libya's considerable oil resources, virtually the sole national means for generating revenue, to provide food, housing, and clothing for the Libyan populace.

Qaddafi's pragmatic approach to governing was buttressed by a political philosophy contained in his "Green Book" (a clear play on what was almost universally described as Chairman Mao's Little Red Book) known

as the Third Universal Theory. As described by one observer, this was "based on the four pillars of socialism, popular democracy, Arab unity and progressive Islam . . . The theory was promoted as applicable to all countries and the regime sought to spread its influence in the region and beyond by sowing the seeds of social, economic and political change."[1] In more practical terms, Libyan foreign policy from Qaddafi's earliest days in power encompassed three elements. The first element called for various approaches to fostering Arab unity. Trying to force his nation to "punch above its weight" upon assuming political power, Qaddafi sought to portray the country as the vanguard of radical change and himself as a leader in the Arab world, notwithstanding the presence of far more prominent Arab states and far more experienced leaders in a number of those countries. One example of this was Qaddafi's call in the1970s for a Federation of Arab Republics involving Egypt, Syria, and Libya, which never came to fruition. There also was a call for "a federation of Arab states stretching from the Atlantic in the west to the Gulf in the east."[2] The second element of Libyan foreign policy was support for various terrorist causes and movements, some as far removed from Libya as Ireland's Irish Republican Army. Closer to home, Qaddafi used his oil wealth to support efforts to undermine Arab governments he deemed too moderate, including Egypt after Anwar Sadat came to power, a much larger and more powerful nation. Such actions hardly inspired confidence or respect for Qaddafi in large segments of the Arab world and served, inter alia, to neuter any pretense to Arab leadership he sought to convey. Finally, Qaddafi was an ardent supporter of Palestine and radical groups operating there such as the Popular Front for the Liberation of Palestine and the Abu Nidal Organization. This brought Libya into direct political conflict with Israel. Libya's support to terrorist groups, likely involvement or support for terrorist attacks against airports in Rome and Vienna in 1985, a 1986 attack on a West Berlin nightclub that killed two Americans and the complicity of Libyan nationals in the December 1988 downing of Pan American flight 103 over Lockerbie, Scotland which resulted in the loss of 270 people, many American, enflamed relations between Washington, much of the West, and Tripoli. After the nightclub attack, the Reagan administration retaliated with an air attack against several Libyan military targets. United Nations Security Council Resolutions (UNSCR) 731 (January 1992) and 748 (March 1992) and UNSCR 883 (September 1993) placed an international spotlight on Libya's aggressive policies and resulted in the imposition of economic sanctions that over time would take a considerable toll on the Libyan economy.

Underscoring Libya's hostile political stance to Israel, the United States, and the West in general, was an almost quixotic quest to purchase or develop nuclear weapons at least since the 1970s. From Qaddafi's perspective, a nuclear weapons capability would provide not only a

considerable deterrent to foreign interference in Libya's affairs, but also a large dollop of respect that Qaddafi craved within the Arab world.[3] A nuclear weapons capability also would provide de facto redress or compensation for the underdeveloped conventional force capabilities of the Libyan military. Whereas the fledgling Israeli nuclear program required substantial external assistance (in this case France) yet still could benefit greatly from an indigenous base of highly skilled scientists, Libya's pursuit of a nuclear weapons capability from its earliest days had to confront the unpleasant reality of a much less capable scientific cadre, exacerbated by equally meager managerial competence. These shortfalls would prove ultimately to be the program's Achilles heel. As a result, various Libyan international forays for programmatic support, whether for training in nuclear technology, acquiring nuclear hardware, or trying to directly purchase nuclear weapons turned into a virtual global quest. In one form or another Libya approached or established relationships with myriad potential partners, including the United States (until 1981), Pakistan, China, the former Soviet Union, India, Belgium, Argentina, Ukraine, Japan, France, and possibly North Korea.[4]

Under these circumstances it is hardly surprising that the earliest years of Qaddafi's rule coincided with the initial efforts to set in motion Libya's nuclear weapons acquisition program. For example, the year 1973 probably was a benchmark for Libya's nuclear ambitions as this was when a Nuclear Energy Commission was established, and it probably is not a coincidence that Libya did so in the wake of the Yom Kippur War. In addition, the huge revenues generated by Libya's oil industry made the undertaking of ambitious and expensive projects possible. Unlike the government of Israel that through ensuing decades would say as little as possible about its nuclear posture or capabilities, the cornerstone of the policy of nuclear ambiguity, Qaddafi made repeated and public pronouncements about Libya's steadfast commitment to remaining a nonnuclear weapons state. For obvious reasons Qaddafi was not prepared to make clear Libya's strategic intent. We "signed all agreements on the nonproliferation of nuclear weapons," he said, claiming in the process that Libya was the victim of efforts by other nations to portray it as seeking a nuclear capability.[5] To a limited extend Qaddafi was correct; Libya had indeed ratified the Nonproliferation Treaty (NPT) in 1975 and in July 1980 "an agreement was reached with the International Atomic Energy Agency placing all of Libya's nuclear installations under inspection." More formally, this is what is known as a Safeguards Agreement.[6] Had matters remained as circumscribed as described by Qaddafi there would have been little worry about Libya's actions but from the outset of Qaddafi's regime actions and words would diverge significantly on the question of acquiring a nuclear weapons capability. As demonstrated repeatedly, the development of a nuclear weapons capability by nations with far greater scientific resources for that

complex task is highly time-consuming. Such programs in Israel, South Africa, and Pakistan, for example, required years of effort to reach maturity.

If a confluence of domestic and foreign policy imperatives account for Libya's interest in acquiring nuclear weapons, it is clear that in its initial forays into the nuclear weapons arena that it sought to short circuit this lengthy development process by attempting to purchase an entire nuclear weapons capability. Notwithstanding that Qaddafi's predecessor had signed the NPT in 1968, committing Libya to forgo efforts to acquire or develop nuclear weapons, reports circulated that Qaddafi sent a trusted deputy to China shortly after assuming power in 1969 with just the goal of acquiring a Chinese nuclear weapon in mind.[7] The mission's failure—China was not prepared to support an action so potentially reckless and fraught with unknown consequences—did little to discourage Libya's nuclear ambitions and, as a result, the Qaddafi regime would soon undertake to build a program piece by piece domestically, albeit with considerable external assistance, a more complex and protracted path to a nuclear weapons capability. (At least one unconfirmed report also claimed that a decade after the failure of the overture to China that Libya approached India with the same objective, to purchase a nuclear weapons capability.) Qaddafi clearly wanted a weapon—and badly—but there is little evidence that the Libyan military during this period or later ever developed a strategic doctrine for incorporating even a small nuclear inventory into its defense planning.

Given the paucity of Libyan scientific expertise, one of the first Libyan efforts at enhancing its understanding of nuclear technology was a series of efforts to enhance the training of a new generation of Libyan students. Through the 1970s, many students were sent to various universities in the United States for both basic and advanced training in nuclear technology areas. (When the bilateral relationship took a negative turn in 1981, that training would largely come to an end.) Similar bilateral cooperation also was set in motion with Argentina; under a 1974 accord, Argentina would provide technical training and send its experts to Libya to assist in uranium prospecting and enrichment.[8]

Having failed in its efforts to directly purchase a nuclear weapon, Libya wasted little time in setting in motion a broad approach augmenting its training programs by acquiring the nuclear building blocks and critical program technology elements. These efforts were summarized by one close observer as, "Libya's active courting of overseas nuclear technology suppliers from the early 1970s onwards. . . . Libya sought assistance for all aspects of an ostensibly nuclear fuel cycle ranging from uranium exploration, mining and processing, enrichment, research and power reactors to plutonium reprocessing. Due to Libya's continuing lack of home-grown scientific and technical expertise—the training programs in the United

States and Argentina never provided the training a nuclear weapons program required—an emphasis was also placed on securing this from other overseas sources. Libya's Arab Development Institute reportedly recruited scientists of various types from Iraq, Lebanon, Syria, Egypt, and other countries by offering large salaries, free housing, and excellent working conditions. For example, in the early 1970s some Egyptian experts, including a prominent physicist, may have traveled to Libya to work at the Al Fatah University in Tripoli. In addition to other forms of bilateral cooperation, Libya also negotiated an agreement with Argentina for assistance in uranium mining and uranium enrichment.[9]

Some of Qaddafi's outreach strategy yielded limited dividends. About 2200 tons of yellowcake, a uranium oxide concentrate, was acquired from Niger. It was also during this period, for example, that Qaddafi befriended Pakistani President Zulfikar Ali Bhutto. Qaddafi decided to invest in Pakistan's fledgling nuclear development efforts—Islamabad needed financial assistance as much as it needed technical cooperation—almost certainly with the expectation that his financial generosity would be reciprocated by Pakistan in the form of training or other nuclear development assistance such as extracting plutonium from irradiated uranium. Tangible results of proliferation significance from the relationship with Pakistan did not accrue immediately to Libya but these elements of Libya-Pakistan cooperation sowed the seeds for what would be a much broader relationship in the 1990s through A.Q. Khan. Nonetheless, as an overall judgment, the agreements Libya set in place during this period can be characterized as useful but not of decisive importance for advancing Qaddafi's nuclear weapons agenda. Many nations harbored an instinctive wariness of Qaddafi, sourced to what was perceived as his erratic statements and policy shifts on many policy issues. For example , Tripoli's relations with Egypt soured in 1974 when Anwar Sadat, seen by Qaddafi as too willing to seek a political accommodation with Israel, became Egypt's president. Other attempts to develop bilateral commercial relationships with the United States (for a research reactor) and France (for the purchase of 20 calutrons from the French firm Thomson-CSF to enrich uranium) proved fruitless, due mainly to similar wariness toward Libya in Washington and Paris.

Libyan officials apparently harbored their own concerns about the modest results of their various international forays because it was during this period that their sights also turned to Moscow. From Moscow's perspective, seen through the lens of the Cold War, supporting an Arab regime at odds with Israel (and soon the United States) was likely to yield political as well as commercial benefits. The Libyan-Russian relationship would continue for several decades, becoming a major contributor to advances in Libya's nuclear capabilities. In 1975, Russia agreed to construct the Tajura Nuclear Research Center (TNRC) along with a ten-megawatt light-water research reactor. It also agreed to provide fuel for the reactor. The research

reactor, by allowing Libya to explore plutonium production technology, was a de facto attempt to create a complementary track to its uranium enrichment efforts. Libya now was attempting to pursue both paths—uranium and plutonium—to a nuclear weapons capability and it was doing so while evading International Atomic Energy Agency (IAEA) safeguards. Experts from the prestigious Kurchatov Institute in Moscow were intimately involved in virtually all aspects of the reactor project although there also was equipment from Hungary, Poland, and Switzerland on site. Russia insisted that in return for its considerable assistance that Libya ratify the NPT (which it did) and sign a Safeguards Agreement with the IAEA, which was finalized in 1980. Russia also conducted talks with Libya on construction of a nuclear power plant at Sirt but this project never reached fruition.[10] Because of the dual-use quality of nuclear technology, and Moscow's requirements on Libya regarding the NPT and IAEA, the Tajura project did not raise immediate alarm bells in the West. Subsequent information would show that it was later in the 1980s when Libya used the reactor for plutonium separation experiments.[11] Not satisfied with having only a small Russian reactor, in 1978 Libya also attempted to purchase a 600 MW reactor from France. In this case, the concerns of the international community surfaced forcibly with the French government buckling under the pressure and refusing to approve the deal.

At least two external and dramatic events during this period also may have been shaping, or at least providing a rationale, Libya's quest for a nuclear weapons capability. On June 7, 1981, a squadron of Israeli fighters and bombers, purchased from the United States, carried out a successful and lightning quick attack (known variously as Operation Babylon or Operation Opera) on the light water nuclear power reactor at Osirak, part of the Al Tuwaitha nuclear research center 20 kilometers south of Baghdad, Iraq.[12] Israeli Prime Minister Menachem Begin, who ordered the attack, knew the reactor did not pose an immediate or short-term threat to Israeli security but he was not prepared to see another nation in the region have the opportunity to someday cross the nuclear threshold and challenge Israel's undeclared nuclear monopoly. Qaddafi's reaction to the attack on his Arab ally consisted of the usual condemnations and rhetorical defiance of Israel. Libya's own research reactor was approaching operational status, which was achieved in 1983, and Qaddafi could not have been oblivious to the message sent by the successful Israeli attack. Albeit speculative, it is reasonable to conclude that he saw at close range that the sobering reality that quest for nuclear weapons could provide a nation a powerful deterrent to foreign attack but could also, under certain circumstances, trigger one.

In 1986, Libya's vulnerabilities to attack were hit home in more ways than one. For years, various U.S. administrations had observed with growing concern Libya's increasing involvement with various international

terrorist organizations. Among other incidents alleged to have been ordered and/or carried out with official Libyan support or approval were December 1985 attacks on the Rome and Vienna airports. On April 5, 1986, the popular LaBelle discotheque in Berlin, a favorite of U.S. military personnel, was bombed, killing two U.S. soldiers and a civilian and wounding another 200 people, including 50 U.S. soldiers. President Ronald Reagan was enraged and determined that these incidents would not go unanswered. On April 14, 1986 the U.S. military, under Reagan's orders, carried out a coordinated air attack involving 100 aircraft on five Libyan targets. Operation El Dorado Canyon, as it was known, took just one hour to carry out and inflicted substantial damage on the selected targets. There were a number of civilian deaths, including Qaddafi's young adopted daughter.[13] At least some of the perpetrators of the Berlin nightclub attack were brought to justice when in 2001 a Berlin court convicted four individuals, including two workers from the Libyan embassy, of participating in the attack.

To what extent these incidents spurred Qaddafi forward with his nuclear weapons acquisition efforts is hard to quantify given his previous activities and commitment of resources but what is clear is that during the 1980s Libya did not relent in efforts to advance its nuclear weapons program. Moreover, it is fair to conclude that the 1980s was the time when the intent and nature of Libya's nuclear efforts became manifest, with undeclared activities in the critical areas of plutonium separation, uranium conversion, and centrifuge enrichment. However, as with much of Libya's efforts through the years, its accomplishments failed to meet its ambitious expectations. Part of the reason is that Libya was under international sanctions that made Qaddafi appear as an unsavory partner, leading Libya to acquiring nuclear-related items haphazardly, "buying what it could when it could . . . Libya simply did not have the indigenous expertise and the market was too fragmented to provide the capability needed."[14]

PLUTONIUM SEPARATION

As noted, Libya concealed from the IAEA experiments at the TNRC to separate plutonium from irradiated targets. Libya also approached Argentina seeking assistance in a related area but U.S. political pressure resulted in Argentina turning down the request.[15] During this period Libya failed to produce sufficient quantities of plutonium, in large measure because the reactor at Tajura was too small.[16] It would have been logical for Libya also to turn to the Soviet Union for assistance in the last half of the 1980s given the ongoing presence of Soviet nuclear experts in Libya. Nonetheless, cooperation in this sensitive area of nuclear technology never unfolded in any substantial way although there are alternative explanations for this. Did Libya become concerned with the reliability of Soviet

reactor designs after the 1986 calamitous nuclear reactor explosion at Chernobyl in Ukraine? Did Moscow become concerned about Libya's possible unwillingness to pay for a new round of technical assistance? Did Soviet President Mikhail Gorbachev take more seriously than his old guard predecessors the proliferation implications of Moscow's support to Libya's nuclear programs?[17] The answers to these many political questions may be unclear but Libya's dependence on foreign expertise in virtually every priority area for nuclear technology is strikingly clear.

URANIUM CONVERSION

Uranium, when enriched to 90% of the isotope U-235, becomes fissile material suitable for making a nuclear device. Uranium conversion is the process by which milled uranium ore is converted, through a chemical process, to a form suitable for enrichment. It was probably around 1981 that Libya began efforts to acquire this technology. As in so many other related areas, Libya reached out to potential foreign collaborators, including several countries that turned down these offers. Libya's struggles and frustrations with this technology are well illustrated by what at first looked like a successful 1984 purchase of a uranium conversion facility. According to one informed source, the purchase arrived in 1986 but without instructions of any kind and remained in storage for years. Japan may have been the source of the shipment. Libya also asked the IAEA for assistance in uranium conversion technologies in the 1980s but the request was denied. Negotiations with a European company, possibly Belgonucleaire for the production of a pilot conversion plant at Sabha also fell through due to pressure from the United States.[18]

CENTRIFUGE ENRICHMENT

Beginning in 1982, Libya "sponsored the development of gas centrifuges for uranium enrichment . . . with the assistance of a German engineer using a centrifuge design that he had brought with him . . ."[19] Libya sought to augment this effort by buying specialized equipment from Japan (a specially designed furnace) and Europe (vacuum pumps) but never succeeded in enriching uranium. However, Libya never succeeded in the critical step of enriching uranium, highlighting a decade of meager results.[20]

In July 1995, Qaddafi decided to refocus Libya's flagging nuclear weapons acquisition efforts. Such decisions often are a result of evolving threat perceptions as many historical cases involving other nations attest. For Libya the external situation must have looked bleak at the time. Israel continued to modernize its economy and develop its military capabilities, international sanctions were punishing the Libyan economy, the Arab

world had grown mostly tone-deaf to Qaddafi's siren song of Libyan leadership and the breakup of the Soviet Union a few years earlier, in which an empire turned overnight into a quagmire of new and struggling nations, left Libya without a strong patron. Whereas the early years of its nuclear weapons program were driven by a desire for prestige and a response to Israel's own program, during this period Libya may well have concluded that a nuclear weapons capability, however modest, would be a critical element in deterring international actions that could threaten the regime's survival.

Tripoli's first strategy to reinvigorate the program was to initiate contacts with Argentina, Bulgaria, Japan, and the newly emergent Russia to determine if any of those nations would assist Libya in, once again, producing plutonium. The unequivocal answer from every quarter was no. Again disappointed by another series of dead ends, Libya turned to Pakistan's A.Q. Khan who by this time had developed an international reputation for willingness, indeed enthusiasm, to use his expertise and far-ranging contacts to supply critical elements of a uranium-based nuclear weapons program.

A.Q. KHAN AND HIS NUCLEAR PROLIFERATION BLACK MARKET

Critical elements of the progress made not only in the Libyan nuclear program, but also parallel programs in Iran, Iraq, and North Korea can be traced to the proliferation activities of Abdul Qadeer Khan, a Pakistani metallurgist born in India in 1936. Khan came to Pakistan in 1952 and received some of his high school education there. His education continued in Europe, culminating with the completion of a doctoral degree from the Catholic University of Louven in 1972. Around this time Khan became employed at The Netherlands-based URENCO, a leading consortium (involving British, German, and Dutch cooperation) in the study and development of centrifuge technology for nuclear fuel.

At this stage in his life Khan seems to have been motivated by loyalty to Pakistan mixed with visceral hatred for both India and the West. Shocked by India's successful 1974 test of a "peaceful" nuclear device that received but mild global condemnation, Khan was determined to help Pakistan level the military playing field against its bitter foe by developing the first "Muslim bomb." He realized that Pakistan would always be much smaller than India in size and population as well as weaker in conventional armaments but that a nuclear weapons capability would be a powerful equalizer. Khan's assessment and sentiment accorded perfectly with the strategic calculus already underway in Islamabad. Pakistan wanted to become a nuclear

weapons state. Khan sent a letter in September 1974 to Prime Minister Bhutto (the father of future Pakistani leader Benazir Bhutto) offering whatever assistance he could provide or information he could glean from his work at URENCO. His offer was accepted by Pakistani authorities and over the next two years, aided by consistently lax security practices at URENCO, he was able to acquire and send to eagerly awaiting Pakistani scientists a treasure trove of designs, drawings, and specifications for centrifuges, a critical piece of equipment for enriching uranium.

After the period of sustained laxness by security officials, possibly attributable in part to Khan's ability to blend in—he spoke Dutch and was married to a Dutch-speaking South African woman—URENCO security personnel finally became suspicious of Khan. Sensing his illicit activities were about to be uncovered, in December 1975 Khan fled to Pakistan. Khan's boldness in Europe was matched by his bureaucratic cleverness once back in Pakistan. Convincing authorities that the uranium path to a nuclear weapon had the highest chance of success—other Pakistani scientists at the Pakistan Atomic Energy Commission were struggling to meet the challenges of producing plutonium, the other fissile material that can be used in a nuclear device—in 1976 Khan succeeded in having a laboratory established at Kahuta under his leadership. Its original name, the Engineering Research Laboratory would later be named the Khan Research Laboratory (KRL).

It would be grossly misleading to give sole credit to Khan for the ultimate success of Pakistan's nuclear weapons development efforts. Unwavering political and resource support was afforded by a series of Pakistani prime ministers who shared Khan's vision while China, eager to assist any nation confronting its arch-rival India, provided considerable assistance in multiple nuclear technology areas. Considerable financial assistance also flowed to the Pakistani nuclear weapons development efforts from Saudi Arabia and Libya. Nonetheless, Khan's endeavors were significant and would pay handsome dividends for Pakistan when in 1998 it became a nuclear weapons state when it detonated several atomic devices. For his many contributions—KRL also became involved in the procurement and development of missiles that could deliver the nuclear weapons under development—Khan was awarded a gold medal and became an iconic figure in his homeland, having played a pivotal role in Pakistan developing the first Muslim atomic weapon.

Khan's story would end there if it wasn't for another powerful motivation, greed, which would lead Khan to a parallel set of activities that would make him a wealthy man, owning properties in Dubai and London as well as interests in hotels and restaurants. Along with

his ongoing hatred for the West, much of Khan's activities from the mid-1980s until the first years of the twenty first century can be seen as driven by these twin and powerful motives, hatred and the desire to become wealthy. Khan came to realize that the information and expertise he brought illicitly from URENCO and mastered and refined at KRL would be of great interest to other fledgling nuclear powers.

Khan set out to capitalize on this situation by establishing an extraordinarily complex, far-flung, and successful black market operation that trafficked in many elements of nuclear information and technology. When it came to finding customers for his nuclear expertise and assets Khan was a true democrat, at least as long as the customer was at political odds with the West. Iran, North Korea, Iraq (notwithstanding the bloody war it fought in the1980s with Iran, Khan's first customer), and Libya all engaged in various levels of nuclear trade with Khan's shadowy, far-flung organization. That organization included at least 30 hubs or nodes in Malaysia, South Africa, Dubai, Turkey, Japan, Switzerland, and The Netherlands. Individuals who had assisted Khan in the 1970s and 1980s in importing various nuclear components for Pakistan's own nuclear program in later years also constituted key elements of his black market export network.

Libya's relationship with Pakistan, as described in this chapter, was particularly complex and multi-layered. It also was not focused on Khan alone and had a mutually beneficial component despite some future rough patches as Pakistani Prime Minister Bhutto in the 1970s was the recipient of substantial financial assistance from Qaddafi and large amounts of uranium purchased from Niger, generosity the Libyan leader expected would be reciprocated by Pakistani assistance in various nuclear technologies. For the most part the flowering of that relationship would be most fully expressed by Khan's business arrangements with Libya in the 1990s.

Throughout the tenure of a series of Pakistani leaders, Khan enjoyed considerable operational autonomy. It was understood that Khan was working on Pakistan's behalf and whatever other extracurricular activities engaged him seemed to matter little to the authorities.

Ironically, repeated warnings from some in the Pakistan Atomic Energy Commission about the political dangers of Khans' activities apparently were dismissed by Pakistani officials who attributed those warnings to bureaucratic rivalry and jealousy. Things began to change in 1999 when General Pervez Musharraf staged a military coup, one of a number to have dotted the Pakistani political landscape since its founding in 1947, against Prime Minister Sharif. Musharraf sought to bring a modicum of accountability to Pakistan's international relationships, in no small measure because of pressure from the U.S. government to do so. In March 2001, Khan was removed from his post

at KRL for violating official orders to limit his foreign activities and made a science adviser to President Musharraf. Musharraf's action, albeit dramatic, did not end Khan's black market operation that was especially active in support of Libya. Finally, a series of events, including the intercept of the ship BBC China in the Mediterranean in transit to Libya, led to Khan's being placed under house arrest in 2004. During this period about fourteen other Pakistani scientists were investigated by Pakistani authorities. Khan assumed responsibility for his actions but not before threatening to expose those at the highest levels of the Pakistani political and military hierarchy claimed to have been witting of his black market dealings through the years. Khan was never prosecuted and President Musharraf refused to allow any foreign national to interview Khan. The full scope of Khan's activities may never be known as he visited myriad countries beyond those identified as clients of the black market network. Egypt, Morocco, Kenya, Saudi Arabia, Sudan, Senegal, Nigeria, and Niger were on Khan's travel itinerary a few years before his activities were brought to a halt.

Libyan relations with Pakistan had taken a negative turn for a number of years after Pakistani Prime Minister Bhutto, a Qaddafi favorite, was hanged by his successor, Zia ul-Haq. Nonetheless, Libya was in considerable need of Khan's assistance, regardless of whatever relations may have been unfolding in political circles. Khan became a near ideal source for Libya's nuclear acquisition efforts over the next several years. As described by one expert, "Khan's great innovation had been to act as a broker . . . A country such as Libya could cut a deal with Khan alone. Khan would then source them with the right materials, using his knowledge, experience, and network. Rather than purchase piecemeal, a country would be offered everything on a platter but at a price."[21] In mid-1997, key officials from the Libyan intelligence service approached Khan and there followed a meeting in Istanbul, Turkey involving Libyan intelligence agency director Matooq Mohammed Matooq, Khan, and B.S. Tahir, Khan's trusted associate with extensive ties in Malaysia and Dubai. The Libyans reportedly expressed appreciation for Pakistan's past programmatic support but claimed that they did not have the desire to begin a production line of centrifuges for enriching uranium themselves. In Libyan eyes the solution would be for Khan and his network to provide an entire centrifuge facility. Pakistan had been working indigenously on the development of the more robust P-2 centrifuges and that coincided well with what was now Libya's highest priority.[22] At the political level the bilateral relationship would improve considerably in 1999 when Pervez Musharraf took the reins of power in Pakistan.

At least one authoritative source claims another Pakistani group also was courting Libya with offers similar to those put on the table by Khan and his associates. In the late 1990s and into the first years of the new century there existed in Pakistan a nongovernmental entity known as Umma Tameer-e-Nau (UTN). According to former Central Intelligence Agency (CIA) Director George Tenet, the ostensible mission of UTN was to undertake social-welfare projects in Afghanistan.[23] However, the composition of the organization suggested a much different mission. According to Tenet, "UTN had another purpose; they hoped to lend their expertise and access to the scientific establishment in order to help build chemical, biological and nuclear programs for al Qaeda . . . The leadership of UTN was made up of Pakistani nuclear scientists . . . its founder and chairman, Sultan Bashirrudan Mahmood, was the former director for nuclear power at Pakistan's Atomic Energy Commission, the organization that had clashed previously with Khan. When asked by a CIA officer if Libya knew of UTN, the Libyan response was yes and that UTN had offered Libya nuclear assistance but turned them down."[24] If true, Libya probably did so because it already had a clandestine relationship with Khan.

What followed is best described as a black market deal of unprecedented scope and ambition not to mention its considerable cost. During this period Libya's "investment" in A.Q. Khan and his network reached at least 100 million dollars and may have ultimately been much higher. After Libya received two sample P-2 centrifuges in 2000, Libya contracted for the delivery of 10,000 centrifuges. Centrifuges are highly complex and fragile pieces of equipment—each centrifuge has about 100 parts that have to be machined to extraordinarily small tolerance. Early models, the P-1, were often unreliable although the newer P-2 design that used robust maraging steel was intended, and proved to be, an advance over the first generation of centrifuges that used aluminum. Nonetheless, if installed and operated properly, the number of centrifuges Libya contracted with Khan could have provided sufficient fissile material to make about ten nuclear devices annually.[25] Khan also offered extensive training sessions in Europe, Africa, the Middle East, and Southeast Asia.[26] Even Khan's extensive procurement network, already deeply involved in supplying parts for several other national programs, would be stretched to acquire and provide the material required to honor the full terms of the contract.

Libya began receiving its first centrifuge shipment in December 2002 at the Al Hasan research and development facilities near Tripoli, the center of its programmatic efforts, and then moved the equipment for undisclosed reasons and began using the facilities at Al Fallah.[27] At least some of the shipments arriving in Libya came aboard Pakistani military transport aircraft, C-130s, raising questions about the extent of official Pakistani knowledge of the clandestine relationship.[28] The parts were delivered without at least one critical element, the rotors. Supplying that part became a

significant problem for the network and for still unknown reasons the approach settled upon by the contracting parties was not to use the existing and well-established network's assets in such locations as Dubai or Malaysia to produce or acquire the rotors but to try to manufacture them in Libya. Even with this approach Libya never succeeded in manufacturing and installing the rotors, rendering the centrifuges useless. With this notable exception, the Khan network increased its production capacity for other materials from its traditional suppliers while Khan also expanded the reach of his black market operation into "non-traditional supplier countries to procure, assemble, and manufacture the components for the enrichment process." Khan may have been forced from his position at KRL by Musharraf's directive but his black market operation still was flourishing.[29]

Another element of the Libya-Khan relationship that advanced but never reached maturity was the contract placed for Khan's network to provide 20 tons of uranium hexafluoride or UF6. This is a chemical compound consisting of one atom of uranium and six atoms of fluorine and is the chemical form of uranium used during the uranium enrichment process. Less than two tons were delivered; the first batch of UF6 came in September 2000 in two small cylinders and a second delivery of 1.7 tons arrived in early 2001. The material may have originated in North Korea with Pakistan and Dubai as transit points.[30]

Of all the technical assistance and nuclear technology provided by Khan's network, the most potentially dangerous element was the information sold to Libya on nuclear weapons design. This occurred in late 2001 or early 2002 according to reliable sources.[31] Libya may have paid $20–50 million for the documents, an amount that it probably viewed at the time as a bargain. Included in the delivery were "assembly drawings and manufacturing instructions for the components of the physics package, the explosive part of the weapon including the detonator explosives and fissile material, but not the associated electronics and firing sets. They reportedly included the step-by-step process for casting uranium metal into a bomb core and building the explosive lenses that compress the core to initiate a nuclear chain reaction."[32] The broad consensus of experts was that Libya had received what originally had been a Chinese design for a ten-kiloton implosion device, a yield slightly smaller than the weapon used by the United States at the end of World War II over Hiroshima. The design, if assembled, would have been very large and heavy, weighing at least 900 pounds and therefore requiring delivery by an aircraft or large ballistic missile, a weapon system Libya did have in its inventory. The design provided Libya has been described as 95% complete, and considerably more detailed than what otherwise might have been available from easily accessed open sources.[33]

Albeit alarming, Libya's acquisition of nuclear weapons design information would not result in the production of nuclear weapons. Libya did

not have the scientific expertise or the physical or technical infrastructure for such demanding and complex work. For these same reasons it also never produced the fissile material needed to make a nuclear device. The Libyan case holds several important lessons. The first is that a determined and sustained national policy to acquire nuclear weapons can produce substantial results. Simply put, the dual use nature of nuclear technology in which technologies and facilities with commercial application also can serve as easy cover for a nuclear weapons program. Many nations were wary of dealing with Libya but others did so for their own political and commercial reasons and that assistance, over time, was not inconsiderable. The second lesson is that the time and resources Libya invested in its covert nuclear weapons acquisition program notwithstanding, there is no ready substitute for an indigenous scientific base able to comprehend, internalize, and exploit the capabilities provided by foreign suppliers, whether sourced from foreign governments or the black market. (Libya's efforts to purchase an entire nuclear weapons capability had failed twice.) The final lesson, driven home in December 2003, is that on occasion a nation may sacrifice its quest for a nuclear weapons capability on the altar of broader domestic and foreign policy priorities.

Consonant with a well-cultivated sense of the dramatic and unpredictable, on December 19, 2003 Qaddafi authorized a public statement claiming that Libya would end its clandestine nuclear weapons program as well as well as its long-range missile program (defined as missiles with greater than a 300-kilometer range and 500-kilogram payload capability) and chemical weapons program. Libya had no biological weapons program. Libya claimed to have "taken the initiative" with its decision in the Middle East, Africa, and the Third World. The Libyan announcement included a declaration of willingness to ongoing and comprehensive verification inspections by the IAEA of its declared facilities. In March 2004, Libya also agreed to facilitate those inspections by signing the Additional Protocol of the IAEA's Safeguards Agreement process that would allow for more intrusive and short-notice inspections than otherwise called for in the original July 8, 1980 Safeguards Agreement Libya signed with the IAEA. Libya also confirmed the details of its announcement with a formal letter on December 20, 2003 to the president of the United Nations Security Council.[34]

The reactions from the United States, Great Britain, and the United Nations were swift and positive. U.S. President George W. Bush and British Prime Minister Tony Blair held simultaneous press conferences in their respective capitals the day after Libya made its announcement. Blair characterized the decision as "historic and courageous" while Bush claimed that U.S. pressure on North Korea and Iran and the March 2003 invasion of Iraq "have sent an unmistakable message to regimes that seek or possess WMD [weapons of mass destruction]. Those weapons do not bring influence or prestige. They bring isolation and otherwise unwelcome

LIST OF NUCLEAR-RELATED FACILITIES DECLARED BY LIBYA

Al Hasan—the original centrifuge research and development location
Al Fallah—the new location for centrifuge research and development
Al Khallah—the original site for a uranium conversion facility
Salah Eddin—the new site for a uranium conversion facility
Janzour—centrifuge manufacturing shop
Sabha—yellowcake storage facility
Sawani—storage site for centrifuge equipment in the 1980s
Al Karamia—storage site for construction material
Tajura—desalination production platform
National Board of Scientific Research headquarters
Al Ezeizia—site for storage of centrifuge materials
Tajura Nuclear Research Center

Source: International Atomic Energy Documents

consequences . . . Leaders who abandon WMD will find an open path to better relations with the United States."[35] Bush and Blair almost certainly were the least surprised by the announcement as officers from their respective intelligence services had been engaged in secret negotiations with Libya since at least the previous spring about ending its WMD programs.

As discussed previously, Libya had struggled for decades to master the intricacies of fissile material production and nuclear weapons design with mounting frustration. Nonetheless, Libya had been engaged with Khan's black market operation in the years immediately before the announcement and had been expending considerable financial resources to keep that relationship viable. Why did Khan choose to reverse course so dramatically?

In at least one respect the "dramatic" decision, and that characterization seems apt given the nature of the announcement and its candor, was not one made on the spur of the moment. While U.S. and U.K. intelligence officials had been discussing a series of WMD issues with their Libyan counterparts months before the announcement, a closer reading of the diplomatic record indicates clearly that Qaddafi, albeit for reasons that were well short of altruistic or a desire to become a poster boy for nonproliferation, had been enticed by the prospects of better relations with the West for some years. Libyan Foreign Minister Abdul Rahman Shalgam would claim in early 2004 that as far back as 1992 his country had opened

exploratory talks with that purpose in mind with members of the then new Clinton Administration.[36]

It was not until 1999, however, that Libya's contacts with the West took on a more substantive direction. By that time. a panoply of U.N. and U.S. economic sanctions had taken a considerable toll on Libya's economy. In the aftermath of the December 1988 Lockerbie bombing, the outrage from the international community was palpable. At least in part as a result of that pressure, Libya announced in December 1991 that it would sever ties to terrorist organizations but it did little initially to respond to the specifics of United Security Council Resolutions demanding that Libya hand over those suspected of planning or participating in the attack and paying compensation to families of the victims.[37] Punitive U.N. economic sanctions ensued, including banning sales of oil equipment to Libya, freezing large amounts of the country's foreign assets held in foreign banks and the transfer to Libya of equipment to support Libya's oil and natural gas infrastructure.[38] As would be repeated in other cases where U.N. sanctions were imposed, including against Iran in the 2006–2008 timeframe, individual national economic interests resulted in dilution of the sanctions' scope: Libya's foreign earnings almost exclusively are derived from oil exports and for this reason even the sanctions imposed by the United Nations were punishing. Nonetheless, Germany and Italy were highly dependent on Libyan oil and they argued against even more punitive measures.[39]

The question of the scope of international sanctions became more politically charged when President Bill Clinton in August 1996 signed the Iran-Libya Sanctions Act (ILSA). According to one assessment, "The ILSA provided for the imposition of mandatory US sanctions on foreign companies that made investments contributing directly and significantly to the development of petroleum or natural gas resources in Iran and Libya. ILSA required the United States to impose sanctions on foreign companies that invested over $40 million over a period of 12 months in Libya's energy sector."[40] European opposition to the law was swift and predictable; Clinton bowed to European pressure by waiving his government's sanctions on deals consummated by French and Italian energy companies, undermining U.S. nonproliferation objectives. Nonetheless, the cumulative effect of the various sanctions efforts was substantial and by 2003 Libya's oil production had fallen to half of what it was in the 1970s. Following in train, living standards in Libya declined as a rapidly growing but often underemployed younger generation—a dangerous combination—began to turn to various political movements opposed to Qaddafi. Groups with growing popularity such as the Muslim Brotherhood, with roots in Egypt, the Islamic Liberation Party, and the Islamic Martyrdom Movement underscored Gaddafi's growing political vulnerability, a fact driven home by a failed assassination attempt against him in summer 1995.[41] Against this backdrop the Libyan decision to pursue negotiations with the United

States and the United Kingdom appears logical and is consistent with the view herein that regime survival was even more important to Libya than the possession of a nuclear weapons capability.

Qaddafi seems to have undertaken a dual track approach to his growing political problems. On the domestic front, he dissolved a number of important ministries, including those responsible for education, health, housing, and communications and transferred those responsibilities to local councils as a way of deflecting blame from the central government.[42] Of much greater delicacy were the diplomatic events of 1999. Libya turned over the Lockerbie suspects in April of that year, leading to the suspension of the U.N. sanctions. Libyan officials also held a series of talks with U.S. counterparts. In addition, CIA officers, joined by their British colleagues, held a series of clandestine meetings that year with other Libyan officials, including Libyan intelligence chief, Musa Kusa, who had studied at Michigan State University.[43] The meetings continued through much of 2001 as the West began looking closely at Libya's cooperation with the Scottish tribunal trying two Libyans for the Lockerbie bombing.

In the aftermath of the attacks against the World Trade Center in New York City and the Pentagon in the Washington, DC area, the focus of the U.S. government turned to what the Bush administration termed the global war on terrorism and temporarily away from Libya. Libya returned to the focus of both the U.S. and U.K. governments in March 2003 when a Libyan envoy told British officials of Qaddafi's willingness to end his WMD programs in exchange for easing of the sanctions imposed on Libya.[44] A series of discussions involving Bush, Blair, and their intelligence chiefs resulted in the United States sending one of its finest and most experienced intelligence officers, Steve Kappes, who would later become CIA's deputy director, to join a British counterpart in a series of meetings in European capitals with Libyan intelligence chief Kusa and Libyan diplomat, Fouad Silni. Kusa admitted Libya's lengthy, planned, and near-total violation of its international nonproliferation commitments. U.S. and U.K. officials, sensing an opportunity for a significant breakthrough, were eager to send teams of visitors—the Libyans balked at the term "inspections" as it connoted to them a buckling to Western pressure—but the Libyans began to have second thoughts.

An additional round of meetings was scheduled, again in Europe. The Libyan delegation was joined by Qaddafi's son, Saif al-Islam. Efforts by Saif to make demands on the West proved fruitless; Kappes and his counterpart were far too experienced for that and the talks dragged on for several more months. Finally, in September 2003 the team was invited to Tripoli where Qaddafi personally became involved, beginning the meeting with a lengthy diatribe against the West for many real and imagined sins.[45] Settling down to business, Qaddafi, referring to his WMD programs, acknowledged that he wanted to "clean the file," but by the end of the

meeting no final agreement had yet to be reached. By the fall of 2003 the U.S, invasion of Iraq had resulted in the insertion into that country of 150,000 American military personnel as well as a smaller U.K. military force for the purpose of removing Saddam Hussein from power, an undertaking that doubtless was watched with great interest and probably considerable concern by Qaddafi.

Of more direct consequence was the seizure of a ship carrying cargo on October 4, 2003 at the Italian port of Taranto of the BBC China; the ship had originated from Malaysia in August. After tracking the ship through the Suez Canal, the German Secret Service, working in conjunction with U.S. and U.K. counterparts, contacted the German owners of the ship and asked their cooperation in diverting the ship to Taranto. Once in port a team of experts set about to quickly examine the suspect cargo. The ship was bound for Libya and the manifest claimed the cargo was "used machine parts." Upon close inspection the team discovered packed in wooden containers bearing the logo SCOPE (the Malaysian manufacturer) were thousands of aluminum components for assembling centrifuges, the equipment that enriches uranium and the centerpiece of Libya's nuclear weapons acquisition program.[46]

The U.S. and U.K. governments chose not to trumpet the seizure of the ship's contents publicly but were quick to re-engage their Libyan counterparts with another trip to Tripoli in an effort to resolve the now lengthy impasse over how Libya would dispose of its programs as Qaddafi indicated would occur.[47] (There also was a different drama unfolding in Washington because Undersecretary of State John Bolton, the department's lead on nonproliferation issues, deliberately had not been informed in advance by Secretary of State Colin Powell or CIA Director Tenet of the planned BBC China seizure for fear Bolton would prematurely break the story. Bolton apparently showed justifiable and considerable ire at these developments.) Progress was being made by separate teams negotiating the end of Libya's biological and missile programs but the nuclear talks remained contentious. Mistrust between the Libyans and their Western counterparts was palpable; the Western team was not prepared to share much information with their Libyan interlocutors. The situation hardly improved when the Libyans maintained a steady denial of their interest in enrichment or other parts of the fuel cycle. Another meeting ensued with Libyan intelligence chief Kusa, this time in November near London. The Western team used the meeting to provide, with political approval in Washington and London, more details on what was known about Libya's efforts and its ongoing relationship with Khan. Their goal was to show in no uncertain terms that knowledge of Libya's clandestine efforts was considerable. This seemed to have the desired effect on Kusa; the U.S. and U.K. experts weren't just fishing for information; they knew a great deal more than Kusa or his colleagues believed to be the case.[48]

Shortly thereafter, intelligence officers from both nations returned to Libya on December 1, spending about 11 days there. The tone of the meetings was more business-like than in the past although there were no new admissions at the time flowing from the Libyans. Shortly thereafter, however, the Libyan government made its dramatic announcement, setting in motion a complex period of follow-up visits to monitor the dismantling. The visits also confirmed the scope and extent of Libya's lengthy and ultimately unsuccessful quest to acquire nuclear weapons. The BBC China seizure also set in motion events in Pakistan that would lead to the unraveling of Khan's lucrative black market network.

After the December 19 announcement, IAEA Director El Baradei led a team to Tripoli to begin the oversight of a dismantlement process of Libya's WMD programs carried out by U.S. and U.K. experts. After reviewing thousands of pages of documents turned over by the Libyans as part of the dismantlement process, El Baradei would conclude that Libya was perhaps three to seven years from acquiring a nuclear weapon. In March 2005, Libya signed the Treaty of Pelindaba, which calls for the establishment of an African Nuclear Weapons Free Zone. In 2008, El Baradei announced that Libya had cooperated with the dismantlement and subsequent inspections process and said that future IAEA activities in Libya would be routine.

The Libyan case can be viewed as a political success for the U.S. government's nonproliferation policies. A nation avidly pursuing a nuclear weapons capability had been stopped from doing so and that was no small accomplishment. At the same time, Libya's brazen and relentless nuclear weapons acquisition efforts underscored the weakness of the nonproliferation regime and the institutional edifices that had been erected to prevent such practices. Small comfort could be taken in Libya's failure when considering that a nation of no particular significance with a poor scientific base could make substantial strides to building a nuclear infrastructure if not acquiring nuclear weapons. That somber reality would play out again with other nations in the region with the same goal and possessing both more resources and more sophisticated capabilities.

CHAPTER 3

Iraq: War without (Nuclear) Weapons

It is ironic that the history of Iraq's involvement with nuclear technology and, later, nuclear weapons, is so closely entwined with two U.S. Republican presidents. In the 1950s, Dwight Eisenhower became convinced that the secrets of nuclear energy would inevitably become widely understood and also that those secrets, if properly controlled and applied, could serve useful civilian and not just military ends in a number of fields. Eisenhower's belief in the promise of nuclear energy was presented in his 1953 proposal for an Atoms for Peace Program. Atoms for Peace, in part for U.S. commercial advantages, endorsed the dissemination of America's growing expertise in nuclear energy to nations around the globe so that nuclear energy could be used for economic development. Iraq was one of the early beneficiaries of the program. As part of the program's initial wave of information sharing, an Atoms for Peace library, including declassified documents from America's war-time Manhattan Project, was sent to Baghdad. Some 50 years later in 2003, President George W. Bush would lead the United States, supported by its ally Great Britain, into war with Iraq, justifying his decision largely on the assertion that Iraq was attempting to acquire nuclear weapons as well as other weapons of mass destruction.

What occurred in Iraq and its nuclear weapons program between the 1950s and 2003 is another example of an uneven but sustained effort by a Middle East nation to acquire various nuclear technologies with the intent of crossing the nuclear weapons threshold. As in the Libyan case, it also is the story of another military officer, Saddam Hussein, holding the reins of political power for several decades, and ultimately leading his nation on a path to ruin. Born in 1937 near the city of Tikrit, which is approximately 120 miles north of Baghdad, Hussein from his early adult years was caught up in plots, coups, and political intrigue. Baghdad had

become in 1921 an independent nation with a monarchical form of rule under the pro-Western Hashemites. They remained in power until July 14, 1958 when a military coup led by Abd al Karim Qasim, an Army officer, succeeded in overthrowing the government. Ironically, the coup led the U.S. government to scrap plans to send a small reactor to Iraq; the reactor was sent to Iran instead.

A year later, in 1959, 22-year-old Saddam Hussein, having already embarked on a career as an Army officer, tried but failed to assassinate Qasim. Qasim would continue to rule for another few years but was not so fortunate in February 1963 when another plot succeeded in killing him. It is fair to characterize Qasim's assassination (which was not at Hussein's hand) as a military coup not unlike those seen at various times in other Middle Eastern countries, but it also was a catalyst for the rise to power of the Baath Party, founded in the mid-1940s by Michel Aflaq. The Baath Party's political philosophy incorporated both nationalistic as well as socialistic elements at a time when many in the Arab world were searching for an identity after years of colonial rule. Tikrit would remain a strong center of Baathist support and during his years in power, Hussein, who would become president in 1979, valued (and demanded) loyalty above perhaps any other virtue and would surround himself with those from the Tikrit area.

While the Baath Party, of which Hussein was a member, first gained prominence after Qasim's 1963 assassination, in the ensuing five years it was unable to fully consolidate its power within Iraq in the face of determined opposition from another Army faction led by the Arif brothers. Bloody struggles for power unfolded during this period but after July 17, 1968, when the Baath Party returned to power, it was apparent that Hussein, who had held an internal security post during part of the decade, would become the pivotal figure in Iraqi politics for years to come.

Iraq's scientific cadre would prove in ensuing years to be more skilled than their Libyan counterparts, but Iraq did not immediately exploit, or even attempt to exploit, the copious nuclear-related information received from the United States. It was not until 1962, six years after the Atoms for Peace "gift," that Iraq began a nuclear power program when the Soviet Union supplied it with a small (two megawatt) research reactor that went critical in 1967. In the following year Libya signed the Nonproliferation Treaty (NPT) and ratified it in 1969.

Joining the NPT put Iraq on record as forswearing the acquisition or development of nuclear weapons but it soon became apparent that the Iraqi government harbored other intentions. According to one source, ". . . in 1971 a secret plan was initiated to breach the treaty. At that time the program was run by the Iraq Atomic Energy Commission (IAEC). . . . The chairman of the Physics Department of the Nuclear Research Center, located at al-Tuwaitha, 17 km south of Baghdad, was Khidir Hamza. . . . Hamza reports that in 1971 he was approached by two men in charge of

the IAEC, both Baath Party members . . . who requested that Hamza develop a plan for acquiring nuclear weapons."[1] It is unclear whether the IAEC representatives were authorized by any higher authority to tell Hamza that starting such a program would lead to substantially increased funding for what heretofore had been a small and struggling program. As events would prove, Saddam Hussein was about to become personally involved in the program; he served from 1973 to 1979 as director of the IAEC. His powerful presence alone would ensure that resources would flow to the various program elements but there also was another price to be paid. If the good news was that financial resources indeed would be commensurate with the priority accorded it by the government, the bad news was that Hussein and his personal representatives were seldom tolerant of the almost inevitable programmatic problems and delays attending any effort to develop nuclear weapons, creating an unrelenting atmosphere of pressure, intimidation, and fear among those at the program's highest scientific levels.

As Hamza later would recount, deception and determination would become key elements of Iraq's nuclear weapons program. Early efforts were focused on acquiring "a complete fuel cycle able to produce and separate plutonium. The plan focused on the foreign acquisition of complete nuclear facilities with training in their use conducted in the supplier country."[2] Despite the import of this strategic decision, Iraq was not reckless, provocative, or overtly aggressive in the program's initial years; it made, with some reluctance, a conscious decision to acquire nuclear facilities that would be under International Atomic Energy Agency (IAEA) safeguards given Tripoli's commitment to the NPT. Nonetheless, the Iraqi government, spurred forward by Saddam Hussein, was unambiguous in its ultimate objective, which for reasons of domestic support, international prestige, as well as a counter to Israel's nuclear program, was to pursue a path leading to the production of nuclear weapons.[3] What is less clear during the early years of the Iraqi nuclear program is how a nuclear weapons capability, even if quite limited, would be incorporated into Iraq's overall defense strategy. The Israeli experience showed that nuclear weapons were not of great consequence in two conventional wars against the Arabs and also later would prove of no value to Tel Aviv against more limited military actions such as the intifadas. At least part of the reason may be found in the fact that Iraq was keeping its nuclear aspirations within a very closed circle; it's difficult for any military organization to plan a strategy for a weapon it doesn't have in its inventory or few in the chain of command know is being developed.

The clearest example in the 1970s of Baghdad's nuclear technology acquisition strategy was its approach to France. The timing and choice of France as a foreign partner almost certainly were not coincidental. Iraq's relations with the Soviet Union, a natural partner for the type of nuclear

assistance Iraq sought, had hit a lull. After Qasim's overthrow in 1958 of the monarchical government, Iraq immediately turned to and developed good relations with the USSR, including Hussein tolerating as a gesture of good will, if not embracing, the Iraq Communist Party. Iraq sought a powerful patron and Moscow was eager to be seen as supporting various "liberation movements" throughout the Middle East and elsewhere. (The presence of a Kurdish minority in northern Iraq restlessly seeking political independence from the Baghdad government must have been viewed as an awkward adjunct to the broad outlines of Soviet-Iraq relations.) The political dynamics emerging after the 1973 Yom Kippur War changed the bilateral relationship for a while. Rising oil prices resulting from an Arab embargo in retaliation for the West's support of Israel during the war provided Iraq with greater financial resources and hence political maneuverability while Soviet prominence in the region took a direct hit as a result of the military collapse of Moscow's client, Egypt, in the 1973 conflict. This slight cooling in relations was not in any way permanent; the Soviet Union—and later Russia—would remain a political ally of the Baghdad government for years to come.

In addition to the strategic reasons for Iraq to look elsewhere for a potential partner for its nuclear development efforts, the French, in particular, stood out as their expertise in many nuclear technology areas was impressive and well known in Iraq. France, as did the Italians through the 1970s, also trained hundreds of Iraqi scientists and engineers, forging a strong bond between the respective scientific communities. Perhaps most important was that the French were prepared to agree to a critical Iraqi programmatic request. Initially, Iraq sought from the French a gas graphite reactor (an excellent source of plutonium) and a plutonium reprocessing facility, both of considerable proliferation concern.[4] At first, France denied both requests and Iraq also approached Canada for a Candu reactor of the type that supported India's nuclear weapons program (India had carried out a "peaceful" nuclear detonation in 1974) but those efforts also did not yield any positive results for Iraq. A team of Iraqi officials also visited India but for unknown reasons no cooperative relationship ever developed.

The French, on the other hand, despite their initial negative response to the request had not cut off all discussions for nuclear technology. An Iraqi team led by Dr. Khidhir Hamza in 1974 began negotiations for what the French called an Osiris research reactor (named after the Egyptian god of the dead) and another smaller research reactor—both of which would run on weapons-grade uranium.[5] In the West the larger reactor would be known as Osiraq, an amalgam of the reactor name and Iraq and referred to as Tammuz by the Iraqis in commemoration of the Arab month, July, in which the Baath Party had come to power. The talks continued into 1975 when Saddam Hussein, by now the driving force behind Iraq's nuclear weapons quest, flew to Paris with promises of cheap Iraqi oil as an

additional inducement for the French. French scientists clearly understood the proliferation potential of the reactors and at one point offered to provide reactors that ran on much lower (8%) enriched fuel called caramel fuel. The Iraqis balked, clearly preferring a deal that would provide them a supply of highly enriched uranium. The French relented and allowed the original terms of the contract to be implemented. The construction site would be at al-Tuwaitha, which was becoming the heart of Iraq's nuclear efforts. Concurrently, Italy signed a deal with Iraq for the provision of hot cells, which allows technicians to extract plutonium.

The Osiraq reactor was a large structure, with a main hall reaching 10 stories high with three cooling towers and a large dome over the center part of the reactor. The reactor also was notable for its unusual thermal capacity (it was not a producer of electricity); most research reactors rarely exceed 5 MW capacity, but the reactor produced 40 MW with a peak capacity of possibly 70 MW. The significance is that a simple way to "breed" (produce) plutonium is from unenriched uranium. However, that process requires high-density neutrons such as weapons-grade uranium to start the breeding process. With the deal for Iraqi oil in hand, France supplied about 28 pounds of weapons-grade (93% enriched) uranium. Iraq also may have had as much as 200 tons of unenriched uranium at the Osiraq site. One source assessed that the unenriched uranium "for Iraq it could not have had any other possible use other than to be bred into plutonium—for Iraq has no enrichment facilities, no power reactors, nothing else for which unenriched U 238 makes sense."[6]

Debate long has continued over the level and immediacy of the proliferation threat posed by the Osiraq reactor. Was the reactor a direct threat to Israeli security? What motivated Israel to launch on June 7, 1981 a bold and highly controversial air attack that inflicted significant damage on the Osiraq reactor? After all, it is possible that the French experts working at the site would have tried to stop the Iraqis from beginning plutonium production. The reactor also was subject to IAEA inspections. At the very least the Iraqis would be reliant on the French process of moving fuel in and out of the reactor. Under these circumstances the project may have appeared as of limited proliferation concern to all but the most astute observers.

These arguments fall short for at least four reasons. The first is that both the French government and its scientists, as shown in the Israeli case as well as by French refusal to push hard for Iraq to accept lower enriched fuel for its research reactors, had a rather poor record of attempting to cajole or demand of its customers adherence to nonproliferation "best practices." As noted, French scientists also had developed good relations with many of their Iraqi counterparts. The second reason is that the IAEA indeed had every right to carry out inspections at Osirak because Iraq was an NPT signatory and the reactor was at al-Tuwaitha, a declared facility. Nonetheless, the practical reality of a safeguards agreement with the IAEA

is that the country to be inspected can use gaps in the system to carry out proscribed activities. For example, only three inspections per year were to take place at declared Iraqi facilities and they were to be scheduled months in advance. The IAEA also can inspect only declared, not suspect, facilities. Osiraq was declared to the IAEA but inspectors could not look for clandestine operations there. A nation also can limit the access of individual inspectors deemed too critical or probing. In the Iraqi case, the decision had been made in Baghdad to push as hard as possible for Soviet and Hungarian inspectors. The Soviet Union was a patron of Iraq while Hungary was a member of the Warsaw Pact and in no position to go against the political dictates of its Soviet "protector." Iraqi scientists calculated that they could beat any safeguards arrangements and, if careful, produce perhaps five to seven kilograms of plutonium per year, enough fissile material to make one nuclear device. Their optimism may have seemed misplaced or unjustified but in fact it was the product of careful study since the mid-1970s of IAEA safeguards procedures, including placing one Iraqi scientist on a safeguards inspection team. One Iraqi expert would later describe the IAEA inspections process as "weak and easily manipulated . . . The agency accepted Iraq's importation of weapons-grade uranium for the research reactors without evaluating the possibility that Iraq might direct the material to military use."[7]

The third reason for concern about Osiraq is that Iraq in 1980 also sought to acquire as much as 11 tons of depleted uranium from NUKEM, a West German company. This could serve as the target material for the reactor and could produce as much as 11 kilograms of plutonium, a sufficient quantity for making at least one or possibly two nuclear devices.[8] Finally, no less an authority than Saddam Hussein, in 1975 spoke unambiguously about his view of the project when he stated in an interview that "the Franco-Iraq agreement was the first actual step in the production of an Arab atomic weapon, despite the fact that the declared purpose . . . is not the production of atomic weapons."[9]

Of greater consequence than any outside ex post facto assessment of Osiraq's proliferation potential was how the government of Israel and its political leadership, notably Prime Minister Menachem Begin, assessed the threat to Israeli security posed by the reactor sale. Other factors with a more domestic flavor also would factor in Begin's thinking. From the project's earliest days in the mid-late 1970s the Israelis monitored the construction progress and related activities at al-Tuwaitha. Shimon Peres, no stranger to nuclear issues, was head of the opposition Labor Party at the time. Peres recognized the reactor program to be a potential threat to Israel but also judged that his strong personal relationship with French President Francois Mitterand could be used to convince the French government to slow assistance to the project before the emerging threat became too pronounced.

The prevailing view within Prime Minister Menachem Begin's governing Likud Party was much more alarmist. The Iraqi military was seen as posing a strategic threat to Israel that was increasing rapidly and not just in the area of nuclear technology. Iraq had fielded at the time about a 200,000 man army backed by 2200 tanks and 450 aircraft.[10] Those figures could not have escaped Begin's notice—he also was serving as defense minister—at a time when the invincibility of Israel's own defense forces was thrown into question after its initially shaky performance in the Yom Kippur War. The combination of growing Iraqi conventional force capabilities and the Franco-Iraqi nuclear reactor agreement with its implications for the future of Israel's nuclear monopoly was a powerfully troubling combination. If Israel's regional edge in conventional forces was subject to erosion then Begin may well have concluded that Israel also could not relinquish its advantage in nuclear weapon capabilities.

There appear to have been at least three additional elements in Begin's strategic calculus. The first is rooted in Israel's domestic political scene at the time. During Begin's tenure, the Israeli economy was beset by rampant and uncontrolled inflation, badly souring the public mood and its support for the Likud Party and the prime minister. Elections to the Israeli Knesset (parliament) were on the horizon—set for November 1981—and Peres's opposition Labor Party throughout that year was shown in every political poll to be a serious threat to reclaiming power. Begin was dismissive of Peres's view that the proliferation dangers of the Osiraq reactor could be resolved diplomatically. Under these circumstances, did Begin also believe that he would have to act before the elections given that a Peres victory would lead to a much reduced likelihood of direct Israeli action against the reactor? Did Begin also calculate that a dramatic, and presumably successful, military action would elevate his sagging political fortunes? How much these considerations played in Begin's thinking may be impossible to answer with certainty but domestic factors played some role in Begin's decision to attack the reactor.

The second factor was Israeli disappointment, once again, with the U.S. government's refusal to provide Israel a security guarantee. This was something past Israeli governments had sought from the United States since Dwight Eisenhower's time in office. Political statements of support for Israel often emanated from the White House or Foggy Bottom, home of the State Department, but senior U.S. officials were not prepared to provide a guarantee that U.S. military might, including the deterrent effects of its growing nuclear arsenal, would be used to support Israel in a crisis. Secretary of State Edmund Muskie in 1980 told Israeli Foreign Minister Yitzhak Shamir that "in spite of being the leader of the West, the world's greatest superpower did not wield unlimited power."[11]

The final factor traces to the highly personalized nature of Israeli decision making on national security issues. Since the founding of the Israeli

state and the strong governing style of David Ben-Gurion, Israel's first prime minister, subsequent Israeli prime ministers have often made their most important decisions on security issues by forming a small circle of trusted advisers and relying on their own judgment with at most limited outside input. Almost all Israeli leaders have world views shaped by backgrounds of service in either the Israeli military or intelligence services. Their knowledge of Israeli history often is encyclopedic. In Begin's case his understanding of Israeli history included an enormously personal element. Begin had lost both parents to the Holocaust and made abundantly clear that he would not preside over a second Holocaust. Osiraq, in his mind, could present to an Iraqi leader like Saddam Hussein who professed nothing but unrelenting enmity toward Israel, and had never recognized Israel's legitimacy as a nation, the capabilities to carry out a second Holocaust, this one with atomic weapons. Israel is a small nation with limited strategic depth; Begin well understood that even one or two nuclear weapons delivered against Israeli population centers could be devastating. These considerations also likely weighed heavily in Begin's mind as he contemplated the decision to attack.

It is an entirely different question whether Saddam Hussein would have contemplated in the foreseeable future anything as reckless as using or even threatening to use nuclear weapons against Israel, at least in the late 1970s to early 1980s, even if they had become available to him. Hussein would of course blunder disastrously in attempting to subjugate the small and militarily weak nation of Kuwait in 1991 but he had enough rationality to avoid confronting a decade earlier the still very formidable Israel military. Nonetheless, Begin was not prepared to bet Israel's security on the putative rationality of Saddam Hussein. The result was the sudden and dramatic June 1981 Israeli attack on the Osiraq reactor that would have far-reaching and lasting consequences.

A close review of the evidentiary base underscores that before Begin's decision to launch a military strike against the reactor that Israel undertook a series of media, diplomatic, and covert actions designed to stop or at least slow the project. Several years before the attack, a number of press reports began circulating in the print media in Washington, London, Berlin, and elsewhere calling attention to Iraq's alleged plans to build nuclear weapons. This media blitz was augmented by a robust diplomatic strategy that had at least two elements. The first, beginning shortly after French agreement to provide an Osiris-type reactor, was an ongoing effort by various Israeli officials, including those at the highest levels of government, to engage their French counterparts, urging them to curtail their planned cooperation with Iraq. Shimon Peres, although in the political minority at the time, was involved in this effort on Israel's behalf. Similar approaches also were made to Italian officials as Italy also was carrying out a plan to supply sensitive technologies to Iraq, including the previously mentioned

hot cells, and to Germany, which at the time was a possible source of additional nuclear technology for Iraq and would become so at a later date.

The second element of the diplomatic strategy was focused on the United States and President Jimmy Carter. From the earliest months of his presidency, which began in 1977, Carter had spoken passionately of his support for Israel and opposition to proliferation activities. The view from Tel Aviv was that the Osiraq reactor was the ideal opportunity for Carter to give content to his words. Secretary of State Edmund Muskie was not prepared to offer Israel any type of nuclear guarantee and after several years of fruitless exchanges, Carter compounded Israeli disappointment in 1980 by stating that the United States would not attempt to intervene in the affairs of other major nuclear powers (such as France) with their own commercial and diplomatic interests in the region.

The evidence is not incontrovertible but it is highly likely that covert actions also were used by the Israeli government in an attempt to slow Iraq's nuclear ambitions. On April 6, 1979 the "French Ecological Group" claimed responsibility for setting off five explosions at Le-Seyne-sur-Mer that damaged the two reactor cores to be sold to Iraq. French technicians attempted to fix the damage to the reactor cores but some hairline cracks remained; the Iraqis accepted the cores in this condition, which was far from ideal from an operational standpoint. The group was never caught or even heard from again and suspicion for the attack focused on Mossad, the Israeli intelligence service.[12] In June 1980, Iraqi scientist Yehia al-Meshad was in Paris to oversee the first delivery of nuclear fuel for the reactor. He was clubbed to death in his hotel room and a month later Marie-Claude Magalle, the French prostitute with him at the time, was killed in a hit-and-run accident.[13] Later in 1980, Salman Rashid, an electrical engineer, died under mysterious circumstances in Geneva.[14] On August 7, 1980, three bombs exploded at the Italian company SNIA Techint, the manufacturer of the hot cells Iraq needed to produce weapons material from spent fuel rods. Again, no individual or group was ever identified or apprehended.[15]

Despite the use of diverse Israeli approaches short of the use of force to slow or derail it, the Osiraq project was moving forward but it was about to draw unexpected and unwanted attention. The overthrow of the pro-Western Shah of Iran in March 1979 by Islamic fundamentalists led by Ayatollah Khomeini added another layer of complication to an already politically fragile region. Israel, which had enjoyed strong relations with Iran under the Shah, would come to view the new government in Tehran as an existential threat. The Israelis were not alone. Saddam Hussein, a Sunni Arab with deep suspicions of Shiites inside and outside his country, also was watching the same developments warily from Baghdad. He had consolidated power in June 1979, becoming president of Iraq while adding to his personal and political portfolio a series of posts including

command of the Iraqi military, leadership of the Baath Party, and chairmanship of the Revolutionary Command Council, a vestige of the Baath party that was transformed into Iraq's central decision-making organization. In September 1980, for myriad reasons related to border disputes, a failed assassination attempt by an Iranian group against Iraqi Foreign Minister Tariq Aziz, and a revival of ancient Arab-Persian suspicions, Hussein launched what would evolve into a bitter and protracted eight-year war against Iran. At the end of the first month of conflict, two Iranian jets, part of a larger formation of aircraft attacking a nearby Iraqi conventional power plant, dropped several bombs on the Osiraq reactor, causing minimal damage.

That attack would serve as a precursor for the much more devastating June 7, 1981 attack on Osiraq by the Israeli Air Force. The reactor still had not reached operational status but Prime Minister Begin decided he could no longer wait any longer to try to destroy it. Some thought had been given by Israeli planners to attacking the reactor with a commando operation but this option was dismissed quickly because of the logistical complexity of undertaking such a raid 600 miles from Israeli soil.[16] Begin's decision to proceed with an aerial attack was met with far less than universal acclaim by senior Israeli politicians. Shimon Peres remained fixed on the idea that the reactor was not an imminent threat and that diplomacy still had time to work. Others argued that an Israeli attack would unite the Arab world and inflict irreparable damage on the prospects for Israeli peace with Egypt. Still others argued that an attack on an Iraqi reactor would lead to an attack against Israel's nuclear complex at Dimona. Begin remained unshakable in his conviction that military action was justified and indeed required to maintain Israel's nuclear monopoly in the region, a belief that came to be known as the Begin Doctrine.

The June 7, 1981 attack was a resounding tactical success for the Israeli Air Force (IAF) and its highly skilled commander, Major General David Ivry. Israeli pilots had been practicing for a complex and long-range air attack since 1977 without knowing the exact target. Operation Opera, known also in some quarters as Operation Babylon, employed a joint attack force of Israel's most advanced military aircraft, six F-15 Eagle aircraft with air superiority capabilities and eight F-16 Falcon strike aircraft.[17] The planes flew initially over Jordanian territory, including over King Hussein of Jordan's yacht at such a low altitude that he recognized the aircraft markings and tried to alert Iraqi officials. Israel's element of surprise at least in part was preserved by good fortune; the Jordanian king's efforts to alert the Iraqis of the impending attack failed because of a malfunctioning communications link between Jordan and Iraq. The aircraft also overflew Saudi Arabia undetected before proceeding to the Iraqi target. Iraq's air defense forces were caught unaware. Fourteen tons of ordnance were unleashed over the target with 14 of 16 bombs hitting the

reactor core, which was the aim point, and inflicting severe damage. The second and smaller reactor was not targeted. No Israeli aircraft or personnel were lost.

International reaction to the attack unfolded along predictable lines. The Iraqis launched a torrent of condemnation but did not retaliate militarily, almost certainly in large measure because Iraqi forces already were embroiled with Iran. Both the United Nations and the IAEA, whose safeguards program had been exposed as inadequate, also issued strong condemnations requiring U.S. political intervention to forestall the taking of more substantial measures. Ronald Reagan, the new U.S. president, did not seem unduly concerned about the Israel attack. Egypt, engaged in peace negotiations with Israel, felt compelled to launch a stinging verbal broadside. Within Israel, in addition to the morale boost the Israeli military derived from the success, Operation Opera also paid political dividends, propelling Begin's Likud Party to victory in the Knesset elections. The Israeli public clearly approved of Begin's decision.

A series of longer-term strategic implications trailed in the wake of Israel's tactical success and those were much less favorable. The most important was that Iraq, already committed to the acquisition of fissile material to support the fabrication of nuclear weapons, was not about to relinquish its cherished goal. As a result of Israel's attack, the Iraqi program suffered a setback of at least three years and possibly longer. Hussein's determination to continue the quest for nuclear weapons remained undaunted; in January 1982 at the direction of the IAEC, an Office of Studies and Development was created to develop the thinking that would take Iraq's program into a new direction. The result would be a shift in tactics and focus within the nuclear weapons program but not a shift in long-term program objectives. As recounted by one senior Iraqi official, "the loss of the Tammuz reactor caused the IAEC to fundamentally shift course."[18]

The new path Iraq would chart would take it away from reliance on a plutonium-based program supported by militarily vulnerable reactors to a uranium-based program centered on the development of clandestine enrichment facilities. Consonant with its new strategy, Iraqi officials took a series of steps in response to the destruction of the Osiraq reactor. At first they sought French concurrence to replace the reactor but after four years of fruitless negotiations realized that plan would not materialize. This failure crystallized in Iraqi minds the imperative to implement the new strategy and as a result Iraq also sought to develop "a heavy water or enriched uranium reactor and associated plutonium separation capability and develop uranium enrichment production capacity."[19] Organizationally, the IAEC was replaced by the Ministry of Industry and Military Industrialization (MIMI), a cabinet- level agency.[20] In addition, a new series of buildings were ordered to be built at al-Tuwaitha. Their purpose would be to house work related to producing weapons-grade uranium.

As a result of the Israeli attack and the centerpiece of its new thinking, Iraq made the decision that it would seek to acquire weapons-grade uranium by concentrating on two enrichment processes, research and development of electromagnetic isotope separation (EMIS), which would receive priority attention. EMIS used obsolete technology dating to the Manhattan Project of the 1940s but its appeal, at least in part, was that critical pieces of equipment to support the effort were not on any proscribed export control list. The other process, gaseous diffusion enrichment, was a technology by which gaseous uranium hexafluoride (UF6) is forced through many semipermeable membranes to enrich uranium. Both efforts were to be led by Dr. Jaffar Dhia Jaffar and would require the construction of new facilities. Locating the buildings at al-Tuwaitha for the initial work on EMIS and gaseous diffusion, a declared site subject to IAEA inspections, may have appeared risky, perhaps even reckless. The Iraqis erected large berms to conceal the new buildings from others at al-Tuwaitha and pathways were carefully prepared to make the new facilities almost impossible to see. Meanwhile, Iraqi scientists and technicians were prepared in advance with answers if any unwanted or probing questions suddenly arose during an IAEA inspection.[21]

According to one authoritative description of Iraqi thinking at the time, "Gaseous diffusion was planned to produce low enriched uranium which could be used as feedstock for EMIS, dramatically increasing overall highly enriched uranium HEU production in EMIS separators. If EMIS was unsuccessful, the plan called for expanding the gaseous diffusion facility to produce HEU directly. At the time gas centrifuge technology was viewed as too difficult to accomplish."[22] The goal of the EMIS program was the construction of two production units each producing 15 kilograms per year of weapons-grade uranium using natural uranium fuel, a combined total that would have yielded one nuclear device. Construction on the first EMIS production facility began in 1987 at Tarmiya, north of Baghdad and a second and similar facility also was started later in the same year at Al Sharqat, about 120 miles northwest of the Iraqi capital.[23] Due to a variety of technical and production problems through the 1980s, both the EMIS and gaseous diffusion options for enriching uranium failed to produce desired results, forcing Iraqi scientists to once again shift strategies. The reasons behind these failures cannot be sourced to lack of effort or resources but rather the inherent and multiple technical hurdles presented by both approaches.

Given the unforgiving nature of the Hussein regime, Iraqi scientists were compelled for more than scientific reasons to turn to a third option for uranium enrichment, gas centrifuges. A new clandestine program was set in motion along the lines of Pakistan's successful centrifuge program. As explained by an Iraqi scientist, "A gas centrifuge spins at very high speeds on a centrifugal axis to create centrifugal force which separates a

gaseous mixture of the uranium isotopes. The heavier isotope, uranium-238 falls from the lighter uranium-235 . . . Once the heavier isotopes have been drawn out the highly enriched uranium in the center may be siphoned from the cylinder."[24] Hussein Kamel, who became Saddam Hussein's son-in-law by the magnanimous act of marrying the Iraqi president's 15-year-old daughter, had become directly involved in Iraq's nuclear weapons program. He ordered Dr. Mehdi Obeidi, who would direct the program, to locate the centrifuge program away from al-Tawaitha. Obeidi chose what had been a nondescript irrigation research facility in Rashdiya, north of Baghdad as the home of the new Engineering Design Directorate.[25] The Iraqi Department of Agriculture would vacate the facility in record time.

Obeidi clearly understood the considerable technical and engineering requirements attending development of a centrifuge program. As the Pakistanis and other nations had learned, centrifuges are both delicate and demanding; Obeidi told Hussein Kamel that the type centrifuge he envisioned would have to "spin more than 50,000 revolutions per minute, at least 20 times faster than the most advanced motor Iraq had ever seen."[26] Moreover, Iraq would need at least 1,000, and ideally far more centrifuges, to produce sufficient quantities of weapons-grade uranium in a reasonable amount of time.

Obeidi judged correctly that the first program requirement was acquisition of the specialized material, known as maraging steel, to construct the centrifuges. He became involved in this effort personally, traveling to Paris where he met with a black market dealer with a Pakistani background known as Malik. Obeidi requested the highest quality maraging steel, known as maraging 350, claiming it was for Iraq's artillery program. Malik understood the special nature of the request and remarked that maraging 350 was seldom, if ever used for such a purpose as the more economical maraging 250 was of sufficient strength and durability for weapons application.[27] Malik did not press the matter and arranged for a subsequent meeting in London with Obeidi at which time they agreed to the Iraqi purchase of 100 tons of the highest quality margaing steel that "was conceivably enough to produce 10,000 centrifuges, which in turn could yield 150 kilograms of highly enriched uranium per year. That would be enough uranium for Iraq to annually produce 10 bombs . . ." The steel was shipped to Dubai, sent by truck to Saudi Arabia, and on to Baghdad.[28] Other parts for the program would not be assembled until they had reached Iraq.

A centrifuge has about 100 individual parts, some of which need to be specially manufactured. Iraq's procurement efforts for other critical parts for the centrifuge program would take a similarly complex path but the one constant was to have the purchases, whenever possible, appear to have a dual-use quality meaning that at least some hardware sought for the clandestine program could be defended as having legitimate

commercial application. In support of this strategy was the creation of front companies in Iraq to serve as false end users. For example, Obeidi's Engineering Design Center staffed and controlled the Industrial Projects Company. Similarly, MIMI controlled the Al Arabi Trading Company. In turn, Al Arabi would control front companies such as the Technology Engineering Group and Technology in the UK as procurement vehicles for Western products.[29] According to Obeidi, "We purchased vacuum valves and pipes from the German company Leybold . . . from Leybold's subsidiary we bought electron beam welders . . . The German firm Reutlinger sold us machines to balance the rotors. We sought other parts from Yugoslavia, England and Switzerland . . . One of the most difficult pieces to obtain was the small high powered magnet that sits atop the centrifuge, holding the rotor in place . . . I set our sights on the Austrian high-tech firm Treibacher, one of the world's leading magnet makers."[30]

In addition to its hardware purchases, Iraq also was taking extensive measures to enhance its understanding and capabilities in key nuclear technology efforts, particularly centrifuges, but also for its work in EMIS and gas diffusion. One of the least understood and occasionally underappreciated aspects of Iraq's clandestine efforts throughout the decade was its program to acquire covertly as much documentation and insight into nuclear technology and nuclear weapons design as possible. As discussed in the previous chapter, Libya had to rely heavily on external assistance to advance its nuclear weapons program. In stark contrast, Iraqi scientists, driven at all costs in the aftermath of the Israeli attack on Osiraq to reconstitute and also preserve the secret of their nuclear ambitions, chose a go-it-alone strategy, seeking to learn the secrets of other nuclear programs but eschewing formal foreign assistance or a foreign presence in Iraq. Part of the reason behind Iraq's evolving strategy can be traced to making a virtue of necessity; most nations also had become wary of working too closely with Iraq after the June 1981 Israeli attack. Nonetheless, the Iraqis were wholly pragmatic on the source and manner of the assistance they required for their programs and the reluctance of others to develop new and formal working relationships with Baghdad complicated, but ultimately did not deprive, Iraq of considerable information for its enrichment as well as nuclear weaponization work.

When Iraqi scientists encountered a problem with their centrifuge design that seemed unsolvable, they brought in Bruno Stemmler, a German expert, but that was an exceptional case. Even without the presence of a cadre of foreign experts in their country, Iraq devised numerous ways to glean from foreign sources critical information to boost its nuclear programs. As Obeidi recounts, he placed top priority on training his technicians abroad. Those experts were sent to Imperial College London, and others in Germany, including the training of twenty two engineers at the German company Interatom.[31] The United States became a high priority

target for the execution of an aggressive, diverse, and partially successful strategy to collect as much information as could be obtained covertly for Iraq's nuclear requirements. This collection strategy was not particularly sophisticated but it was audacious; Iraqi scientists, some Iraqi students, Iraqi diplomats as well as officials from other parts of Iraqi government, including the intelligence services, were directed to collect wide-ranging information on nuclear technologies and nuclear weapons.[32] This "vacuum cleaner" approach was inherently inefficient and considerable amounts of useless information was collected. Nonetheless, Iraq's broad harvesting efforts also yielded considerable substantive fruit.

- U.S. libraries, including the Library of Congress, the MIT library, and the library at the University of Wisconsin (where 300 documents were copied) were accessed by Iraqi students or Iraqi intelligence officers posing as students.
- Journals of all types related to specialized fields of interest to Iraqi scientists and engineers were acquired, including explosives journals, metals journals, and shockwave phenomena journals (useful for understanding the first nanoseconds of a nuclear detonation).
- The U.S. Argonne National Laboratory was targeted for information useful for the EMIS program, including information and technology related to accelerators.
- Perhaps the boldest, and one of the most successful efforts, came when two Iraqi intelligence officers attended the August-September 1989 Conference on Detonation held in Portland, Oregon. The U.S. Department of Energy (DOE), custodian of the nation's nuclear secrets, was a conference sponsor along with the Department of Defense. Nominally, the conference was unclassified but it turned out to be another of the myriad examples where lax DOE security would jeopardize U.S. national security and serve the ends of a nation harboring a nuclear proliferation agenda. In this case the Iraqis were able to sit in on "discussions on HMX, the high explosive of choice for nuclear detonation, and on flyer plates, devices that help produce the precise shock waves needed to ignite A-bombs."[33] According to Iraqi leading scientist Dr. Khidir Hamza, "the conference came at the right time . . . in developing explosives you need to work through several problems . . . many papers gave us many indications on which direction to go."[34] Access to the conference not only provided Iraq with invaluable substantive insights, but also assistance in identifying suppliers of sensitive technologies.[35]

The ultimate goal of Iraq's extensive acquisition efforts, of course, was to produce sufficient quantities of enriched uranium to make a nuclear weapon and, ultimately, to develop an inventory of nuclear weapons. Along with its efforts in the uranium enrichment area, Iraq also sought, as shown from its presence at the DOE conference, to learn as much as possible about the intricacies of nuclear weapons design and fabrication. Assuming the availability of a sufficient quantity of fissile material, there

are a formidable set of engineering and technical challenges associated with fabricating a nuclear device. Advanced scientific nations such as the United States and Russia from the earliest years of their respective nuclear programs devoted considerable effort to refining the process by which the component parts of a warhead, containing the guidance and navigation equipment, conventional explosives and fissile material could be assembled so as to fit on a delivery vehicle (such as a missile or aircraft) and detonate reliably. That process constitutes some of the most closely guarded secrets of any nuclear power. For Iraq, having embraced a go it alone approach, the process was particularly daunting even with the efforts being expended in many countries to acquire such information.

Iraq's efforts to produce nuclear explosives can be traced to the mid-1980s. Nuclear weapons design requires substantial computational power and in the 1980s Iraq was using a Japanese-supplied mainframe computer to do much of that work. Iraq also was taking steps to improve its delivery of conventional—and at some later date nuclear—weapons to targets. It may have envisioned a 20-kiloton warhead being placed on its missiles. As a result of its relationship with the Soviet bloc, the Iraqi military had been purchasing and integrating missiles into its inventory for a number of years and they were being widely used against Iran in the war. Given this experience, there is little doubt that missiles were viewed as the delivery means of choice for any nuclear device that might be developed.[36] In the late 1980s Iraq also drew up plans for a nuclear test site, called the Al Sahara Project, to be located in the country's southwest, but Iraq never developed the site or tested a nuclear device. Through a series of nonnuclear detonation tests before the Gulf War, Iraq was able to test and refine at least several warhead designs. To enhance the focus on weapons design, weapons experts at al-Tuwaitha were set up in a new and clandestine facility at al-Altheer.

The involvement of the Khan black market is the one constant in almost any review of the nuclear proliferation activities of various nations in the final two decades of the twentieth century. Khan and his associates, as will be discussed in the following chapter, had established by 1987 a business relationship to provide various forms of nuclear assistance to Iran as they would later with Libya. In 1987, Iran and Iraq still were engaged in intense fighting that had included at various points in the conflict the use of chemical weapons by Iraqi forces. The bitterness from the conflict would continue long after the 1988 cessation of hostilities. Nonetheless, Khan was an equal opportunity proliferator; those political machinations were of no consequence or impediment to his business interests.

In 1990, the Khan network offered Iraq the same type of access to technology and expertise offered Iran only a few years earlier. For the Iraqis the specifics of the offer centered on the Khan network providing, for a substantial price of course, assistance in centrifuge technology and nuclear

weapons design. A 1990 memo marked "top secret" and "personal" was uncovered some years later by U.N. weapons inspectors. It described a meeting "in Baghdad between Iraqi intelligence officers and an intermediary for Khan believed to have used the name Malik."[37] Malik almost certainly was the same individual who had arranged at an earlier date the shipment to Iraq of a large quantity of maraging steel and on this occasion he was the network's representative who offered assistance in the previously mentioned areas. Another document also uncovered by the weapons inspectors showed that Dr. Jafar Dhia Jafar, who led Iraq's nuclear program, had responded positively to the offer.[38] Cooperation between the Khan network and Iraq would never materialize because of Iraq's invasion of Kuwait and the subsequent Gulf War.

By the end of the 1980s, Iraq's far-flung efforts to piece together the information and equipment required to advance Hussein's nuclear ambitions had shown measurable but incomplete results. Steady progress had been made in acquiring important design information for the centrifuge program as well as materials needed to implement those plans. Dr. Obeidi and his team had succeeded in enriching a small amount of uranium to a low level. Nonetheless, the engineering hurdles associated with industrial-scale production were yet to be confronted, an ever present reminder that an indigenous source of fissile material (HEU) was lacking.[39] Failure to show striking progress on such an important project was never well received by either Saddam Hussein or Hussein Kamel, and both men were about to add another unexpected and weighty task on Iraq's nuclear community.

Iraq's war with Iran, which had started with so much promise, over the years foundered and was concluded ingloriously with a negotiated cease fire; from Baghdad's perspective the results were largely negative. None of Iraq's various military objectives or broader political goal of attaining regional predominance were fulfilled and eight years of war had taken a toll not only on Iraqi military forces, but also on the Iraqi treasury, which was using approximately half of its oil revenue just to service its debt repayments. Baghdad's failures in Iran, in turn, were a major catalyst for Baghdadi's aggressive political ambitions regarding Kuwait. Complicating the post-war financial picture for Iraq was a substantial reduction in U.S. agricultural credits. From Washington's perspective, through much of the Iraq-Iran war United States policy had been (if quietly) in favor of an Iraqi victory over Iran, a nation that had become under Ayatollah Khomeini one of America's most implacable adversaries. However, by the end of the war the combination of continuing suspicions about Iraq's proliferation activities that could not be kept wholly out of view and the Hussein regime's use of chemical weapons (nerve agents)—not only against Iran, but also against Iraq's Kurdish population that had used the war as an opportunity to push for autonomy in northern Iraq—forced a

realignment of U.S. policy under President George H.W. Bush.[40] The end of the Cold War had left the United States in a position of unparalleled global influence while the Soviet Union, Iraq's long-time patron, had been replaced by a much weaker Russian Federation. This situation would suggest that Saddam Hussein could not undertake another invasion with impunity but a confluence of events led him to do just that.

Kuwait is a small and sparsely populated nation of approximately 2 million people but it also possesses considerable oil beneath its sandy expanses and a developed energy infrastructure that was pumping two million barrels of oil per day. Iraqi attempts to intimidate its diminutive neighbor trace back to at least 1961 when Iraqi president Qasim made threatening remarks about annexing Kuwait. As with many wars fought through the ages, far reaching ambition and strategic miscalculation underpinned Iraq's invasion of Kuwait on August 2, 1990. Kuwait doubtless seemed a much softer target militarily than the recently concluded conflict with Iran and Kuwait's oil fields loomed as a lucrative prize. Hussein used a dispute with Kuwait over war credits as the primary causus belli. Kuwait had provided Iraq funding in support of Baghdad's war effort and expected to be repaid after the war. Hussein was in no position do so and Kuwaiti officials were not prepared to relent. There also was a dispute over alleged—and probably trumped up—Kuwaiti incursions into Iraqi territory to extract oil from the al-Rumaila oil field.[41] To further bolster its case, Iraq claimed to have been the victim of alleged Kuwaiti attempts to drive down the price of oil by raising its production levels above OPEC quotas. At the same time, Hussein was trying to assess the U.S. response to his provocations.

Attempts by Saudi Arabia to broker peace did little to calm the situation as Iraq in July already had begun moving 100,000 members of its Republican Guard military into position to invade Kuwait. Egyptian President Hosni Mubarak, deliberately or not, added to Kuwaiti confusion about Iraqi motives. Mubarak apparently told Kuwaiti officials that Hussein had told him the military maneuvers were largely a bluff. They were not. From the outbreak of hostilities the outnumbered Kuwaiti forces were able to offer little more than token resistance to invading Iraqi forces although the Kuwaiti emir was able to make a last-minute escape to exile in Saudi Arabia. Hussein proclaimed in late August that Kuwait had become Iraq's "19th province."

As Iraq was preparing for war, Hussein Kamel also turned up the pressure on the scientists working on the nuclear program. In early August, as the war was beginning, Dr. Obeidi, who was leading the centrifuge program, was visited at Rashdiya by Dr. Jaffar. Jaffar, under orders from Hussein Kamel, directed Obeidi to use the few centrifuges that had been assembled to undertake a crash program to produce one nuclear weapon.[42] The apparent thinking of the Hussein regime was that even one nuclear weapon may serve as a deterrent to any invasion of Iraq that might ensue

after its incursion into Kuwait. Obeidi knew that Iraq's centrifuge program had not produced the fissile material requisite to honor such a directive and from the conversation he surmised that Jaffar's separate enrichment efforts, EMIS and gas diffusion, also had not been successful. Jaffar told Obeidi that the plan would address this shortfall by having Obeidi's team divert reactor fuel that had been dormant for years at al-Tuwaitha—and subject to IAEA inspections—and enrich it to 93%, which is weapons grade.[43] Both scientists knew the implications of such an endeavor; Iraq would be in flagrant violation of its NPT commitments and any resultant "success" would place a nuclear weapon in the hands of a ruthless and possibly desperate politician, a prospect that held little appeal to either scientist. Obeidi described the scene in grim terms, saying "He (Jaffar) had the appearance of a besieged man unable to pry Saddam's fingers from around his neck."[44]

Obeidi estimated that Iraq still lacked many parts needed to assemble the number of centrifuges required to produce quickly a sufficient quantity of weapons-grade uranium. Compounding the challenge was that sources of foreign supply had become much harder to come by—and would remain so—as a result of the passage of U.N. Security Council Resolutions (UNSCR) 660, 661, and 678 directed against Iraq because of its invasion of Kuwait. Obeidi had little choice but to press ahead, cannibalizing existing parts whenever possible while seeking ways to manufacture other parts previously supplied by foreign sources. These efforts continued through 1990. Obeidi offered a retrospective assessment of those months of frenzied efforts: "By December 1990, as the crisis over Kuwait was coming to a head, I knew that we were still months away from producing enough material for a weapon."[45]

By that time the United States and an international coalition had nearly finished preparations for a military offensive (Operation Desert Storm) that commenced on January 16, 1991 with a blistering six-week air campaign against Iraqi targets, including the immediate destruction of the Atomic Energy headquarters and nuclear research facilities at al-Tuwaitha, followed by an overpowering ground assault in February against Iraqi forces. During the early years of his presidency, George Bush had sought to maintain cordial relations with the Arab world and that fact, along with the hope that the Arab world ultimately would side with Iraq, the stronger Arab power in the dispute, may have convinced Hussein that he could ignore repeated international demands for his military's withdrawal from Kuwait. He miscalculated; beyond Bush's vehement refusal to allow the invasion "to stand," the U.S. president, dealing with the first crisis after the Cold War, also was acutely aware of the wholly negative consequences of Iraq and Saddam Hussein remaining in control of a combined 10% of the world's oil production while posing a threat to Saudi Arabia in the absence of coalition military action.

President Bush, who of course knew nothing of Obeidi's bleak assessment, also was concerned in the months preceding the invasion of Kuwait about Iraq's nuclear weapons potential. While there was significant disagreement within the U.S. intelligence community regarding the status of Iraq's nuclear efforts and possible timeline for Iraq to acquire a nuclear weapons capability (some at the Department of Energy thought Iraq was years from having any nuclear weapons capability), the policy view from the White House was one of deep and immediate concern.[46] On Thanksgiving Day 1990, Bush spoke to U.S. forces in the Persian Gulf, telling them that, ". . . those who would measure the timetable for Saddam's atomic program in years may be seriously underestimating the reality of that situation and the gravity of that threat. Every day that passes brings Saddam one step closer to realizing his goal of a nuclear weapons arsenal. And that's why more and more your mission is marked by a sense of urgency."[47]

Iraq would pay a very high price for Hussein's intransigence. As it became apparent that Iraqi military forces, albeit deployed in significant numbers, were no match for the quality, mobility, or firepower of the U.S.-led coalition, the question that arose for President Bush and his advisers was how hard the coalition forces should push to destroy the Iraqi army. Not wanting to be seen as partaking in a war of annihilation, the president settled for allowing a large portion of the Iraqi army, and hundreds of pieces of equipment, to return to Iraq unchallenged. On February 28, 1991, a cease fire went into effect. Saddam Hussein, who was to remain in power, tried to portray the decision as proof that the United States was a weakened power whose reputation had been tarnished.[48] In reality, Iraq was compelled to accept in April 1991 through U.N. Security Council Resolution 687 the imposition of "an inspection and monitoring regime, intended to insure that Iraq dismantled its WMD programs and did not take any actions to reconstitute them."[49] All elements of Iraq's nuclear program as well as all chemical and biological weapons-related facilities would be subject to inspections as would Iraq's missile program. This would be accomplished through the Special Commission on Iraq (UNSCOM) and soon thereafter on the nuclear side also by inspectors from the IAEA.

From the earliest stages of the UNSCOM and IAEA presence in Iraq, and on orders from the highest levels of the Iraqi government, the all-consuming priority of the Iraqis most closely associated with the nuclear program was to ise all possible means to deceive and deny to the weapons inspectors information regarding the details of the various program elements, personnel associated with each element, and the pace and scope of each activity. Beyond sheer obstinance to an unambiguous international mandate, by so doing the Iraqi government was indicating that it harbored plans, however fanciful, of some day reconstituting its nuclear program. To this end, to coordinate its denial and deception efforts a

Concealment Operations Committee, an oversight body, was established and led by Qusay Hussein, one of the Iraqi president's sons in May 1991. A Special Security Operations group implemented the orders of the Concealment Operations Committee, which in 1993 was renamed the National Monitoring Directorate with the same mission to obstruct the inspection work.[50] Fearful of the consequences of appearing to carry out Hussein's directives with anything less than unbridled zeal, Iraqi scientists went to extraordinary lengths to conceal years of work, beginning with the development of a series of cover stories for their scientists. Obeidi described this process:

> Hussein Kamel ordered us to dismantle everything at Rashdiya, and then to disguise the entire facility. We removed the clean room an dipping, plastered over the walls of the centrifuge laboratory and modified a number of the structures. We poured a new concrete floor to disguise the pits designed for centrifuge stands. We cleared our offices of all incriminating documents, and set up drafting tables that would suggest engineering work on water treatment projects. Hussein Kamel ordered us to turn over to the security services all remaining designs, documents . . .[51]

Despite Iraq's elaborate concealment efforts, the secrets of the nuclear work through the 1970s and 1980s were uncovered slowly by the various and aggressive inspection teams. By the middle of 1991, which coincided with the arrival of the highly competent IAEA lead inspector David Kay, at least some elements of Iraq's work on EMIS, gas diffusion, and centrifuges for uranium enrichment had been exposed. The inspectors took many samples and seized as many documents as possible. They even went so far as to dig from the ground the almost 100 tons of maraging steel procured by Obeidi from Maliok and by mixing it with inferior metals rendered the steel unusable for weapons purposes. A number of suspect buildings were destroyed and the enriched uranium at al-Tuwaitha was taken out of Iraq.[52] At the same time, law enforcement authorities in Munich were arresting eight German nationals on export control violations stemming from the support they provided to Iraq.

It is no exaggeration to conclude that through most of the 1990s the interaction between the inspection teams and Iraqi scientists and the Iraqi government were marked by unremitting hostility and deep mutual suspicion. Through the early 1990s, Iraqi obstructionism became so persistent that the United States considered using renewed force against Iraq in the form of aircraft deployed to Saudi Arabia but nothing came of that. Even in the face of such threats Iraq remained intransigent. In 1993, for example, the inspection teams insisted on installing surveillance cameras at former weapons sites, triggering equally vehement Iraqi denial. The work of the inspection teams also had to contend with their own internal challenges.

The IAEA inspection teams did not always have technical experts with weapons backgrounds on hand and David Kay would complain about the lack of intelligence support from the United States for his teams.[53]

Iraq's concealment efforts in 1994 and1995 suffered a series of embarrassing revelations. In August 1994, Khidri Hamza, director of the weapons program, defected. Perhaps even more stunning was the August 7 1995 defection of Hussein Kamel, who fled to Jordan with his brother, Saddam Kamel. Having failed to establish himself as an alternative leader to Saddam Hussein, Hussein Kamel accepted the Iraqi president's offer to return to Iraq under a pledge of amnesty. That pledge was almost immediately broken when Saddam Hussein, no stranger to duplicity, arranged for the murder of his son-in-law.[54] In accepting Hussein's offer of safe return, Kamel's judgment proved far less impressive than his oft-demonstrated deviousness.

Kamel's defection set off an almost immediate firestorm within Iraqi circles working to obstruct the continuing work of the inspection teams. While in Jordan, Kamel had met with UNSCOM and IAEA officials, providing extensive details of many aspects of what he had overseen in Iraq, including previously unknown aspects of the centrifuge program and a recent attempt to bury equipment associated with the electromagnetic separation project.[55] Kamel also shared information on the clandestine nuclear procurement network as well as the biological and chemical weapons programs.[56] Kamel's reputation, as was his life, was now wholly expendable in Iraqi eyes. Iraqi officials gathered together a large cache of documents and took them to a chicken farm owned by Kamel in the Baghdad suburb of Haidar. An Iraqi operative then alerted the inspectors as to the document's bizarre location. The "discovery" (known as the Haidar House farm documentation) forced Saddam Hussein to make new admissions on the enrichment program and nuclear weapons design activity but he did so only in the context of claiming that Hussein Kamel had acted without official authorization in developing a nuclear weapons program.[57] Unbridled skepticism about that claim barely begins to describe the reaction from the inspectors and much of the international community.

The combination of myriad discoveries by the inspection teams and Kaeml's revelations—including that Saddam Hussein had not given up his nuclear ambitions—may have forced an occasional and begrudging Iraqi mea culpa but they did not result in any change in official Iraqi attitudes. Through the 1990s, Saddam Hussein would continue funding for the IAEC and insist on obfuscation and deceit from his scientists in their interactions with UNSCOM and the IAEA. The United Nations was growing increasingly impatient with Iraq's obstructionist posture. On March 27, 1996, U.N. Security Council Resolution 1051 called on all members of the international community to provide UNSCOM and the IAEA with information on materials exported to Iraq that could have been used in

any Iraqi WMD program. On June 12, 1996 another resolution, UNSCR 1060, repeated past demands for Iraqi cooperation and openness toward the inspection regimes while UNSCR 1115, passed on June 21, 1997, made the same demands. UNSCR 1137, passed on November 12 of the same year imposed an international travel ban on Iraqis identified as having worked on any WMD program. None of these actions compelled a change of Iraqi policy; Saddam Hussein viewed the inspectors with barely disguised contempt. On October 31, 1998 he announced that Iraq would no longer cooperate with the inspection teams and within about six weeks all the teams had left Iraq. UNSCOM and the IAEA had learned a great deal about Iraq's nuclear program but there remained unanswered questions that would become much harder to answer without inspectors on the ground. Richard Butler, who had succeeded Rolf Ekeus as head of the UNSCOM team, left little doubt that he was convinced of Iraq's intentions to have the nuclear scientists return to work. However, it was difficult for Butler to find tangible signs to support his judgment.[58] Those uncertainties would figure prominently in events that lead to an even larger international crisis.

The departure from Iraq of the inspection teams deprived the international community of a unique source of insights into Saddam Hussein's past nuclear activities and their presence also made it much harder for his scientists to undertake any activities that would have reconstituted the nuclear program. The animosity and suspicion in parts of the international community built up over the years would not end with the departure of the inspection teams. On the contrary, the United States and its allies recognized that they would have to devote even more of their technical collection resources to monitoring any suspect activities that could signal the start of a new clandestine program. The capability of the U.S. intelligence community to image targets from space and collect various types of communications was formidable but far from perfect. By its nature intelligence collection is difficult—nations almost always will go to great lengths to shield their secrets from U.S. intelligence assets and Saddam Hussein's Iraq was no exception. In addition, the analysis of often fragmentary and sometimes conflicting data is far more art than science with different individuals and organizations, with the same data in hand, frequently coming to different judgments on it.

Fragmentary evidence, coupled with significantly differing interpretations of that evidence, would beset the U.S. and U.K. intelligence communities—and by extension the U.S. and U.K. policy communities—almost immediately after the departure of the weapons inspectors. (The departure of the inspectors did not end all human intelligence, called HUMINT, on Iraq because some defectors of questionable reliability would come to the West.[59]) For example, in June 1999 the Joint Atomic Energy Intelligence Committee in the United Kingdom issued a report on Iraq's possible

reconstitution of its nuclear program. The report's conclusion was that the inspectors had destroyed sizable portions of the nuclear infrastructure, that Iraq retained the basis for reconstituting the program but did not appear to have done so. Such judgments, which raised as many questions for policy consumers as they answered, likely did little to clarify in the minds of the reader the exact state of play within Iraq.

In early 2001, U.S. intelligence received reports that Iraq was ". . . trying to purchase 60,000 high-strength 7075-T6 aluminum tubes with an outer diameter of 81 millimeters. Their potential use in centrifuge rotors made them a controlled item under the Nuclear Suppliers Group guidelines and prohibited under two UN Security Council resolutions. Upon first receiving the report, the CIA concluded they were intended for use in the uranium enrichment program."[60] These reports were accurate and in May 2001 the first batch of the proscribed goods, approximately 2,000 tubes, was shipped from China and made its way slowly toward the Middle Eastern port of Aqaba. At the port CIA officers took possession of the tubes.[61]

Confiscating the first shipment of tubes provided U.S. intelligence a rare opportunity to closely examine the contraband Iraq was trying to acquire. Nonetheless, even that advantage did not lead to consensus within the intelligence community over the intended use of the tubes. On one end of the debate was the CIA—backed by the Department of Defense's Defense Intelligence Agency—which held in a finished publication that the tubes "had little use other than for a uranium enrichment program."[62] Officials at the DOE's Office of Intelligence came to a different conclusion. DOE's intelligence "shop" was quite small in manpower compared to the analytic strength at CIA or Defense Intelligence Agency. As such, DOE was not intended to or capable of rendering separate judgments on many areas of intelligence (and policy) interest such as the Chinese economy or Middle Eastern politics. DOE's unique contribution to the U.S. government's intelligence capabilities derives from its ability to harness the technical expertise and experience, particularly on nuclear issues, resident at U.S. national laboratories such as Sandia National Laboratory and Oak Ridge National Laboratory. The aluminum tube issue was tailor-made to those strengths. From the outset, DOE's experts had serious reservations in accepting that the tubes would be used in support of a reconstituted Iraq nuclear program. Their reasoning was derived from a close assessment of the specifications of the tubes, including that some of those specifications were not consistent with gas centrifuge use. A more likely explanation, DOE judged, was that the tubes were intended to be used in conventional ordnance.

On October 15, 2001, the CIA received a report from the Italian Service for Information and Military Security claiming that "Niger was planning to ship several tons of uranium to Iraq" and that discussions about the

possible sale dated to February 1999.[63] One week later the Defense Intelligence Agency published an article concluding that "Iraq probably is searching abroad for natural uranium to assist in its nuclear weapons program."[64] The CIA was hesitant to embrace such a sweeping judgment and after an intense interagency debate it was decided that former ambassador Joe Wilson would travel to Niger and meet with local officials in an effort to corroborate the Italian reporting.[65] Wilson's trip provided an opportunity for a series of meetings with Nigerien officials, including a former prime minister and former minister of mines and energy. Wilson's interlocutors provided him a consistent story; there had been no such sale although Iraqi officials in 1999 apparently had expressed interest in establishing with Niger some type of commercial arrangement.

Within the intelligence community such debates as those on the aluminum tubes and purported uranium sale can be contentious and even bitter at times but they also are useful, if conducted properly, in bringing to light the best analytic thinking on issues of policy importance. The debates within the intelligence community regarding Iraq's putative interest in reconstituting its nuclear program unfolded against the backdrop of a broader and no less intense policy debate about the direction of U.S. policy on Iraq. George W. Bush in his 2000 campaign for the presidency had not staked out any new or aggressive plans for the Middle East, including Iraq, compared with those of Bill Clinton. In the early months of Bush's new administration there were some, including Secretary of State Colin Powell, who held a nuanced view toward Iraq, arguing that Iraq would collapse at some point on its own weight and that U.S. policy should focus on "smart sanctions" that would be designed to be harmful to the Iraqi regime without unduly detrimental to the Iraqi people, laboring under the burdens of a ravaged economy and high unemployment.[66] It is sometimes overlooked that the Clinton administration had chosen a declaratory policy of regime change in Iraq but in practice its actions, such as the establishment of a no-fly zone, were centered on containment and did little to force Saddam Hussein's ouster. The Clinton policy appeared inadequate to many senior officials who came into the Bush administration, particularly at the Department of Defense, where Deputy Secretary Wolfowitz and Undersecretary of Defense for Policy Douglas Feith already were advocating a new and more confrontational policy direction. Vice President Richard Cheney, who served as Secretary of Defense during the Gulf War, by all accounts held similar views.

Divergent views on complex foreign policy issues are a recurring element in every administration. For the Bush administration what changed fundamentally the dynamics of the debate were the tragic events of September 11, 2001. The attacks on New York City and the Pentagon in suburban Washington, DC caused significant physical damage, destroying the World Trade Center, badly damaging the Pentagon, and taking the lives of

nearly 3,000 innocent victims. A defining element of any terrorist act and those who perpetrate them is to have a psychological effect beyond the parameters of the event. For al Qaeda, this objective succeeded spectacularly as the images of the collapsing World Trade Center were beamed throughout America and to a global audience. Since the breakup of the Soviet Union and subsequent end of the Cold War, the United States had stood unchallenged on the global stage with unrivaled military capabilities. Understandably, a sense of invulnerability infused both the American public and its leaders. Some spoke of "Rome on the Potomac." That worldview was shattered by the September 11 attacks and likely would never return.[67]

For President George W. Bush, the intellectual challenge of the September 11 attacks was to develop a conceptual framework from which policy responses would follow. Bush had been president for less than a year but the remainder of his tenure in office would be marked by a relentless effort to prosecute a "war on terror." The path he chose, which became known as the Bush Doctrine, in essence was a desire to take the fight to the enemy. In practical terms this meant the administration, perceiving a new type of threat to U.S. national security, was prepared to use preemptive or even preventive military force, a significant departure from decades of U.S. policy preference and military doctrine that eschewed the option of "going first." The Bush Doctrine also placed high priority in such regions as the Middle East on the promotion of democracy and democratic principles of governing. The administration's first implementation of this worldview was the commencement on October 7, 2001 of military actions (Operation Enduring Freedom) in Afghanistan, the refuge for al Qaeda and the home of its protectors, the Taliban. Although a tactical success in military terms, those gains were not consolidated or fully exploited strategically, a result that would be inherited by President Barack Obama.

The more ponderous question that soon preoccupied the Bush administration's foreign policy team was what to do about Saddam Hussein and Iraq. A decade after President George H. W. Bush had forcibly ejected Iraqi forces from Kuwait, Saddam Hussein remained in power and in 1993 even attempted to assassinate Bush after he had left office. The 1990s also had been marked by ongoing Iraqi intransigence on the still remaining uncertainties about its WMD programs and Hussein's intentions; after September 11, the possibility that Iraq may be developing nuclear weapons became a rallying cry to action for the Bush administration. In his January 2002 State of the Union speech, Bush denoted Iraq as one of the nations constituting an "axis of evil." In August 2002, Vice President Cheney spoke bluntly to a large crowd at a Veterans of Foreign Wars speech, asserting, ". . . there is no doubt that Saddam Hussein now has weapons of mass destruction . . . Many of us are convinced that Saddam will acquire nuclear weapons fairly soon."[68] This sweeping formulation left many

unanswered questions but in the cauldron in which the administration saw itself after September 11, 2001, it was possibility that came to crowd out probability in policy planning.

If Saddam Hussein indeed harbored any plans to reconstitute his nuclear (or chemical and biological weapons programs), the logical application of the Bush Doctrine seemed to call for serious consideration of prompt military action. Both the president and the vice president clearly were preoccupied with Iraq's possible WMD capabilities and had begun making the case for war on the basis of what the unpredictable Saddam Hussein may choose to do, including giving some WMD capabilities to terrorist groups. As national security adviser Condi Rice would warn with melodramatic flair, the United States did not want the smoking gun to be a mushroom cloud. The lingering questions for the many skeptics of going to war against Iraq centered on the intelligence community's evidentiary base of intelligence collection and analysis of Iraq's WMD plans and intentions.

As we have seen, the U.S. intelligence community had its own suspicions about Iraqi nuclear activities but also some disagreements and uncertainties regarding critical questions of timelines, capabilities and if Hussein would even dare use any type of WMD against U.S. forces given the near certainty that in so doing he would trigger an overwhelming U.S. response. Members of Congress sought to have more information on these issues before authorizing any use of force by the administration. The most authoritative and detailed assessment provided by the U.S. intelligence community to policy makers and Congress is a National Intelligence Estimate (NIE). A NIE is the product of the entire intelligence community, although the actual drafting of the NIE is carried out by either one organization—often the CIA—or analysts from other parts of the intelligence community working with a National Intelligence Officer, the senior official charged with the production of the NIE. George Tenet, the popular and highly capable CIA director during this period, has written that "In early September 2002, with a vote looming on authorizing the use of force in Iraq, CIA came under pressure from members of the Senate Select Committee on Intelligence to produce a written assessment of Iraq's WMD programs."[69] Tenet complied with the request, starting a process that he would judge in hindsight should "have done a better job highlighting what we did and didn't know about Saddam's WMD programs."[70]

It is instructive to assess why an intelligence product so critical to the decision making of the executive and legislative branches as they considered whether to go to war in Iraq fell far short of Tenet's standards and the needs of the policy community. Tenet argues persuasively that the lack of time was a major factor. There also is another factor Tenet takes up albeit briefly that merits further attention. The integrity of the NIE process and its ultimate success rests largely on the fullest discussion by those holding

different perspectives. The Niger uranium case and, in particular, the controversy over the intended use of the Iraqi purchase of aluminum tubes were the type of issues that would have to be reviewed and depicted in the final product with as much accuracy and candor as possible because they shed insight into Iraq's broader thinking. DOE experts had made a strong case that the aluminum tubes were not for WMD use. If DOE's assessment was right, the case being made by the administration that Iraq was pursuing WMD (at least nuclear weapons) was weakened and, by extension, so was the case for war.

At this critical juncture the process was compromised by a little known but significant case of bureaucratic incompetence at DOE. The final phase of the NIE process brings together the senior representatives—almost always highly experienced professionals—from the various parts of the intelligence community. At that meeting key analytic differences are surfaced and, in the final document, explained for the reader. Unfortunately, DOE sent an affable but wholly unqualified officer, Thomas Ryder, to the meeting. He failed completely to represent the strong technical case that had been made by DOE's experts at the working level. As Tenet observed, ". . . he was not a technical expert, however, and despite being given several opportunities, he was unable to explain the basis of his department's view in anything approaching a convincing manner."[71] The reason for Ryder's failure was simple; he was not an intelligence professional but rather a personnel officer by training and career direction. For one of the most critical intelligence meetings in the run-up to the Iraq invasion, DOE had sent a well-intentioned but wholly unqualified rank amateur. As a result, the executive and legislative branches, for reasons they would never understand, received a document of greatly diminished value.

Why would DOE take such an irresponsible course? Ryder had been placed as acting director of the Office of Intelligence largely through the actions of Ken Baker, Ryder's supervisor and a career officer. In the years preceding Ryder's appointment, DOE had as its intelligence chief Notra Trulock, an intelligent and independent minded intelligence professional. Trulock had created a firestorm during the closing years of the Clinton administration with a sensational charge that Chinese intelligence officers had penetrated the U.S. national laboratory system and gained access to a treasure trove of secrets related to U.S. warhead design and in the process exposing a series of security lapses and managerial incompetence in parts of DOE and the U.S. national laboratories. Trulock also reported to Baker who, always hyper-sensitive to possible criticism, was enraged that Trulock would embarrass the department and expose its "dirty laundry" by surfacing such charges. Baker was viewed by many as a bully to and manipulator of subordinates while at the same time acting obsequious and fawning to political appointees to whom he reported. Even that loyalty had distinct limits as at the same time he was currying favor on Capitol

Hill by calling Republican congressional aides and sharing with them information gleaned from meetings he attended with Clinton administration officials.

According to Trulock, Baker may have orchestrated a series of baseless charges to smear him and his office.[72] Trulock left DOE under a cloud of unproven accusations but Baker dared not have another independent officer in the job. Baker had known Ryder for years and could be sure Ryder would not take any controversial actions in a job for which he was totally unprepared. Ryder didn't disappoint; during the NIE meeting he meekly sided with the majority view and never offered, as Tenet noted, a strong defense of DOE's minority but, as events would prove, correct assessment. The national interest was the poorer for not having received DOE's best thinking but Ryder could take solace in the fact that on Baker's recommendation he received a $20,000 award during 2001–2002.

It is unlikely that any set of intelligence judgments made in late 2002 would have forestalled the administration's war plans. For example, it has been reported that in July 2002 Condi Rice told Richard Haass, a senior State Department official, that "the decisions were made" and that absent Iraq capitulation to all U.S. demands, war was inevitable.[73] As the United States prepared for war in late 2002, Iraq allowed the return of IAEA inspectors in November 2002. Three months later, the IAEA would report formally that no evidence had been found of a reconstituted nuclear weapons program. For all practical purposes, the report came too late. The Bush administration had decided and would remain adamant that it wanted nothing less than regime change in Iraq and the WMD issue was, as Deputy Secretary of Defense Paul Wolfowitz would acknowledge after the start of the war, "the one issue that everyone could agree on."[74]

The administration achieved its near-term objective; Saddam Hussein's far too long chokehold on Iraq was brought to an end by the invasion. Hussein was tracked down and captured hiding in a "rabbit hole" near Tikrit, his former home, in December 2003 and in 2006 was hung after a tumultuous trial. On a far more negative note for the administration, the invasion also led not to a greeting of U.S. and British forces as "liberators" as Vice President Richard Cheney and others had predicted, but as a foreign presence to be resisted by a bloody insurgency. The United States and United Kingdom would expend in the years to come enormous financial resources whose direct and indirect costs may well exceed 2 trillion dollars and, even more importantly, the lives of thousands of young soldiers in restoring some semblance of stability in Iraq. Those losses were compounded by the loss of untold Iraqi civilian casualties often blithely ignored in the U.S. media and severe diminution of the United States' moral authority in the eyes of many at home and abroad.

Shortly after the war, the CIA established an Iraq Survey Group under the redirection of David Kay who was later replaced by Charles Duelfer.

The Iraq Survey Group would search through numerous facilities and review scores of documents in an effort to provide authoritative answers regarding the status and progress of Iraq's nuclear program. They came to understand that after 1991 Saddam Hussein wanted to keep the program alive in some form and, possibly, to reestablish it if and when U.N. sanctions were lifted. In September 2004, Duelfer issued a formal report that the Iraq Survey Group found no nuclear weapons or existing nuclear weapons program. Saddam Hussein's nuclear ambitions, which had encountered numerous obstacles through the years, never reached the ultimate goal. The program had overcome many of those obstacles and, under other circumstances, might have succeeded by the end of the 1990s in giving Hussein the nuclear weapon he sought. Ironically, it was his overreaching political ambitions, particularly in the 1991 invasion of Kuwait, that resulted in Iraqi scientists confronting an obstacle, intrusive international monitoring, they could not overcome. More than a decade later, the United States paid a very high price both to confirm that result and ensure Hussein's ouster. The United States' misadventures in Iraq may have had the positive effect of sealing the prospects of the nuclear program there (a pyrrhic victory given the program may well have failed in any case) but the region, and the international community, was in the midst of dealing with an even more threatening prospect by an Iraqi neighbor, an Iranian government with nuclear ambitions.

CHAPTER 4

Iran: A Relentless Pursuit

The Iranian nuclear program is the product of many fathers rather than a single, driving visionary. Libya's Muammar Qaddafi and Iraq's Saddam Hussein, both long-serving leaders with virtually unlimited political authority, played commanding roles in the nuclear programs of their respective countries. Even within Israel, a fledgling democracy in the late 1940s and early 1950s, Prime Minister David Ben-Gurion played an outsized role in his nation's nuclear development. Against this backdrop, the Iranian nuclear program stands in sharp relief. The history of Iran's nuclear program is a reflection of the interests of radically different political regimes, those of the pro-Western Shah Mohammed Reza Pahlavi and the virulently anti-U.S. theocratic regime that emerged after the overthrow of the shah in 1979. Even within the theocratic government formed after the 1979 coup, Iran's nuclear (and missile) program has progressed relentlessly, albeit at times in fits and starts, under a series of elected presidents and two "supreme leaders," Ayatollah Ruhollah Khomeini and Ayatollah Ali Khameini.

The underlying factors in Iran's quest for nuclear technology—and almost certainly nuclear weapons—along with the capability to deliver those weapons over long distances also lead to a focus on Iran's history and people. Contemporary Iran is far more than the one dimensional nation sometimes portrayed in recent years by the Western media as comprising little more than a group of religious zealots seemingly at odds with many nations in the region as well as their own people. Iran is a nation centered on a young and, as demonstrated by the Green Revolution that arose after the fraudulent elections in summer 2009, increasingly restless generation; about 70% of the population is younger than 30 years of age. Iran may have few reliable allies in the region—Syria is the notable exception—but on a personal level the vast majority of Iranians are outgoing and forward-looking with intense interest in the panoply of seemingly ever-expanding means of global communication and engagement.

At the same time, Iranians also are the inheritors of an ancient civilization as well as cherished traditions, including a love of poetry perhaps rivaled only by Russians. Given its size, oil and gas resources, and strategic location bordering the Persian Gulf, it is not surprising that Iran also has held great political attraction for other nations. At various times, and sometimes in concert, Russia and Great Britain have taken what is fair to characterize as imperialistic interest in Iran's affairs. In addition, U.S. engagement in Iran (both governmental and commercial) through parts of the 20th century, at times, not always, reflected little more than sledge hammer subtlety. Foreign intervention in Iran's affairs have inculcated in the minds of many Iranians, and not just the upper reaches of the current ruling regime, a profound suspicion of foreigners at a political level even as many remain fascinated by aspects of Western lifestyles and culture.

As demonstrated by the nuclear programs of Israel, Libya, and Iraq, perceptions of external threats are a central factor but not the sole determinant of the decision to acquire nuclear weapons. Libyan and Iraqi officials each believed international prestige and domestic political support would accrue to their regimes by developing a successful nuclear program, including nuclear weapons. The same calculus holds true for Iran; nuclear technology even if poorly understood by "the man on the street," is seen by many as a source of national achievement and pride.

Iran's introduction to nuclear technology came, as was with other programs in the region, through the Atoms for Peace Program. In 1957, the United States and Iran reached agreement for cooperation on research into the peaceful uses of atomic energy. In part, the U.S. motive was to open commercial doors for U.S. investment in Iran's civilian nuclear industries such as medicine. The plan included a deal for the United States to lease Iran 13.2 pounds of low enriched uranium for research purposes.[1] U.S. commercial motives notwithstanding, the growth in this and other elements of the bilateral relationship also was the product of U.S. political interest in Iran's strategic importance as a state bordering the Soviet Union and the Shah's willingness to be a U.S. partner. Shah Mohammed Reza Pahlavi was the son of Reza Shah who ruled Iran from 1921 until 1941 when various wartime exigencies made it desirable for the British and Russians to push him aside, ostensibly because of Reza Shah's pro-German leanings. The situation was far more complex than that but the result was the elder Shah gave way to his son as monarch although the allies would maintain de facto control of Iran until the end of the war in 1945. After some tensions between the former wartime allies that would presage later Cold War clashes in other regions, the Soviet Union withdrew its forces from Iran in May, 1946.

The young Shah, educated in Switzerland, did not lack intelligence but his years there did little to imbue him with an emotional attachment to or deep understanding of the wants and needs of the Iranian people. Shy and

diffident by nature, he was not well prepared emotionally for the tumult of Iranian politics. His exposure to political intrigue Iranian style was the result of a 1949 assassination attempt against him engineered by the Communist Tudeh party which was subsequently banned.[2] What ensued as a result of the underlying political malaise was a period of crisis and martial law that fostered the rise to political power of Mohammad Mossadeq, a lawyer by training, who struck a popular chord in the Iranian populace when his National Front political coalition led the Majles (Parliament) on March 15, 1951 in a vote to nationalize Iranian oil. This was viewed—and correctly—as a direct threat to Western business interests, sparking a huge row with the West whose energy companies had access to Iran's substantial oil wealth on highly favorable terms. Mossadeq became prime minister in April 1951. As a result of the Majles vote, the British government imposed a boycott on the import of Iranian oil and scores of British workers departed the oil fields. Iranian oil revenues decreased as a result, triggering economic difficulties, rather than the expected economic prosperity, within the country. Mossadeq still remained highly popular in domestic circles through 1952 but his relations with the United States and United Kingdom ruptured by year's end when he broke off diplomatic ties with the British.

The British convinced the United States to support plans for a coup against Mossadeq (known within the Central Intelligence Agency [CIA] as Operation Ajax), which was set in motion by the U.S. and British intelligence services. The first attempt to rid Mossadeq in August 1953 failed when the prime minister became aware of the plot. Demonstrating less than heroic resolve, the Shah fled the country out of fear of retribution for backing the plot. Mossadeq's own fate was sealed shortly thereafter when demonstrations in Iran arranged by the United States and British this time succeeded in serving as the catalyst for Mossadeq's removal from power. He would be tried and convicted of treason but allowed to live under house arrest.[3]

The Shah was returned to power but he and his foreign benefactors would pay a significant and long-term political price for the coup. As described by one observer, "The idea that everything that happened in Iranian politics was manipulated by a foreign hidden hand was again reinforced . . . It established the US in a strong position in Iran as a prime ally and protector of the Pahlavi regime . . . but took away much of the enchantment the US had previously enjoyed popularly, as a virtuous alternative to the older powers."[4]

Now firmly ensconced in power, the Shah would rule with few constraints. He established as key policy objectives enhancement of Iran's international prestige, building a modern economy and continued strengthening of his ties to the United States. Now free to do so, the Shah took a number of practical steps to give nuclear cooperation a permanent

and prominent role in the bilateral relationship. In 1959 he laid the groundwork for this cooperation when he ordered that an institute, to be known as the Tehran Nuclear Research Center, be established as part of Tehran University. The Tehran Nuclear Research Center became the home of the 5 mw research reactor supplied by the United States which also supplied the reactor fuel. At the same time Iran endorsed the international community's nonproliferation objectives by signing the Nonproliferation Treaty when it was opened for signature on July 1, 1968 and in early 1970 the Majles ratified the treaty.[5]

A series of events in the early to mid-1970s unveiled the scope of the Shah's nuclear ambitions. In 1974, he established the Atomic Energy Organization of Iran (AEOI) to guide Iran's nuclear development and appointed Akbar Etemad, a Swiss-trained scientist, as chairman. The timing coincided with a substantial increase in Iranian oil profits resulting from sharply rising prices triggered by the 1973 Yom Kippur War. The Shah assessed the situation as providing a twofold advantage. The first was that he now had the financial lubricant to fund his nuclear ambitions, the centerpiece which was a plan to construct by the end of the century as many as twenty three nuclear power plants, a figure probably far more grandiose than realistic. He also concluded that his plans for nuclear power in the long-term would serve Iranian national interests by allowing Iran's oil production to be directed to foreign and highly profitable international markets.

To this end Iran signed a series of agreements with foreign partners such as its 1975 deal with India, which only a year earlier had successfully tested a nuclear device. Significant deals also were signed the previous year with France and Germany. The Shah was prepared at that time to purchase U.S. nuclear technology as he had done so previously. However, the US sought to impose stringent limits on Iranian use of any supplied nuclear technology and for this reason Iran turned elsewhere. With the French firm Framatome the Iranians contracted for construction of a 950-MW pressurized water reactor and nuclear fuel for the reactor at Darkhovin, south of the town of Ahvaz. In March 1974, Iran also signed a contract with the German firm Kraftwerk (a subsidiary of Siemens) for the construction of two 1200-MW power plants near the coastal city of Bushehr.[6]

Iranian officials also recognized the shortfalls and requirements of advancing their nascent domestic nuclear infrastructure. The lack of a large cadre of trained scientists and engineers in 1975 was addressed partially with an agreement with the Massachusetts Institute of Technology to train AEOI employees. France also agreed to provide training in reactor operations for Iranian personnel as did the Germans, Italians, Canadians, and British in various contracts. On a parallel path Iran was prepared to invest heavily in an effort to ensure ample supplies of the feedstock for its

nuclear power plants, uranium. It committed about 1 billion dollars to purchase a ten percent share of Eurodif, a uranium enrichment consortium based in France and also involving Italy, Belgium and Spain along with an interest in a uranium mine in Namibia.[7] Reports also circulated that Iran loaned the French Atomic Energy Commission 1 billion dollars toward the construction of a gaseous diffusion facility at Tricastin, France.[8] These plans were well thought out, had they materialized Iran would have had access to both uranium enrichment technology as well as large supplies of uranium.

The contracts signed by Iran for various aspects of nuclear technology assistance, including the development of nuclear power plants, were wholly consistent with its Nonproliferation Treaty (NPT) commitments that included forswearing the development or acquisition of nuclear weapons. Nonetheless, they were watched with great interest in the region and beyond. It will be recalled that it was during this period that Iraq also commenced a plan to advance its nuclear technology capabilities. In a July 2004 interview with the highly respected BBC correspondent Gordon Corera, Jafar Dhia Jafar, a leader in Iraq's nuclear program, would claim that Iran's actions served as a "triggering effect on Iraqi actions.[9] Jafar's claim may have some validity—Iraq surely was watching Iran closely—although Saddam Hussein for his own reasons almost certainly proceeded down the nuclear path in the absence of any Iranian decisions in this area. It also became increasingly apparent to the U.S. government that Iran was developing a growing interest in the development of specific nuclear technology capabilities, particularly reprocessing or plutonium separation of the spent fuel from the planned for reactors, that had highly negative proliferation overtones because a reprocessing capability would provide Iran sizable amounts of weapons-grade plutonium and complement its investments in uranium enrichment.

The Nixon administration had been badly surprised by India's 1974 nuclear test and did not want a repeat of that experience even from an important ally. The initial alarm bell for Washington was sounded on June 23,1974, just five weeks after India's successful May 18 test when the Shah, in Paris, was quoted as saying Iran would acquire nuclear weapons "without a doubt and sooner than one would think."[10] The Iranian embassy the next day hurriedly issued a press release disavowing the accuracy of the report. On June 25, while still in Paris, the Shah in an interview with Le Monde, a leading French daily, continued to downplay the thrust of the original remarks, saying it was ridiculous for nations to pursue nuclear weapons because they had no utility and would only provoke hostile responses. The Shah added that Iran favored a Middle East nuclear free zone but would not ignore actions to acquire or develop nuclear weapons by small states. He would repeat much of this formula in a February 1975 interview by claiming that Iran did not wish to acquire

nuclear weapons but might have to reconsider its policy if small states began building them.[11]

It appears that the U.S. government was not mollified by efforts to tamp down the Shah's initial comments on nuclear weapons. Some of these concerns were centered on the Shah's intentions while some others focused on the Shah's "nuclear legacy." According to one report, "a 1974 Defense Department memorandum, recently declassified . . . noted that stability in Iran depended heavily on the Shah's personality. Should he fall, domestic dissidents or foreign terrorists might easily be able to seize any special nuclear materials stored in Iran for use in bombs . . . An aggressive successor to the Shah might consider nuclear weapons the final item needed to establish Iran's complete military dominance in the region."[12]

For President Gerald Ford, who ascended to the presidency after Richard Nixon's August 8, 1974 resignation, the fine line his policy had to walk was between supporting an important ally in a region of superpower competition or reaffirming the United States' commitment to strong nonproliferation policies by limiting bilateral nuclear cooperation which at the same time would have hurt U.S. commercial interests. Ford tried to have it both ways. Ford offered Iran the opportunity to participate in a multinational reprocessing center as a means to forestall Iran from developing a similar capability. Secretary of State Kissinger also became intrigued with the idea of a "buyback option so that the United States could acquire spent fuel rods from Iranian reactors."[13]

These proposals received a decidedly cool reception in Iran. AEOI chairman Akbar Etemad decried the "second class citizenship" implied for Iran in the U.S. offer and asserted that Iran had "the full right to decide whether to reprocess or otherwise dispose of or treat the materials provided under the agreement."[14] Iran would soften its rhetoric and response to the U.S. conditions for cooperation somewhat but an agreement was never consummated because U.S. domestic politics intervened when Jimmy Carter became president. During the Ford-Carter presidential campaign, Carter, who portrayed himself a champion for strong nonproliferation policies, had expressed considerable misgivings with what he viewed as Ford's too generous terms to Iran, the exact opposite of Iranian perceptions. Carter would begin his own administration's process of negotiating with Iran on nuclear cooperation, including the proffered purchase of 6–8 light water reactors from the United States, but this time Iranian politics would intervene dramatically.

Throughout his reign the Shah was largely unsuccessful in meeting the social and economic needs of his rapidly expanding population. Iran's oil wealth built impressive military capabilities while serving as a continuing source of wealth for a privileged few. The Shah instituted land reform policies as part of his "White Revolution" and although he ruled with an iron hand, under U.S. pressure he relented somewhat by allowing the

dissident National Front to reenter Iranian politics. Suffrage for women was granted and some educational reforms were instituted. These efforts were commendable but, in the eyes of many Iranians, insufficient.

The Shah's greatest political vulnerability, and what would ultimately contribute significantly to his downfall, was an unrelenting political broadside leveled against him beginning in 1963 by a little-known cleric, Ayatollah Ruhollah Khomeini. Khomeini's withering critique, broadcast first from the Iranian holy city of Qom and then from exile in Paris, France, encapsulated three elements. In a series of speeches Khomeini charged that the regime was rife with corruption, neglected the poor, and that Iran had become a puppet of the United States as witnessed by the presence of thousands of Americans (the 1979 figure was estimated at 30,000) who lived and worked in Iran.[15] President Carter, always prepared to speak out against whatever he considered the morally indefensible, added a U.S. voice to what over time became a growing chorus of critics of the Shah and his government. Khomeini's criticism in particular continued for years, the repressive actions of the Shah's often brutally efficient security apparatus, SAVAK, often provided new fodder for the cleric. Finally, and after a year of sometimes violent demonstrations, the Shah who was physically weakened by cancer and politically diminished by the loss of support even from the once steadfast Iranian military, left the country on January 19, 1979. On February 1, 1979 Khomeini returned to Iran, greeted by rapturous throngs.[16]

The overthrow of the Shah was both a people's revolution and one, at least at the outset, that was driven not so much by religious fervor but by the corruption of the Shah's government, poor economic conditions and distrust of the United States. For the new regime the challenge of forming a government became nearly all consuming in its first year. That preoccupation gave way soon thereafter to the necessity of responding to Iraq's military campaign against Iran. With this pressing business, the Shah's nuclear plans in the 1970s, particularly its myriad contracts with foreign partners, were allowed to wither. This is not to say that in the first months of the new regime that Washington was indifferent to working with the new regime. Initially, National Security Adviser Zbigniew Brzezinski was deeply concerned about the implications of Khomeini's ascent to power for the future of the United States–Iran relationship and gave some consideration to engineering another coup.[17] That notion faded quickly when Brzezinski decided to capitalize on the fact that Iran was now being led by, inter alia, a virulent anti-communist. Under the Shah, Iran had been a Cold War outpost serving various U.S. strategic interests against the Soviet Union. Some in Washington believed that dynamic could be reconstructed and the CIA held secret meetings with and passed information on the Soviet Union to its new Iranian counterparts.[18] Brzezinski in the fall of 1979 also held a secret meeting in Algeria with Iranian Prime Minister

Mehdi Bazargan, doubtless in part to promote the U.S. vision of an "arc of Islam" that could contain the Soviets.[19]

Whatever limited prospects in November 1979 may have existed for even reasonably normal relations between Washington and Tehran dissipated when the U.S. government decided to allow the Shah into the United States for treatment of the cancer that would kill him the following year. Enraged at the U.S. gesture, Khomeini incited Iranian students to seize the U.S. embassy and take embassy personnel hostage. This led to a rupturing of diplomatic relations, as well as severed military and commercial ties with Washington Diplomatic ties were severed in April 1980 and still have not been restored. The hostage crisis also ushered in a dismal political stretch for Jimmy Carter who appeared to many Americans and overseas observers alike as unable to resolve the crisis.

As the Khomeini government was dealing with major political and military challenges, the Shah's nuclear ambitions were seen as at odds with the fundamentalist regime's pressing priorities. Previously signed contracts for foreign collaboration in nuclear technology were canceled or postponed and Ayatollah Khomeini reportedly described nuclear energy as "unIslamic."

That view would change beginning in the mid-1980s. Because Iranian officials then and to the present have claimed no interest in acquiring nuclear weapons it is difficult to identify definitively what was the cause of Iran's sea change in attitude. What is clear, nonetheless, is that during this period Iran was subject to Iraqi attacks using various types of chemical weapons of mass destruction, often delivered by missiles. The use of chemical agents began in mid-1982 with riot control agents to counter Iranian attacks and progressed a year later to mustard gas and then to Tabun, a nerve agent and finally, near the end of the war, Sarin and GF, other nerve agents. Compounding Iran's sense of isolation was the lack of condemnation from the United States or other Western powers to Iraq's weapons of mass destruction (WMD) use against Iran. (Hussein would be criticized harshly later when he used the same weapon against Iraqi Kurds.) The new regime's survival became an overriding concern and in this context it is likely that Khomeini signaled his approval for a revival of Iran's nuclear program. In October 1988 Hashemi Rafsanjani, then speaker of the Iranian parliament, addressed members of the Islamic Revolutionary Guard Corps and provided the only known official insight into how the war with Iraq shaped Iran's views on its own acquisition of WMD. "We should fully equip ourselves," he inveighed, "both in the offensive and defensive use of chemical, bacteriological and radiological weapons."[20]

A persuasive evidentiary base now exists and documents, including information provided to the IAEA by Iran in 2003, that by the mid-1980s that Iran was aggressively reaching out to prospective foreign partners as a way to reconstitute its nuclear plans and enhance its capabilities to enrich

uranium, notwithstanding that Iran had no extant nuclear power plants which use uranium to operate. For example, Iran tried to arrange a deal with Argentina to receive uranium enriched to 20% which is considered the standard for highly enriched uranium (HEU). The most important international partners would be Pakistan, China and Russia and their cooperative relationships with Iran from the mid-1980s until the year 2000 merit our attention. Among the most ambitious and, from a proliferation perspective one of the most troubling, was Iran's partnership with the A.Q. Khan black market operation. Pakistani officials claim the first Iranian overture for assistance was through formal channels, not clandestine exchanges, and the record substantiates that claim. In early 1986, Iranian President Ali Khameini, who would become Iran's Supreme Leader, visited Pakistan in search of sensitive nuclear technology. The Pakistani press in November 1986 reported that President Mohammad Zia ul-Haq had given his approval for bilateral cooperation in such areas as the training of Iranian scientists, which would be formalized in the first part of 1987 by the chairman of each nation's atomic energy commissions. In part, Zia saw the agreement as a means of maintaining good relations with an important regional actor even as Pakistan maintained strong relations with Saudi Arabia which was supporting Iraq in its war with Iran.[21] At the same time, Zia weighed other considerations resulting in limits on what Pakistan would formally provide Iran. He wanted to avoid having undue Western attention focused on Pakistan's own clandestine nuclear efforts, ordering his scientists to cooperate with Iranian counterparts but only to a limited extent. As the leader of a Sunni Muslim nation, Zia also was wary of assisting the nuclear ambitions of Iran, a Shi'a Muslim nation.[22]

Whatever constraints Zia wanted placed on Pakistan's nuclear cooperation with Pakistan apparently was of little concern to A.Q. Khan who was leading Pakistan's efforts to develop its own nuclear weapons. As the formal bilateral agreement was being negotiated and codified, Khan traveled once and perhaps twice to Iran, visiting the Bushehr site that had been bombed several times by Iraq. During the visit he offered, contrary to official Pakistani policy, assistance to Iran in centrifuge development which he described as an excellent means of uranium enrichment.[23] Although stymied by Zia, Iran was eager to explore the opportunities presented by Khan, in no small measure because the offer coincided with Iran's own decision in 1984 to open the Esfahan Nuclear Research Center (ENRC) that would study reactor technology, including enrichment technology and chemical separation of depleted uranium to extract plutonium. This commonality of interest would set the stage for an expansive relationship that would continue for years. It also would mark the beginning of the black market operation in which Khan would use both the documentation in centrifuges acquired illegally from URENCO, as well as the results of his own laboratory's research in Pakistan, for lucrative if illicit purposes.

In so doing Khan, long disdainful of the United States, also could enjoy the additional pleasure of working with one of America's now most implacable foes.

Khan's illicit supply network had many tentacles and in 1987 began operating on behalf of Iran, its first client. That year in Switzerland representatives of Khan's network provided Iranian agents with what has been described as an item-by-item shopping list for various types of assistance.[24] Later in 1987 several meetings were held and the first deal was sealed in a Dubai hotel. S.M. Farouq, a businessman with close ties to Khan and the black market operation, represented his Pakistani friend who did not attend the meeting. Farouq was joined by Buhary Tahir, his nephew, who also was to become an integral part of the network. According to one authoritative account, "A key Iranian interlocutor in the 1987 meetings was reportedly Mohammad Eslami, representing an Iranian military front company."[25] Eslami would later become a senior commander in the Islamic Revolutionary Guard Corps. His presence underscored the military's interest—and Iran's strategic intent--from the nascent stage of the relationship. Eslami's interest is easily understood given what would be revealed subsequently about the scope and contents of the shopping list:

- A disassembled sample of P-1 centrifuge machines
- Drawings and specifications for the machines
- Drawings and specifications for a complete uranium enrichment plant
- Materials for 2,000 centrifuges and associated equipment
- In addition, it may have been in 1987 that Iran was first offered detailed information related to the casting or uranium metal into hemispheres, which almost certainly was related to the fabrication of nuclear weapons components.[26]

Iran "shopped" selectively, purchasing at the time about three million dollars in goods and services while using the Khan network's list as a guide for future purchases, many of which would be made by Iran's own international network of front companies such as those operating in Germany. Designs and parts were the mainstay of Iran's initial purchases, probably as a clever means to reduce time spent on future development. Those purchases were useful in advancing Iran's work at the ENRC—gas centrifuge testing began in 1988 and would continue there until 1995 when "those activities were moved to a workshop of the Kalaye Electric Company, a company in Tehran belonging to Atomic Energy Organization of Iran."[27] Nonetheless, the relationship with the Khan network was not a panacea for Iran's myriad technical requirements. Khan almost certainly sold the Iranians some surplus equipment from his laboratory (KRL), which, given the fragile nature of the first generation centrifuges (known as the P-1), could cause as many problems as they solved.

The deaths of Pakistan's Zia in 1988 (he was traveling with the United States ambassador when their plane exploded mysteriously in midair) and Iran's Khomeini in 1989 changed the dynamics of the bilateral relationship in at least one respect. General Mirza Aslam Beg, chief of Pakistan's army staff, emerged as a powerful political figure, actively promoting various anti-Western positions. Beg was becoming increasingly disgruntled that the U.S. government apparently was losing interest in Pakistan's strategic importance as it became clear that the Soviet Union would retreat from Afghanistan. Washington's perceived growing indifference to Pakistan coincided with President George H. W. Bush preparing to refuse to certify for the first time that Pakistan did not have a nuclear weapons program, a congressionally mandated assessment that triggered both political and financial difficulties between the two nations.

Under these conditions, Beg shared Khan's view that there were compelling reasons for supporting Iran's interest in developing all areas of nuclear technology. Support for this judgment was strengthened by the March 2010 revelations in the Washington Post that recounted an eleven page written account by A. Q. Khan, never previously detailed to the public, of the workings of the clandestine supply network, beginning with its cooperative relationship with Iran. Beg is described in the Khan report as meeting in Islamabad in 1987 with Ali Shamkhani, a leader in the Islamic Revolutionary Guard Corps, who reportedly told Beg that he (Shamkhani) came to collect the promised nuclear bombs. The Iranian apparently sought three nuclear weapons, the lucrative sale of which Beg viewed as a way for the Pakistani military to support its budgetary requirements. The sale did not occur but indicates both Iran's strategic intent as well as the direct involvement of senior Pakistani officials in what was potentially much more than just a black market operation.[28]

Beg went so far as to encourage or support Khan's clandestine efforts with Iran but he was not the only official involved in these deliberations. Two former high level Pakistani officials claimed that Iran's new president, Hashemi Rafsanjani, in 1989 may have sought the approval of Pakistan's new prime minister, Benazir Bhutto, for completion of a deal involving nuclear weapons technology brokered by Beg. Beg denied the specifics of these charges but acknowledged that detailed bilateral discussions on nuclear technology issues ensued on his watch. Discussions of a similar nature continued for at least the next couple of years, involving Beg's successor, General Asif Nawaz, Rafsanjani and Iranian experts. Bhutto left office in 1990, only to return in 1993, serving until 1996 as prime minister.

Pakistan's byzantine internal political currents did not hinder the return of the Khan network to the service of Iran's nuclear goals and in some ways Pakistan's political machinations may have enhanced Khan's maneuvering room as no one in Pakistan seemed opposed on principle to assisting Iran. In that environment, also observed and well understood

by the Iranians, additional cooperation was virtually inevitable. Revelations arising from the inspection regime of Iraq begun in 1991 that shed considerable light on the scope and nature of Iraq's nuclear plans also supported Iran's decision to continue moving forward with Khan's network. The final motivation was that after a several years of effort to build on the initial purchases, Iran had not achieved satisfactory success. As we will discuss, cooperation in various nuclear technology areas was underway with other foreign partners but the centrifuge program was a centerpiece in Iran's program.

For these reasons Iran reestablished contact with the Khan network, setting the stage for meetings in August and December 1993.[29] B.S Tahir, who had been involved in the previous deals with Iran, offered centrifuge designs and machines. With approval from President Rafsanjani, and in October 1994 an agreement was struck after some protracted haggling by which millions of dollars would flow to the Khan network. In return, Iran received P-1 designs, components for a large number of machines, and drawings for the more advanced (and more reliable) P-2 centrifuge.[30] By early 1995 Iran had received most of this information and material, often transported by Iranian merchant ships. Subsequent meetings would occur through most of the 1990s although may have been acrimonious. Khan and KRL were in the process of upgrading Pakistan's centrifuge program to the new P-2 models and the network apparently continued to supply Iran, as it had done previously, with older machines. For this and other reasons Iran was struggling to move from research to operational capability in its enrichment program. Neither Pakistan nor the Khan black market provided the magic key for Iran to unlock all the complex secrets of developing nuclear weapons. Nonetheless, Iran derived valuable insights about the enrichment process from Khan and his associates and on its own would move forward with construction at Natanz of two centrifuge facilities, one above ground holding one thousand centrifuges and a much larger underground facility for as many as 54,000 centrifuges.[31]

Iran's long and complex relationship with Pakistan was only one element of Tehran's nuclear cooperation with foreign partners. In 1985 China, an ardent supporter of Pakistan because of its equally and decidedly poor relations with India, began to figure prominently in Iran's nuclear development. Seven years earlier Chinese Party leader Deng Xiaoping had embarked his nation on an "opening to the outside world," including expanded commercial deals. China's nuclear industry which in its earliest days had been beholden to the Soviet Union for much of its early development, by the1980s had matured considerably. China's nuclear efforts focused primarily on nuclear weapons design and production but its scientists possessed considerable ancillary knowledge. As Iran was searching for foreign assistance in nuclear technology China was searching for ways to earn hard currency as a way to fund its future developmental

goals. This commonality of interest would establish China as a major Iranian trading partner in a number of areas, including such sophisticated conventional armaments as high speed anti-ship cruise missiles, surveillance radars and missile guidance technology.[32] China, whose economy was in the process of becoming a global powerhouse, remained highly dependent on foreign energy sources and Iran, with abundant oil and gas resources, doubtless was seen as a valued partner for this reason as well. Details of the first years of Sino-Iranian nuclear cooperation apparently were not closely monitored by Chinese political authorities. Nonetheless, Chinese leaders would come to well understood that in an era where the United States was emerging as an unrivaled superpower with the end of the Cold War that Iran was the one nation that might foil any "hegemonistic" plans the United States might harbor in the Middle East.

Sino-Iranian nuclear cooperation began opportunistically. In 1984, Iran opened its nuclear research facility at Esfahan. Iran's initial expectation was that France, as part of its contractual relationship with the Shah, would construct a research reactor there. The Shah's overthrow resulted in the French government's decision to cancel all nuclear cooperation with Iran as Ayatollah Khomeini in Tehran coming to a similar decision. China was prepared to fill the void. Iranian President Rafsanjani in June 1985 traveled to Beijing and signed a secret protocol for nuclear cooperation between the two countries, ostensibly oriented toward peaceful cooperation.[33] Central to the agreement was China's commitment to assist in the overall building of the Esfahan facility and providing fuel for the four small research reactors that were part of the deal. In 1988, construction on the first reactor began and it went critical four years later. By 1995, the other three reactors had been constructed and were operating.

The Esfahan facility would become the hub of future Chinese technology support in Iran. The 1985 agreement also included a provision for Chinese training of AEOI personnel in China; by 1987 as many as fifteen Iranian experts were there.[34] During this period China was not an NPT member—it would not join until 1992—and the Chinese Ministry of Foreign Affairs vehemently denied reports of the secret agreement. There also is little available confirmation of speculation in some quarters that Chinese experts assisted in Iran's efforts to best exploit information and materials being provided by Pakistan. China long had been a major supporter of Pakistan's nuclear weapons development program and it would have been logical for Iran to consult Chinese experts on what Pakistan was providing.

Another element of Sino-Iranian cooperation unfolded in 1987 when Beijing agreed to supply a calutron, so-named as it was invented at the University of California, and delivered it two years later. A calutron is a way of enriching uranium that uses magnetism to separate beams of uranium isotopes with different atomic masses.[35] A calutron also was the

centerpiece of Iraq's EMIS program. The machinery received by Iran could enrich uranium to the HEU level of 36.5% but it was physically small and could only produce small amounts of material. For this reason the U.S. government did not consider the deal of particular significance. As was also true in the Iraqi case, this assessment was potentially short-sighted because through reverse engineering it was possible for both nations to pursue larger-scale development. Iraq chose that path but it has not been demonstrated that Iran attempted to do so.

Other areas of cooperation also were negotiated that were of direct proliferation concern. In 1990, General Jiang Hua, deputy director of China's Committee for Science, Technology and Industry for National Defense signed a ten year deal for expanded cooperation with Ali Akbar Toukan, Iranian Minister of Defense. The deal included China's commitment to use the China National Nuclear Company (CNCC) to supply a large 27 Mw heavy water reactor at Esfahan. Heavy water contains large amounts of deuterium which, when exposed to radiation from a reactor, produces plutonium. The reactor under consideration was capable of producing annually about 6 kg. of plutonium.[36] This material could be extracted via chemical processes and the 6 kg. of production would be sufficient or nearly sufficient to make one nuclear device. Chinese experts surely understood the implications of providing an already expanding Iranian nuclear program with the capability to produce plutonium from both a technical perspective. The political perspective in 1992 would be driven home to Chinese leadership when under heavy protest fro the United Sates government China made the political decision to terminate the project. Iranian bitterness toward China was intense but muted while, in contrast, Tehran loudly criticized U.S. meddling. Information produced in 2002 by an Iranian opposition group revealed that the Tehran government's interest in a heavy water production plant never abated.

Bilateral cooperation remained strong in other related areas. In 1991, Iran imported from China about 1.8 metric tons of natural uranium. In itself, the material was not of direct proliferation concern but was stored at an undeclared facility at the Tehran Nuclear Research Center, a violation of Iran's NPT commitment. In 1993, Iran imported from China another 50 kg. of natural uranium. Some uranium from that shipment was used by Iran for another method of uranium enrichment, atomic vapor laser isotope separation (AVLIS), a small—and thus easily concealed—and efficient way of enriching uranium. Ironically, work on AVLIS was begun during the Shah's rule and encouraged by experts from the United States.[37] Other parts of the uranium delivery were used in making uranium metal which is the material in the cores of atomic bombs.

In July 1991, Chinese Premier Li Peng visited Iranian President Rafsanjani in Tehran. The Bushehr nuclear reactor project had stalled after the 1979 revolution and Iran wanted to reinvigorate the project. China agreed

to replace the originally planned German team (and design) and had in mind a possibly different location for a new reactor, in part out of the not unreasonable fear that the Bushehr site was located in a potential earthquake zone. Media reports in various Western capitals began to appear that for the first time portrayed the nuclear cooperation in a decidedly negative light, hinting that Iran's nuclear ambitions, perhaps even those involving nuclear weapons, were being heavily supported by Chinese assistance. Those concerns were well placed as amply demonstrated by the heavy water reactor deal. China was about to join the NPT and also understood that not all but much of its cooperation had potential proliferation consequences. Beijing also doubtless did not welcome being on the receiving end of negative international scrutiny. Over time, the plan for China to take on the Bushehr work would be derailed by a combination of technical issues and possible disagreement as to how and when Iran would pay for a project that would easily exceed one billion dollars.

Sino-Iranian cooperation had unfolded in many directions, mainly positive, over an extended period. U.S. policy had taken on—or in some cases ignored—these developments on a piecemeal or case by case basis. In late 1996, Iran requested that its experts be allowed to observe an upcoming Chinese nuclear test and subsequently to have its experts learn from Chinese counterparts how to prepare for and conduct similar tests. In Washington, the implications of such cooperation were impossible to ignore.

As a result, the administration's approach took on a more focused dimension in October 1997 when Chinese President Jiang Zemin traveled to Washington to meet President Bill Clinton. By that time the Clinton administration had become increasingly concerned about Iran's underlying motives for its obvious interest in nuclear technology and also was addressing that issue with the Russian government. Sandy Berger, Clinton's national security adviser and a keen observer of China, was a major proponent of improved United States–Sino relations but was steadfast in understanding that China's cooperation with Iran on a range of sensitive technology issues was a serious concern requiring a broader resolution. The administration received what it desired when the Chinese leader during his visit pledged that China would not sell a nuclear power plant, a heavy water reactor or heavy water production plant or undertake similar future cooperative ventures with Iran. President Zemin refused Clinton's request for similar Chinese restraint in supporting Pakistan.[38] The Zemin-Clinton agreement represented the de facto end of extensive technical Chinese assistance to Iran. Iran was highly agitated but could say little in public against China, again reserving its vituperative rhetoric for the United States as the cause of China's policy change. More objectively, Chinese leaders apparently calculated that by the late 1990s that Iran's nuclear ambitions were becoming a political liability for Beijing and that cooperation with the United States on a broad set of issues trumped any

commercial or regional political goals Beijing perceived in the Middle East. What must be factored into the mix is that Chinese support to Iran over a lengthy period bore a fair share of the responsibility for the situation in 1997 from which the Beijing government was now trying to shy away.

A close review of various national nuclear weapons programs shows that there rarely, if ever, is just one external supplier for a proliferant nation. Expertise in almost all aspects of nuclear technology resides in at least several dozen nations; whether with official approval or not, this expertise has been offered repeatedly. That axiom held true in Iran's case as it searched for those international partners willing and able to advance Tehran's nuclear ambitions. Russia is another case in point. Russo-Iranian relations since at least the nineteenth century have been complex; throughout the last half of that century and well into the twentieth century the bilateral relationship is best characterized as one in which imperial (and later Soviet) Russia interfered insistently in Iranian affairs.[39] After Russia withdrew from Iran following the end of World War II and with Reza Pahlavi reigning as Shah, the relationship cooled considerably under the shadow of U.S. influence. As Iran was beginning a new political chapter in the early 1980s followed by a program to reinvigorate its nuclear program in the mid-1980s, the Soviet Union, of which Russia was the core member, was under its own internal stresses borne of moral decay, corrupt and ineffectual leadership and a stagnant economy.

The Government of Russia that emerged in 1991 after the breakup of the USSR was beset by a seemingly endless and chaotic series of political and economic challenges. Nonetheless, the resilience of Russia and its people is a defining national characteristic; Boris Yeltsin would provide a symbol, albeit a shaky one at times, of resolve to reform the abusive and unresponsive elements of Soviet-era governance and embark on a new national experience. Russia remains a work in progress with many of its once emerging democratic elements trampled by Vladimir Putin's vision of control from the top, but during the Yeltsin era it began to carve for itself a new position in the post-Cold War era.

Regarding Iran, Yeltsin's challenge was to redefine a bilateral relationship that would incorporate an admixture of several elements and motives. Those motives included a desire to earn badly needed hard currency as arms sales were a major (and, aside from oil and gas) and rare source of hard currency for cash starved Russia. Concurrently, Russian geostrategic analysts were acutely aware of America's predominance in the Middle East, amply demonstrated by Washington's leadership of a military coalition to that in 1991 ousted Iraqi forces from Kuwait. The firepower and speed employed especially by U.S. forces to accomplish that mission doubtless left a strong impression on the Russian General Staff that for decades measured their own military capabilities against those

demonstrated by the U.S. military. Under these conditions, an enhanced relationship with Iran offered an appealing means to mitigate some of Washington's perceived imperial reach. In addition, and perhaps more pragmatically, Russia's bloody and protracted conflict in the breakaway republic of Chechnya would have been made all the worse had Iran chosen to support the Shiite Muslims there, something that Russian policy worked assiduously to prevent.

Moscow's policy choices toward Iran also had to take into consideration the views of the Clinton administration. It is sometimes written that it was the 2002 release of information by an Iranian dissident group that provided critical insights into Iran's clandestine nuclear work. That portrayal is at least partially misleading as the Clinton administration through much of the previous decade had been tracking closely, along with the highly capable cadre of Israeli analysts, Iran's programmatic activities as well as the various sources of external support for them. For example, Presidents Clinton and Yeltsin established through their number two officials the Gore-Chernomyrdin Commission, a mechanism for regular (semi-annual) discussion of and decisions on wide-ranging bilateral issues including health care and agricultural cooperation as well as security issues.

Particularly sensitive issues such as those involving Iran were part of the agenda. In some cases results favorable to Washington were achieved; future Russian arms sales to Iran were to be constrained but there also were disappointments. The administration was unsuccessful in having Yeltsin reverse a January 8, 1995 deal by which Viktor Mikhailov, Minister of the Russian Atomic Energy Agency (then known as Minatom), and Reza Amrollahi, chairman of the AEOI, agreed to Russia to taking over the project at a cost of $800 million a build a 1000 MW light water nuclear power reactor at Bushehr, the same project begun years earlier under the Shah and halted by Ayatollah Khomeini. Later that year a separate agreement would be signed for Russia to provide fuel for the reactor. On the surface, the construction of a nuclear power plant appeared benign and Russian officials maintained that nuclear cooperation with Iran fell within the scope of activities permitted by the NPT. The underlying concern in Washington was that the presence of hundreds of Russian experts onsite also could provide clandestine advice in any number of other areas of nuclear technology of greater proliferation concern. The agreement also contained a secret codicil calling for construction of a gas centrifuge plant (later cancelled), the training of Iranian experts at Russian nuclear facilities, including at the prestigious Kurchatov Institute in Moscow and in uranium mining. The United States would complicate the Bushehr deal by applying political pressure on entities in Ukraine and the Czech Republic to withhold supplying critical parts for the reactor. The project would fall badly behind schedule for technical and financial reasons—it was scheduled to be completed in1999--and when that date slipped the targeted completion

date was reset for 2003.[40] Construction was not completed on the first unit until 2009 and the reactor still had not gone critical as of early 2010.

At Minatom, Yevgeniy Adamov, who succeeded Viktor Mikhaylov as Russian Minister of Atomic Energy, had a very expansive view of the opportunities for his ministry to cooperate with and profit from its ties to Iran. In the late 1990s he was planning to expand the scope of Russia's work at Bushehr to include construction of three additional nuclear power plants. Those plans never materialized but the proliferation concerns of the United States, or even those within other parts of the Russian government, did little to impede Adamov's efforts to provide Iran with nuclear technology with direct proliferation concern. In December 1998, Western press reports revealed the efforts of Russia's Scientific Research and Design Institute of Power Technology (NIKIET) and the Mendeleev University of Chemical Technology to sell Iran a 40 MW heavy water research reactor.[41] Personnel and blueprints were provided to begin the project which would have enhanced significantly Iran's capability to produce plutonium, a fissile material used for bomb making. Russia would bow out of the project but it likely served as the start for what is now known as the Arak heavy water production plant, an Iranian undertaking. During the late 1990s, the same Russian entities also were negotiating with Iran on the sale of a facility to convert natural uranium into uranium hexafluoride (UF6), an early step leading to subsequent uranium enrichment. Prior to his 1998 appointment as Minister of Atomic Energy, Adamov had served as Director of NIKIET, adding to U.S. concerns regarding the minister's intentions.

Through much of the 1990s, a different set of Russian entities and experts carried out extensive and, probably from Iran's perspective, invaluable assistance in many aspects of missile technology. Russian interest in missile development emerged as far back as 1929 when Sergei Korolyov began working on rocket propulsion and Russia's Cold War competition with the United States fueled the development of a missile industry of unparalleled scope. As with nuclear technologies, ballistic missile technologies have an inherently dual-use element; a rocket that launches a communications satellite into orbit, for example, can serve as the platform to launch a nuclear weapon. As we have seen, during its war with Iraq, Iran became almost transfixed with the threat posed by missile attack. Near the end of the war Iraqi missile attacks on Tehran became commonplace with as many as one quarter of the city's population fleeing to safer areas.

The current mainstays of Iran's long and short-range missile force are the Shahab-1 with a range of 320 kilometers, the Shahab-2 with a 500 kilometer range and the Shahab-3 with a range of 1300 kilometers, sufficient to hit targets throughout most of the Middle East. Each of these missile systems had their origin in North Korean designs. However, it was Russian assistance—sustained and diverse—that enabled Iran's missile program to make substantial advances and, just as important, to do so in a

much shorter timeframe than would have been the case otherwise. In virtually every area of missile development, including design, training, guidance systems and propulsion, there was at least one Russian entity providing assistance. This cooperation can be summarized as follows.[42]

Russian Entity Assistance

Baltic State Technical University training of Iranian experts

Bauman Technical University training of Iranian experts

Europalas attempted transfer of specialty steel

Federal Security Service (FSB) facilitated travel for Russian experts

Glavkosmos dual-use missile production technology

Grafit Research Institute transfer of graphite ablative materials

INOR Scientific Center transfer of special composite materials

MOSO transfer of specialty steel via Azerbaijan

Moscow Aviation Institute training of Iranian experts

NPO Energomash rocket engine technologies

NPO Trud transfer of engine components

Polyuus Scientific and Research Institute missile guidance technology

TsAgi missile design software and construction of a wind tunnel

Russian officials, beginning with Yeltsin and Chernomyrdin, invoked in mantra-like fashion that it was not Russia's policy in any way to assist Iran in the development of nuclear weapons or ballistic missiles. Russian officials also maintained that the nation was living up to its NPT commitments on the nuclear side as well as its commitments under the Missile Technology Control Regime (MTCR). The MTCR is an informal agreement Russia joined in 1995 (the seven Western economic powers in the 1980s had developed the idea for the MTCR) whose objective is to advance a policy that there should be a strong presumption of denial by any nation considering the export of ballistic or cruise missiles that could deliver any type of weapon of mass destruction. The same presumption of denial is to apply to the export of major subsystem missile components as well as related technical assistance. The rather inconvenient problem with Moscow's official pronouncements was succinct; those statements were almost wholly inconsistent with the facts on the ground.

This inconsistency posed a vexing problem for the Clinton administration. The 1991 breakup of the Soviet Union provided an unprecedented opportunity after what had been nearly a half century of enmity between the superpowers to develop a more productive relationship in the post-Communist Russia that Boris Yeltsin was seeking to construct. Quite appropriately, the Clinton administration also sought ways to enhance the prospects that Yeltsin would not only begin to transform Russia but to

do so by sowing the first seeds of democracy in a country that had been anything but democratic through its troubled history. This was an exceptionally tall order for Yeltsin. Near the surface in pursuing this worthy objective was deep and lingering mistrust in both capitals, compounded by the parlous and fragile nature of both Russia's shattered political system and its economy. At the same time, Israel, a stalwart ally with deep ties to the Democratic Party and strong support in the U.S. Congress, left no doubt that it viewed Iran in the darkest of shades, convinced it was intent on becoming a nuclear weapons state.

This issue was about to dominate for several years my professional endeavors. In 1996 I had joined the White House National Security Council (NSC) Staff as a member of the nonproliferation directorate with direct responsibility for monitoring Russian policies and actions regarding nuclear proliferation issues with an eye to formulating and advancing U.S. policy interests. Prior to joining the NSC I had been managing a group at the CIA tasked with providing assessments on those same issues for the policymakers I was about to join. Tracking Russian-Iranian cooperation dominated our efforts. Working at the NSC had its demanding elements which were more than compensated for by association with a highly dedicated group of professionals such as Carlos Pascual, Senior Director for the NSC's policy toward Russia and Mike Hamel, an exceptional Air Force officer assigned to Vice President Gore's foreign policy group.

The combination of Russia's nuclear and missile technology assistance to Iran had become so onerous to U.S. and Israeli interests that the Clinton administration felt compelled to take direct action beyond the confines of the Gore-Chernomyrdin Commission. The pressing policy questions fixed on whether or to what extent the Yeltsin government was witting of these activities and what actions were they prepared to take to close them down. The actions of many Russian entities, including the FSB, Russia's intelligence service which may have been assisting the travel of Russian experts to Iran, belied the standard and official denials. The same was true for the Russian entities listed above that, although in most cases officially privatized, maintained close cooperation with the Russian Ministry of Defense or Minatom. The yawning chasm between Russia's words and deeds, as well as the scope of those activities, in early 1997 led President Clinton to propose to President Yeltsin that a group of senior experts from each side establish a mechanism to address these issues.

Yeltsin's agreement set in motion an extended process of lengthy exchanges, usually held in Moscow, on Russian-Iran cooperation. The United States government selected a veteran diplomat, Frank Wisner, to lead the delegation. I joined Wisner as the NSC representative and Jim Timbie, a senior and highly regarded career officer, also was part of what became the core group. We were supported by an able mix of experts from around the U.S. interagency. The U.S. goal in the talks was to assess the

veracity of Russia's claims of official opposition to any activities by Russian entities beyond the recognized parameters of the NPT and MTCR and, where those existed, to develop solutions the Russian government would take to redress such cooperation.

The first senior experts group meeting occurred in late summer 1997 in Moscow. The Russian delegation was led by Yuri Koptev, director of the Russian Space Agency who was supported by various Russian officials. Drawing upon cleared intelligence, Wisner laid out a powerful case that many forms of illicit and dangerous nuclear and missile cooperation were flowing from Russia to Iran. Wisner urged Koptev to look into these cases, report his findings, and suggest remedial steps. Koptev's immediate response—which would be repeated ad nauseum—was to deny, as had Chernomyrdin, such activities were taking place. Nonetheless, Koptev committed to looking into them. This began a process of protracted discussions spread over several years. The Russians added a parallel process by which the U.S. delegation also met with Minister of Atomic Energy Yevgeny Adamov, the ardent supporter of expanded Russian cooperation with Iran.

Adamov adopted a "see no evil, hear no evil" attitude which played out over dozens of hours of negotiation, denying the brunt of the U.S. clams with barely concealed contempt but acknowledging, as did Koptev, that some minor and unapproved contacts may have occurred. During the same period the U.S. core group also maintained a continuing dialogue with Israeli counterparts in Tel Aviv and Washington where senior officials such as Ron Prosor and Jeremy Issacharoff were highly skilled and respected counterparts. Wisner left the delegation after about a year to take a position at the American International Group (AIG) and was replaced by Robert Gallucci, one of the U.S. government's most able experts on proliferation issues with experience involving, inter alia, North Korea and Pakistan.

Gallucci well understood the implications of Russian assistance that regardless of Moscow's official assertions was both deep and broad. By the time he joined the delegation, the U.S. core members recognized the likelihood that the exchanges with Koptev and Adamov would produce, at best, minimal results. At Gallucci's urging the Russians carried out some investigations of their own but these never resulted in any Russian individuals or entities being prosecuted. The Russian government also issued a decree calling for close observance of its NPT and MTCR commitments and for some time there appeared to be a slackening of Russian assistance. However, in the long run the Yeltsin government proved unwilling or unable to rein in its own experts. The U.S. Congress, at the time under Republican control, was wholly frustrated with the lack of progress. Albeit with considerable reluctance, the Clinton administration was prodded into imposing sanctions on those Russian companies suspected of assisting Iran. The

sanctions had little practical effect as most of those entities did little, if any, business with the United States.

Within Iran, the nuclear and missile programs continued apace in the first years of the new century. Tehran also had to appreciate the tone emanating from Vladimir Putin who in 2000 became Russian president. Putin set aside the Gore-Chernomyrdin process (the meeting of experts already had run its course), and reaffirmed Russia's interests in strong ties with Iran, both as a way to increase Russian arms sales as well as for Tehran's continuing intransigence toward the United States. Putin stated in 2001 that, "Economically, Russia is interested in cooperation . . . and politically Iran should be a self-sufficient state that is ready to protect its national interests."[43] In March 2001, Russian officials showed there were limits to their support by bowing finally to long-standing U.S. pressure and finally canceling plans to sell Iran laser enrichment equipment.

Other developments during this period were even less favorable for Iran. On August 14, 2002, the Tehran government was shaken by allegations made at a Washington, DC press conference from the National Council of Resistance for Iran (NCRI), a dissident group led by Alireza Jafarzadeh, claiming that Iran had been concealing construction of a uranium enrichment facility at Natanz and a heavy water production facility at Arak which is 150 south of Tehran. The Natanz facility was said to have been under construction since 2001 while the Arak facility was alleged to have been started in 1996 and as a hedge against failure in the uranium enrichment program. The NCRI added that front companies were established to further conceal the activities at Natanz and Arak. The Kalaye Electric Company served as cover for the Natanz work while the Mesbah Electric Company performed the same function for the work at Arak.[44] Iran had no operating nuclear power reactor and therefore had no apparent need for any substantial amount of enriched uranium.

The press conference generated considerable attention in many foreign capitals. Speculation arose in some quarters that the information revealed by Jafarzadeh may have been provided him by foreign sources but regardless of the information's origin, vehement denials flowed from Iranian government sources in the aftermath. Those drew little more than deep skepticism from various national governments. Recognizing that the facts were compelling, Iran quickly changed tactics, acknowledging that it committed an error of omission in not informing the IAEA of these facilities while maintaining it had not committed any NPT treaty violations.[45]

This reaction implied that Iran was seeking the expedient course of remaining within the NPT and it soon sought to reinforce that approach in at least some of its interactions with the IAEA. For example, in February 2003 Iran admitted that in 1991 it imported from China 1.8 metric tons of natural uranium. Failure to report this transaction at the time was a violation of Iran's NPT obligations as was its subsequent failure to report the

processing of the uranium. IAEA inspectors conducted a visit to Iran also in February 2003 and at that time Iran made a formal declaration regarding the existence of facilities at Natanz, Arak and the Kalaye Electric Company which was described as making centrifuge components. Despite the declaration, Iran would not grant IAEA inspectors access to Kalaye until August 2003 and only after sensitive equipment at what had been deemed previously a watch making factory had been removed to Pars Trash, another AEOI facility. During the same visit IAEA inspectors went to Lashkar Ab' ad, a facility identified in a March 2003 NCRI report as having ties to Iran's nuclear program. The report over time proved to be true with Iran admitting that the facility had a role in laser isotope separation but that no nuclear materials had been used there, a complete falsehood.[46]

In response to growing pressure from the IAEA whose Board of Governors in September 2003 called for a full declaration of Iran's nuclear activities, Iran submitted a formal letter to the IAEA on October 21, 2003 detailing past activities.[47] It also may not have been coincidental that the newly cooperative Iranian posture emerged as the seizure of the BBC-China unfolded, triggering the process of unraveling the Khan black market operation and Colonel Qaddafi was acknowledging his nation's clandestine nuclear program. Iran took another positive and potentially significant step toward greater transparency on December 8, 2003 when it signed the Additional Protocol to its IAEA Safeguards Agreement. The Additional Protocol allows for short notice inspections of a broad range of nuclear sites. However, the agreement was never ratified or even put to a vote by the Iranian Majles and in October 2005 Iranian officials confirmed that they would not honor their 2003 commitment. The IAEA assessment of Iran's cat and mouse tactics was reflected in its November 2004 report to its Board of Governors in which Iran was deemed to have concealed information about its laser enrichment work and "by failures to declare nuclear material and activities."[48]

From September 2003 to August 2005 the so-called EU-3 of the United Kingdom, France and Germany conducted protracted negotiations with Iran on the nuclear question. The Europeans doubtless had ample reason to attempt to forge a diplomatic outcome given they had been mostly relegated to sidelines observer (the British being the exception) some six months earlier with the U.S. invasion of Iraq, Iran's neighbor. In Washington, President George W. Bush had branded Iran part of an "axis of evil" in his January 29, 2002 State of the Union address to Congress, one of many signs from the conservative administration that it was losing patience with Iran's mixture of political duplicity and programmatic aggressiveness. Many European governments, already deeply troubled by the invasion of Iraq, had no desire to see Washington initiate another military conflict in the region.

This is not to say that the Europeans were indifferent to Iran's nuclear ambitions. U.K. Prime Minister Tony Blair, for example, had taken a

consistently firm position of concern about Iran's activities. There still were differences between Washington and various European capitals on approach. The Europeans adopted a collective position that diplomacy, unlike the U.S. position that stressed the value of sanctions and, ideally, regime change, should be given every chance to work. The leadership throughout the continent was in no position to provoke nor did it have any interest in instigating a full blown crisis with Iran. Despite these differences in approach, the EU-3 of England, Germany and France became a de facto surrogate for both U.S. and IAEA direct involvement in the talks. At first reluctant to embrace this approach, the United States would serve as a close observer of the negotiations.

Iran's engagement with the EU-3 would have afforded it an opportunity to address many of the international concerns that by that time had been accumulating for years. The emerging consensus on the part of many leading members of the international community that Iran sought nothing less than access to and mastery of the nuclear fuel cycle—and all that implied for the possible production of fissile material—possibly could have been tamped down. Nonetheless, those capabilities were what Iran was seeking to acquire and instead of a posture of cooperation, even if feigned, Iran struck a posture of the aggrieved nation through the two years of talks. Simply put, Iran was buying time rather than negotiating in good faith. For both the Europeans and the Americans, recognition of this possibility was never far from the surface and the transatlantic partners had agreed that the negotiating process would not be open-ended. By the start of the EU-3 talks with Iran they had agreed that the next step would be to refer the Iran case to the U.N. Security Council barring any unexpected breakthroughs.

The essence of the EU-3 position was that the only way for Iran to preclude the issue being referred to the U.N. Security Council for debate and possible punitive action was for Iran to forgo its nuclear fuel cycle activities. At the outset, the negotiations suggested a sense of modest optimism when Iranian officials agreed at a September 2003 meeting in Tehran, albeit under IAEA pressure, to suspend enrichment work throughout the talks. This was followed soon thereafter by Iran's signing the Additional Protocol.[49] At the same time, Iranian negotiators during the first year of talks kept pushing for an exception to the EU-3's position of a complete ban on enrichment activities by making repeated requests for EU-3 approval of an enrichment pilot plant with perhaps 500–3000 operating centrifuges. This gambit was rejected by the Europeans and with complete backing from the United States. In November 2004, the EU-3 sought to close off this issue through the Paris agreement where Iran agreed to suspend all enrichment and reprocessing activities. The EU-3 also put forward a proposal that in return for Iran's giving up its fuel cycle activities that external sources of fuel for Iranian reactors would be guaranteed.[50] The Paris

agreement notwithstanding, the Iranian position remained focused on its asserted right to enrichment activities and this would become the central sticking point for the final year of fruitless negotiations. By July 2005, the negotiators were reaching an impasse with the center of action now shifting to the IAEA and United Nations.

Further complicating any prospects for a negotiated settlement were the results of the 2005 Iranian presidential election. From an approved slate of seven candidates, former Iran president Akbar Hashemi Rafsanjani and Mahmoud Ahmadinejad, an engineer and teacher by background, member of the ultraconservative Islamic Revolutionary Guard Corps and mayor of Tehran, emerged as the leading contenders. Ahmadinejad was victorious, becoming president of Iran on August 3, 2005 and setting in motion Iran's subsequent adoption of even more confrontational positions with the West and Israel. At a November 2005 IAEA meeting in Vienna, Russia still pressed to give Iran additional time to reconsider its position before agreeing to refer the issue to the Security Council but that was a minority position. The Iranian and Russian position was hardly strengthened by a series of Iranian statements, of which there would be more, denying the Holocaust and Israel's right to exist. Actions followed words when in January 2006 Iran announced, with Ahmadinejad's approval, it was resuming its enrichment activities. The combination pushed the issue to the breaking point; on February 4, 2006 the IAEA Board of Governors voted 27–3 to refer the issue to the Security Council.[51]

During the same period, a series of complex technical issues attended the political machinations surrounding Iran's nuclear program. The most controversial and potentially alarming technical question centered on whether Iran was developing a nuclear warhead. A nation's nuclear weapons program reaches maturity when three conditions are met. First, it must acquire or produce the fissile material required for a nuclear device. It also must be able to deliver the weapon to target. Much of our discussion in this chapter has been devoted to these two elements. However, the third element, nuclear weapons design, is of equal importance.

Nuclear weapons design is a phrase encapsulating the successful completion of myriad and complex tasks. Assuming fissile material (weapons grade uranium or plutonium) is at hand—and Iran as of early 2010 had not produced or acquired those materials—there remain challenges in physics, engineering, and mastery of explosives requiring both a cadre of specialists and specialized equipment. The warhead design also must take into consideration the inherent weight and size constraints of placing atop a missile the warhead and associated electronics. Particularly for a fledgling nuclear weapons state, it is highly desirable, but not essential, to be able to test the design through a nuclear detonation which, again, Iran has not done to date. (A gun device design, for example, might use a tube with an explosive at one end which, when detonated, fires fissionable

but subcritical material down the barrel into other subcritical fissionable material, creating a supercritical mass. This has been proven to be a highly reliable if, by today's standards, crude design.)

Conversely, and in equally complex ways, monitoring any nation's progress and problems in warhead design are an exceptionally challenging intelligence problem. Important aspects of other parts of a nuclear program, producing the fissile material and developing the delivery means, can be assessed by observing, albeit imperfectly, the construction of often large structures or facilities. Commercial satellite photography today allows civilian organizations with specialty interests to undertake rudimentary monitoring activities. Similarly, missile programs also have recognizable facilities and structures that may be imaged by either commercial or spy satellites. The use of satellite monitoring is far from foolproof; nations for obvious reason seek through various means to deny outsiders information on such activities. Moreover, while it is useful to monitor activities at such facilities as an enrichment plant, those observations fall far short of providing insight into what is transpiring within. For example, are the centrifuges working properly? How long during a day are they being run? Nonetheless, satellite reconnaissance remains a major tool in monitoring any nation's possible proliferation activities. In contrast, weapons design work almost always will be virtually impossible to observe, taking place in sheltered facilities and on desktop computers. These factors, as we will see, have resulted in great uncertainty regarding the pace and scope of Iran's nuclear warhead design work. Because of these uncertainties, experts in the United States and elsewhere have had to rely on fragmentary, sometimes unreliable or conflicting human source reporting that at times may be agenda-laden and other times dated. Even with these limitations, there also have been some successes in acquiring useful and timely information.

Iran's interest in mastering the challenges of nuclear warhead design may have been signaled by rumors that the Khan network had provided nuclear weapons design information to Iran as well as the request by Iranian experts to observe Chinese nuclear tests. In both cases the evidence implied something far greater than idle Iranian curiosity but also was fragmentary at best and hardly suggestive of any weapons making capability. The evidence suggesting efforts to develop those capabilities began accumulating in the first years of the new century. Perhaps the most dramatic was the information contained on a stolen laptop computer. In mid-2004 and with German assistance, Western intelligence agencies came into possession of "more than a thousand pages of documents in Persian that were interpreted to indicate Iranian work from 2001 to 2003 on the design of a Shahab missile nose cone to deliver a compact nuclear warhead, as well as other nuclear warhead activities. The documents detailed computer simulations, calculations, blueprints, experiments and diagnostic

information to include studies of various warhead configurations."[52] Subsequent technical analysis conducted by Sandia National Laboratory in New Mexico concluded the information was credible and probably focused on the aforementioned Shahab-3 MRBM. The Sandia analysis also concluded that the approach at the time being taken by the Iranian experts would not have succeeded in developing a reliable warhead design for that missile.[53]

That assessment did not, and could not, resolve the issue given ongoing Iranian efforts. The requirements for producing fissile material, developing long-range missile capabilities and reliable and practical nuclear warhead designs are highly demanding and Iran's progress in all three areas never proceeded in linear fashion. Monitoring their various twists and turns, while trying to draw sound judgments from often fragmentary evidence, also was a major challenge for Western intelligence as would be demonstrated by a highly controversial National Intelligence Estimate (NIE) of which an unclassified version dated November 2007 was released by the U.S. intelligence community. At that time there were elements within the Bush administration continuing to advocate the use of military force as a means to at least forestall what they perceived to be Iran's dogged pursuit of a nuclear weapons capability. The administration also was trying to maintain as much cohesion as possible within the international community for continued pressure on Iran through the United Nations. The issue may have looked different to those within the U.S. intelligence community whose analysis had been roundly criticized for past failures to accurately convey the limits and problems in Iraq's WMD programs. Regardless of the influences on or intentions of those who drafted the 2007 NIE, the published findings served to undermine the advocates of the military option and heightened international pressure.[54] At the heart of the NIE's analysis were these judgments:

> We judge with high confidence that in fall 2003, Tehran halted its nuclear weapons program. . . . We assess with high confidence that until fall 2003, Iranian military entities were working under government direction to develop nuclear weapons. The halt lasted at least several years . . . we assess with moderate confidence Tehran has not restarted its nuclear weapons program as of mid-2007.[55]

Bush administration officials such as National Security Adviser Stephen Hadley sought to portray the NIE's findings in a positive light but it was apparent that they were an unwelcome complication for the administration. It soon became obvious, for several reasons, that alternative interpretations would encroach on the NIE's judgments, showing that it would not provide the "definitive word" on an issue that continued to fester. First, the key judgments also were at odds with assessments held by other

intelligence agencies, including those in Germany, Great Britain, France and Israel. For example, one authoritative report stated that the German intelligence service (Bundesnachrichtendienst) through the middle years of the past decade had taken an unbending stance, judging that Iran had never stopped its nuclear warhead design work.[56] The NIE judgment also was undermined by an Iranian defector, Brigadier General Ali Reza Asghari, who had served in the Islamic Revolutionary Guard Corps. According to a Newsmax report, in 2007 Asghari was debriefed by both U.S. and French experts. As described by one report of these encounters, Asghari said, "I didn't tell them that the nuclear weapons program had been shut down, but that it was ongoing."[57]

Evidence continued to accumulate in support of that assessment. In October 2008 another report circulated that "International nuclear inspectors are investigating whether a Russian scientist helped Iran conduct complex experiments on how to detonate a nuclear weapon . . . inspectors at the International Atomic Energy Agency are seeking information from the scientist . . . described in a lengthy document obtained by the agency . . . it is the first time that the nuclear agency has suggested that Iran may have received help from a foreign weapon scientist in developing nuclear arms . . . the new document, written in Farsi, was part of an accumulation of evidence that Iran had worked toward developing a nuclear weapon."[58] Denials of the report from Moscow and Tehran were swift and predictable.

A more comprehensive assessment of the issue in 2009 began circulating in the form of an IAEA study on Iran's nuclear weapons design plans and capabilities. In late 2009 it had reached the draft stage and at least some of the findings had been passed to an organization in Washington, DC. It is unclear why the IAEA did not publish its findings at the time. Suspicion centered on the possibility that Director General Mohammed El Baradei, winner of the 2005 Nobel Peace Prize for the work carried out by his organization, had politicized the agency's mission by refusing to publish a highly critical judgments of Iranian activities, notwithstanding the fact that Iran had been ignoring UN Security Council resolutions for several years.

There is little doubt but that during El Baradei's tenure that he had led the agency into some very turbulent political waters, with the Iranian case at the top of the list, at least after the U.S. invasion of Iraq. The Director General made little secret of his disdain for what he called the "crazies" in the Bush administration advocating stronger political—and possibly even military approaches—to Iran's WMD programs. Having had the opportunity to engage in wide ranging conversations with El Baradei, I always found him sincere in his convictions. What cannot be condoned is his criticism of senior U.S. government officials, regardless of their views. The IAEA belongs to the international community, it is one of the United

Nations' group of international organizations, and its employees serve the international community. It should not advocate or try to create a policy of its own save what the international community asks it to implement. In the Iran case the U.N. Security Council, as we will discuss, had spoken clearly about its deep concerns about Iran and the directions Iran was to take to come into compliance with U.N. Resolutions. To serve those ends the Agency's duty is to provide, and not hold back, the most objective and comprehensive assessment of the issues within its jurisdiction, regardless of whether that reporting pleases or displeases any particular nation.

In my travels to the IAEA in the mid-late 2000s, I also came away with a sense that within the senior ranks of the permanent professional cadre at the IAEA that there existed considerable disagreement with El Baradei over Iran's strategic intentions. As one of the senior IAEA managers told me in 2007, "I am 99% convinced that Iran wants to acquire nuclear weapons."[59] The effectiveness of any organization inevitably is compromised when its leader is at odds with his senior staff as seems to have been the case at the IAEA. This situation persisted into summer of 2009 when officials in Washington and other capitals were pressing the IAEA to release data it was holding on Iran's nuclear weapons ambitions. As one U.S. official remarked, "What we and all the allies are pressing for is for the full case to be laid out in public."[60]

Given the issue's importance, it would have been wholly inappropriate for the IAEA to withhold publication of its assessment of Iran's nuclear warhead design progress. On December 1, 2009, the IAEA welcomed as its new Director General Yukiya Amano. His thoughts on and approaches to the series of challenges confronting the IAEA over Iran remain to be fully understood. He made a strong start in issuing a February 18, 2010 report on Iranian activities. The report was one in a series of IAEA assessments of Iranian programmatic efforts but the early 2010 report struck a strong chord on the question of Iran's warhead design work. In a section titled "Possible Military Dimensions," the report describes the scope of its concerns:

> . . . the Agency seeks to have confidence in the absence of possible military dimensions to Iran's nuclear programme. The information available to the Agency in connection with these outstanding issues is extensive and has been collected from a variety of sources over time . . . Altogether, this raises concerns about the possible existence in Iran of past or current undisclosed activities related to the nuclear payload of a missile. These alleged activities consist of a number of projects and sub-projects, covering nuclear and missile related aspects, run by military related organizations. Among the activities which the Agency has attempted to discuss with Iran are: activities involving high precision detonators fired simultaneously; studies on the initiation of high explosives and missile re-entry body engineering . . . whether

> Iran has developed a spherical implosion system, possibly with the assistance of a foreign expert knowledgeable in explosives technology.[61]

As dangerous and controversial as were the questions attending Iran's nuclear warhead design capabilities, what convulsed the international community and impelled it toward the formal imposition of economic sanctions voted by the United Nations Security Council was Iran's posture of political confrontation coupled with its continuing enrichment activities. The January 2006 collapse of even a modicum of cooperation between the EU-3 and Iran set the stage for a new round of diplomatic activity with the scene shifting later in the year to the United Nations Security Council. Before that, Javier Solana, the EU foreign policy chief, developed with broad European support a package of incentives he put forward in June 2006. They included an offer to bring Iran into the World Trade Organization, the opening of direct talks with the United States and international support for Iran's civil nuclear program in exchange for Iranian halt to its enrichment and reprocessing work.[62] Iran provided no substantive answer to what most observers viewed as an attractive offer.

Iran's nonresponse cast the dye for United Nations involvement. In an international system where sovereignty still reigns supreme, the permanent members of the Security Council, the United States, United Kingdom, France, China and Russia can place national interests above compromise and cooperative actions. Such was the case with Iran. In the first place, it took three and a half years from the IAEA technical judgment that Iran was not fulfilling its NPT commitments to having the problem referred to the United Nations. That substantial delay, the silent artillery of time in Abraham Lincoln's eloquent phrase, most served the interests first of Tehran and then Moscow and Beijing which for their own strategic and commercial reasons opposed from the start the imposition of any sanctions.[63] Efforts to have Iran suspend its enrichment and reprocessing activities by August 21, 2006, the centerpiece of the nonpunitive UN Security Council Resolution (UNSCR) 1696 of July 31, 2006, ended with Iran providing a 21-page letter of rejection.

Continued Iranian truculence, combined with strong and sustained pressure from the United States, United Kingdom, and France, in late 2006 resulted finally in support, albeit lukewarm, from China and Russia for the first Security Council economic sanctions resolution, UNSCR 1737. (see box) Once agreed to, the sanctions in 1737 appeared to many observers as lacking any substantive bite; the resolution only targeted entities and individuals allegedly involved in Iran's nuclear and missile work. They also wholly ignored any punitive actions against the Iranian economy such as a restriction on gas imports, a critical need for Iran whose aging and dysfunctional energy infrastructure requires the import of about 40% of the nation's gasoline. By all appearances the Tehran government acted as

if unconcerned about the effects of the sanctions resolution, doing little, if anything, to alter its policies by becoming more transparent and carrying out the directives of the Security Council regarding the programmatic work. Iran's disdain for the process, reflected in its continuing confrontational attitude that the sanctions could never hurt the nation, did little more than result in the imposition of subsequent and similarly focused, sanctions resolutions in 2007 and 2008. At the same time, the sanctions process and the attention they generated, served to undermine the drumbeat for military action against Iran swirling in certain circles in Washington and Tel Aviv. Sanctions had to "have time to work;" a view that came to predominate in various European capitals as well as Beijing and Moscow.

UNITED NATIONS SANCTIONS RESOLUTIONS ON IRAN'S WMD PROGRAMS

UNSCR 1737 was passed unanimously on December 23, 2006. This resolution targeted 12 individuals and ten Iranian organizations alleged to be involved in a variety of weapons of mass destruction (WMD) programs, including, but not limited to, various nuclear technologies such as uranium enrichment and heavy water research. Of equal significance was that the resolution identified Iran's work in the ballistic missile area as a source of direct concern. Security Council Resolution 1737 limited the amount of technical cooperation that could be provided Iran by the International Atomic Energy Agency (IAEA) and suggested that nations carefully watch those Iranians identified in the resolution as being engaged in the WMD programs.

UNSCR 1747 was passed on March 24, 2007. This resolution "barred arms exports to Iran and doubled the number of Iranian entities subject to an asset freeze because of their involvement in Iran's nuclear and missile work . . . also on the list was Bank Sepah, Iran's fifth largest bank, because of its transactions with Iranian entities named in UNSCR 1737 . . . The resolution called on UN members not to enter into new commitments for grants or concessional loans to Iran."

UNSCR 1803 was passed a year later on March 3, 2008. Financial sanctions also were central to this resolution. An additional 13 names were added to the now growing list of entities whose assets were being frozen because of their alleged WMD work. A travel ban also was imposed on those individuals. Suspect shipments being transported by Iranian national entities (an airline and shipping company) were subject to inspection and interdiction.

UNSCR 1835 was passed on September 27, 2008. By this time Russia was not prepared to support the addition of new sanctions and none were included

in Resolution1835. Rather, Resolution 1835 renewed past calls for Iran to suspend its enrichment and reprocessing work, a symbolic if not substantive victory for the international community.[64]

UNSCR 1929 was passed on June 9, 2010, after months of negotiation and compromise. The vote wasn't unanimous—Brazil and Turkey voted against it while Lebanon abstained—but Russia and China, after succeeding in having some U.S. attempts at gaining support for "crippling sanctions" watered down, voted their approval. The new sanctions were hailed by President Obama as the toughest yet, a surely unintended if ironic damning of the resolution with faint praise. Nonetheless, Resolution 1929 maintains pressure on Tehran by targeting 15 companies linked to the Islamic Revolutionary Guard Corps (IRGC) for financial sanctions, although there is no comprehensive ban on dealing with the IRGC. The Resolution also reinforced various existing sanctions in some areas of the Iranian economy, blocks international financial transactions related to banned activities and expands an arms embargo to include conventional military equipment such as tanks and aircraft.

As a concession to Russia, the powerful S-300 air defense system was not included in the arms embargo. Russia's decision to sell or not sell that system to Iran will be a strong indicator of depth of Moscow's concern about Iran's intentions and in mid-June 2010, the Russian government indicated it would not carry out such sales in the foreseeable future. UNSCR 1929 represent to some extent a victory for U.S. policymakers in "the fact" that Russia and China continued to vote for sanctions against Iran. The United States and other nations also will be free to continue their own and more sweeping sanctions policies. Iran expended considerable diplomatic effort to forestall 1929, but it remains highly unlikely that the new round of sanctions will have any greater effect on Iranian programmatic efforts than the previous three rounds of sanctions given the bravado rhetoric of their ambassador to the UN who asserted after the vote that Iran would not break under any external pressure. For the Obama administration, passage of the new Resolution was seen as proof positive of Iran's growing political isolation, notwithstanding that on the same week as the U.N. vote Russia, Turkey and Iran met in Istanbul for a regional security summit.

It was against this backdrop of worsening relations between key parts of the international community and Iran that Barack Obama became the U.S. president in January 2009. Obama had campaigned on a foreign policy platform of "extending an open hand" to America's adversaries and Iran was at the top of that list. On various occasions he spoke of willingness to speak with Iranian leaders without preconditions. Early in his presidency Obama would deliver impressive speeches in Cairo and Prague outlining a vision of understanding on such thorny issues as relations between the United States and the Muslim world (in Cairo) and the

imperative to secure, reduce, and at some point eliminate global nuclear arsenals (in Prague). Obama's initiatives represented a sharp contrast in substance and tone from those of his predecessor. They were greeted with fanfare in many international quarters but not in Iran. Obama in 2009 sent two letters to Iranian Supreme Leader Ayatollah Khameini without receiving a meaningful response. An editorial in *The Washington Post* concluded in fall 2009 that, "President Obama's offer of direct diplomacy evidently has produced no change in the stance taken by Iran during the George W. Bush administration."[65]

Complicating Obama's attempts to create a new political dynamic with Iran was the growing impatience of Binyamin Netanyahu, Israel's prime minister. As prime minister in the late 1990s, Netanyahu, more than ably assisted by his security adviser Uzi Arad who also returned to the same position in 2009, had demonstrated encyclopedic understanding of Iran's nuclear and missile programs. Netanyahu also understood well from his time in the United States the American political process and Israel continued to press among its many political allies on Capitol Hill for the administration to take decisive actions. For the Obama administration, already inheritors of wars in Iraq and Afghanistan, the last thing it wanted, in the words of Secretary of Defense Robert Gates, was another military engagement. Israel well knew Washington's preference for a diplomatic resolution but found it difficult to reconcile that approach with the political and programmatic direction emanating from Iran.

The administration remained undaunted, continuing to push for any type of accommodation that might slow Iran's nuclear missile progress. It is probable that one factor, albeit seldom discussed, that gave cause for modest optimism in some Washington circles was possible problems in the fuel Iran was enriching. An article in the October 8, 2009 edition of the trade publication *Nucleonics Week* reported that Iran's supply of low enriched uranium, the material that could be enriched to weapons grade, had certain impurities related to metallic fluoride compounds. How the impurities may have occurred is a separate question. If true, those impurities would make it exceptionally difficult if not impossible for the low enriched uranium to be further enriched to weapons grade.[66] Speculation swirled that Iran was considering (but ultimately rejected) a deal proffered by the IAEA and the Obama administration that Iran turn over to Russia approximately 1500 kilograms of low enriched uranium (enriched to 3.5%) where it would be enriched to 19.75% for use in a research reactor in Tehran that produces medical isotopes.[67] (That the Obama administration and the IAEA were ignoring the Security Council's mandate that Iran suspend all enrichment activities posed for them no apparent obstacle to the plan.) The obvious attraction of the deal to the West was that a large portion of Iran's possible feedstock material for possible additional enrichment would be removed from Iran, something that Tehran ultimately was not prepared to allow

after flirting with the idea. Iran would try in 2010 to revive a variant of this plan with Turkish and Brazilian assistance that was seen as little more than a ruse for Iran to forestall the imposition of another round of sanctions.

A recurring theme of the various nuclear programs in the Middle East—as has been true in impoverished nations like North Korea and Pakistan—is that nations vote with their resources. In the Iranian case, for decades and while enduring harsh economic conditions, the ruling regime has been unstinting in committing resources to its high priority nuclear and missile programs. In September 2009 revelations in major media outlets described the existence of a clandestine uranium enrichment facility known as Foro borrowed in a mountainside some twenty miles from the holy city of Qom. Activity there apparently was being monitored for at least several years by Western intelligence sources, "reasoning that if UN inspectors were monitoring the known facility at Natanz, Tehran would look elsewhere to carry out its work."[68]

On this occasion the analytic judgment was correct. Once again, Iranian officials scrambled to declare to the IAEA, which had not been made aware of the lengthy monitoring of the facility, the "fact of" the construction project being carried out near Qom. Important parts of the international community had its own interpretation of the activities there. Meeting at a G-20 summit in Pittsburgh, Pennsylvania in September 2009, President Barack Obama, French President Nicholas Sarkozy and then-British Prime Minister Gordon Brown made an unusual, joint declaration of their deep concern about the facility's purpose and the way it was concealed. Why did Iran need another enrichment facility when it still did not have even one operating nuclear power plant? Why was it being constructed inside a mountain? Moreover, when that nuclear power plant (Bushehr) began operations why would Iran need fuel to operate it when it had agreed to a Russian plan to supply (and take back) fuel for the reactor? As Prime Minister Brown remarked, the size and configuration of this facility is inconsistent with a peaceful program."[69] The IAEA's Board of Governors also deemed the revelation of another non-declared clandestine facility an egregious violation of Iran's NPT obligations and by a 27–3 vote on November 27, 2009 issued a resolution of censure and calling on Iran to cease construction of the facility.

By early 2010 the United States and the EU-3 members had concluded, in the words of P.J. Crowley, a State Department spokesman, "that Iran refuses to engage cooperatively and constructively with the International Atomic Energy Agency."[70] The Obama administration was in the process of trying to generate international support for another round of sanctions with the British, French, and Germans signaling broad support for that approach. It was unclear if Russia or China would join in supporting another round of sanctions or what shape they would take given the ineffectiveness of past Security Council sanctions. Was Washington prepared offer considerable incentives for Russian and Chinese agreement to a new

A NEW ANTI-WAR MOVEMENT WITH A PRO-IRANIAN SLANT?

Most nonproliferation cases unfold over many years as evidence of possible proliferation significance is uncovered and assessed and political responses are developed. By definition, these are the actions of governments and international organizations, the interest and expertise of various organizations, "think tanks" and private sector experts notwithstanding. In early 2010, it appeared that at least several nongovernmental organizations were readying to engage in the Iranian challenge in a different way but one reminiscent of past anti-war movements. It is hardly a new phenomenon that private sector organizations and individuals would raise their voices in protest of various government policies. The Vietnam War is an excellent case in point; the broad public disquiet reflected in numerous anti-war demonstrations in the mid-1960s to mid-1970s about the U.S. military actions in Vietnam had a strong effect on Presidents Lyndon Johnson and Richard Nixon. Similarly, various "peace groups" including some funded by communist front organizations in the 1980s demonstrated against NATO missile deployments taken in response to similar Soviet missile deployments. There has appeared on the Internet calls for anti-war organizations and activists to protest in the United States and Europe against alleged U.S. or Israeli plans to attack Iran. It is unclear who is providing the financial support for the websites or whether they will develop into anything approaching the effectiveness of past anti-war efforts.

round of sanctions, possibly including exempting entities from those nations from any financial penalties in any new sanctions strategy?

Iran's 25-year pursuit of the nuclear and missile technologies that would transform it into a nuclear weapons state still had not yielded the ultimate dividend as of the first half of 2010. Various estimates continued to circulate regarding the timeline for Iran to acquire nuclear weapons, something it claims to have forsworn years ago. In early May 2010 it was reported that Iran had revealed in photos the planned installation of new centrifuge enrichment machinery said to be two generations more advanced than many of the centrifuge types provided by Pakistan.[71] Initial estimates assert the centrifuges could be five times more efficient in enriching uranium than previous machines.[72] If the reporting is accurate, the new centrifuges raise a number of disturbing questions:

- What is the source of the centrifuges?
- Will they be as capable as the initial and photo-driven estimates suggest?

- Where will the machines be installed? The site near Qom that was uncovered in 2009 seems to have but limited ongoing activity and the large facility at Natanz, doubtless a high priority on any U.S. or Israeli target list, also has not been as active in recent months. Is Iran planning to use the new centrifuges in another clandestine facility?
- If installed and operated properly—a process that could take two years—how much enriched material could be produced in a year or eighteen months?

As the latest information underscores, the inescapable judgment was not whether Iran would acquire nuclear weapon capabilities but only when it would do so. From the vantage point of a new decade, it appeared that it would cross the threshold within the next 18 months or two years under current conditions and without the new centrifuges operating. Such estimates and timelines, as shown by many past miscalculations, carry significant technical and even political uncertainties given the myriad events shaping contemporary Iran. In September 2010 some were claiming that a mysterious computer virus had found its way into parts of the Iran nuclear program, possibly presenting another possible obstacle on the path to a nuclear weapons capability. Uncertainty surrounds the lasting effect of the virus or how many nuclear facilities might have been compromised. However, probability should guide policy judgments and not possibility. At the very least, even in the face of various problems through the years Iran probably is in the process of mastering the requisite technologies associated with crossing the nuclear threshold. If so, Iran would achieve, if it chose, to reach a "break out" capability whereby it stops just short of crossing the nuclear threshold while maintaining the option to cros that threshold in short order. Tehran appreciates that ambiguity in its own program complicates the formulation of international responses, particularly those that extend beyond sanctions such as a blockade or direct military action. It also had become clear to much of the international community that it had long ago mastered the art of denial and duplicity, suggesting that the Iranian challenge was as much about politics—both within Iran and the international community—as it was about technology and program options. An assessment of the mix of politics and technology infusing Iran's nuclear ambitions will inform the first policy challenge of part two, options for meeting the Iranian challenge.

PART II

Policy Challenges

CHAPTER 5

Meeting the Iranian Challenge

Iran long has maintained that it has no nuclear weapons aspirations, asserting that its extensive nuclear program is an expression of an inalienable right to nuclear technology that over time will diversify Iran's energy sources. Those words bear scant resemblance to Iran's increasingly clear strategic intent. Iran's sustained march toward a nuclear weapon and long-range missile capability has been a major concern for U.S. policymakers and members of the international community since at least the mid-1990s. As described with penetrating insight by two close observers of Iran, "Over much of the past two decades, after failed attempts to buy nuclear fuel cycle technology from Russia (a gas centrifuge plant) and China (a uranium conversion facility), Iran has sought by every secret means to assemble the elements of an indigenous, independent nuclear fuel cycle, amid heightened concerns that it is seeking to acquire nuclear weapons."[1]

These developments have generated myriad responses, some seen and some unseen, by the diplomatic and intelligence services of various nations. The U.S. government's efforts in the late 1990s to negotiate cessation of the assistance Russian entities were providing to Iran's weapons of mass destruction (WMD) programs became a prelude to the efforts of the European Union-3 (EU-3), the International Atomic Energy Agency (IAEA), and the United Nations Security Council diplomacy and other means to stymie Iran's nuclear ambitions. Individually and collectively, those negotiations, periodically backed by economic sanctions, have failed to induce or compel Iran to fundamentally alter course. By early 2010 there were at least 180 Iranian entities and individuals under sanctions from the United Nations, United States, and European Union. The international community's failures speak volumes for how sovereign nations, if resolute, can successfully thwart the views of the many.

Under these conditions it is instructive to inquire why the amalgam of international efforts has failed to bend Iranian policy and what, if anything,

can be done to diffuse the dangers posed by Iran's nuclear and missile programs. For that answer we must first look closely at Iran's strategy and goals and then turn to the responses of the international community. From this dual perspective we can begin to assess what options, if any, may yield an acceptable outcome.

At its core, the Iranian challenge is more than a nuclear or missile challenge; it is a political challenge. The nuclear weapons capability of every nation possessing them, however extensive (the United States and Russia) or modest (South Africa until its program ended) in number or capability, ultimately must be placed within that nation's broader threat perceptions and foreign policy objectives. As we have seen, on the question of possessing nuclear weapons Iran has been steadfast in denying any aspirations to acquire nuclear weapons. Absent a declaratory policy or internal document describing the nation's nuclear goals as a guide, the international community is left to make its assessments of Iranian nuclear goals on a broad set of "outputs," primarily Tehran's policy choices, resource commitments and programmatic directions. It also is instructive to factor into this mix what Iran has not done. There may well be many reasons to brand Iran as a "pariah" or "rogue" nation but it has not been a consistently reckless one. The rhetoric of Iranian President Ahmadinejad toward Israel has been and remains bellicose and reprehensible but Iran also has refrained from any direct military threats or actions against a nation well prepared to inflict massive destruction on Iranian society and perhaps as importantly to Ahmadinejad and his cohorts, destroy the ruling regime. In the same passive-aggressive vein, Iran has made a virtual mockery of its Nonproliferation Treaty (NPT) obligations but, unlike North Korea, has refrained from leaving the NPT, an action that would almost certainly elicit broad condemnation.

There are a set of other domestic considerations that also factor into the mix. President Ahmadinejad's problems are not just with the international community; they begin at home. He confronts a robust set of governing challenges, including domestic opposition in Iran sparked by the justifiable outrage over the fraudulent June 2009 presidential election results and the government's subsequent bloody and heavy-handed response to those who protested the results. The legitimacy of any regime rings hollow when it begins murdering its citizens. Iran's economy, which the Iranian president vowed to improve in his 2005 presidential campaign, remains mired in a confluence of inflationary pressures and high unemployment, problems seemingly impervious to fix. Moreover, it is likely that there exist within the turbulent world of Iranian politics divergent views over the path of the nuclear program and in the future how to meld it into the overall context of Iranian foreign policy.

Does Ahmadinejad view the statements he frequently makes touting the progress in the nuclear and missile programs as a way to distract Iranian

citizens from their discontent with the regime's tactics and policies? Does his confrontational rhetoric toward external criticisms of the programs serve a similar purpose? Adopting a strident tone in dealing with the West also may have a "feel good" quality to Iranian hardliners such as those within the Islamic Revolutionary Guard Corps (IRGC) and provide some domestic political value by underscoring Iran's political independence and technical achievements. At the same time, the Iranian populace has a strong interest in external affairs and opinion. Albeit impossible to gauge, there may well be limits to the value of the regime's tactics for a public that for years has been aware of the protracted criticism directed at their nation by much of the international community because of the nuclear and missile programs.

Iran's nuclear ambitions also are fueled by a set of bureaucratic dynamics seldom accorded much attention in the West. This situation has been described as "the emergence of a bureaucratic and scientific establishment with its own parochial considerations. Under the auspices of the Revolutionary Guard, an entire array of organizations such as the Defense Industries Organization, university laboratories, and a plethora of companies (many of them owned by hard line clerics) have provided the impetus for Iran's expanding and lucrative nuclear efforts . . . Tehran's acceptance of the Additional Protocol in 2003 brought forth protest from these corners, with 250 of Iran's scientists signing an open letter" against the signing.[2] Iran would later walk away from its commitment to the Additional Protocol. Operational control of the nuclear and missile programs resides with the Revolutionary Guard and it is almost certain that the organization profits enormously from that role.[3] Given the authority, influence, and profit the IRGC derives from its control over the WMD programs, there is little reason to believe this powerful organization will acquiesce willingly to any significant programmatic changes or reductions in them. The IRGC well understands that the programs have yet to reach maturity and, under certain scenarios, still could be bargained away by the regime. Such a decision, albeit unlikely, would be resisted mightily.

These factors suggest an Iranian government that in at least some respects overall is cautious and selective when choosing to be provocative. Regardless of current motives, the circa 1985 decision by Ayatollah Khomeini to begin a nuclear program set in motion a sweeping series of events, relationships, and decisions. It is possible that Khomeini did not contemplate, or at least fully understand, the consequences of where his initial decision might lead. Nonetheless, there exist countless case studies and assessments of the role of nuclear weapons in the defense posture of various nations. Iranian officials doubtless are aware of the putative advantages of a nuclear weapons capability for its deterrent capability and beyond. The United States and Soviet Union came to realize through years of hard experience in the Cold War that the ultimate utility of

IRAN'S ISLAMIC REVOLUTIONARY GUARD CORPS

The Islamic Revolutionary Guard Corps (IRGC) or Pasdaran in Persian was created by a decree from Ayatollah Khomeini shortly after the 1979 Revolution. Like Russia's Vladimir Lenin who in 1917 recognized the need for an organization to protect the Russian Revolution which resulted in the founding of the Cheka, the forerunner of the Soviet-era KGB, Khomeini from the start saw the IRGC as the guardians of the revolution. At the same time, Khomeini, perhaps with a touch of irony, also drew upon and applied the lessons of the deposed Shah Reza Pahlavi who insisted the Army stay out of politics. Khomeini directed that the IRGC practice political neutrality, guidance that would be lost in the mists of time as the country settled into what is now over 30 years of theocratic rule.

In its early years the IRGC, which is now widely reported to have about 125,000 members but whose numbers may been far greater given the IRGC's many activities, took up its originally intended mission of providing internal and external security duties. The success of the 1953 CIA-MI6 coup against Iranian Prime Minister Mohammad Mossaddeq never receded fully from Iranian political consciousness and the raison d'etre of the IRGC was to prevent another "velvet revolution." To carry out that mission, the IRGC became a paramilitary force with army, air force, and naval units stationed throughout the country. In 1993, the Ashura Brigades, an IRGC offshoot, were established to assist in quelling civil unrest. Over time the core mission would be augmented and expanded. For example, the Revolutionary Guard clandestine arm, the Quds Force, arose to become a de facto external affairs branch, involved in shipping weapons to Hezbollah and creating political unrest in southern Iraq after the 2003 U.S. invasion.

The political neutrality called for by Ayatollah Khomeini quickly gave way to a more mutually-supportive relationship between Ayatollah Khameini and the IRGC. Khameini came to power with a less than stellar set of credentials; he was a junior cleric from Mashan, hardly the spiritual center of Islamic orthodoxy. Khameini may have viewed the Revolutionary Guard as a useful ally in the turbulent political world he was entering and the organization's influence expanded considerably. This is not to say that the IRGC's trajectory was unwaveringly ascendant or devoid of critics. More reform-minded leaders such as Presidents Muhammad Khatami and Akbar Rafsanjani were far from the most rabid boosters of the IRGC and wary observers of their activites.

The organization's fortunes and influence took a considerable step forward with the 2005 presidential election of Mahmoud

Ahmadinejad. A former IRGC member, Ahmadinejad has presided over the steady accretion of power to the IRGC. A near universal assessment today is that the Revolutionary Guard is a presence in virtually every aspect of Iranian governmental and societal affairs. Its members hold many official posts including serving as cabinet ministers, mayors and ambassadors, while its business interests extend into at least one hundred private companies. Most outside observers believe the IRGC also is involved in numerous black market operations. Its control of or association with Iran's nuclear and missile programs is a source of additional and considerable financial benefit along with the political influence accrued from involvement in such high profile projects.

The symbiotic relationship between President Ahmadinejad and the Revolutionary Guard took on a new dimension during his government's response to the contested June 2009 presidential election that returned him to power. Tens of thousands of Iranian citizens, mainly young adults, took to the streets in protest against what to many appeared to be fraudulent election results. The government responded with overwhelming force, killing some protesters and arresting scores of others. Leading the government's bloody response was the Basij Resistance Force, an all-volunteer paramilitary wing of the Revolutionary guard numbering as many as 1 million members.

For years the Revolutionary Guard has enjoyed an established and well-defined mutually beneficial relationship with the ruling clergy. The clergy has governed the nation and the IRGC has protected them. Will this relationship continue to evolve and perhaps in new directions? Could the IRGC become a threat to the Iranian clergy's hold on power if political conditions deteriorated? At the same time, the Revolutionary Guard is not beyond challenge in its own position. It has to compete for influence with such powerful organizations as the Ministry of Intelligence and Security (MOIS). Moreover, it is most unlikely that the IRGC acts cohesively at all times. On August 31, 2007, IRGC leader Yahya Rahim Safavi was replaced by Mohammad Ali Jafari. Safavi's ouster apparently was a result of charges, including from within his organization, that he had underestimated the threat of U.S. military action. On the critical question of assessing U.S. policy options, it appears that the IRGC is far from united. There may be some fissures within the IRGC but its overall commitment to an Iranian foreign policy that confronts rather than seeks accommodation with members of the international system, beginning with the United States, seems unshakable. Its unique role in multiple areas of Iranian society will continue to make it a powerful force in Iranian politics.

nuclear weapons, if that is even the right description, is found in their nonuse or deterrent value but they also understood that, albeit unspoken, nuclear weapons states are conferred a special status within the international community.

As the ruling regime surveys unfolding events in the Middle East in 2010, it likely finds a mix of positive and negative developments. Courtesy of the U.S. invasion of Iraq and the subsequent removal of Saddam Hussein from power, Iran no longer has an overtly dangerous adversary as its neighbor. U.S. forces also are in the process of significantly reducing their presence there. The war against Iraq that lasted through much of the 1980s seared into Iranian consciousness its own strategic and military vulnerabilities and almost certainly represents a more galvanizing motivation for a nuclear weapons program than accorded by various outside observers. President Ahmadinejad reflected this sense of angst in his 2005 speech at the United Nations General Assembly when he said, "For eight years, Saddam's regime imposed a massive war of aggression against my people. It employed the most heinous weapons of mass destruction."[4] It remains unclear what directions the new Iraqi government will take ultimately, but Iran may become an influential force in shaping that future given the chaos of Iraqi politics and Tehran's support to various Shiite factions now competing for power.[5] This is not to say that Tehran will be sanguine about Iraq's future direction. The fluidity of the political scene there in 2010 in the aftermath of parliamentary elections does not preclude an outcome where Iraq becomes a reliable U.S. ally and, by extension, a complicating factor for Iran in the region.

Israel remains a staunch opponent of Iran, particularly given the unwavering resolve of Israeli Prime Minister Netanyahu to confront the Islamic Republic. To date, Iran has chosen to undertake hostilities against Israel indirectly through terrorist activities carried out by a proxy force, Hezbollah. The Iranian nuclear and missile program, albeit highly troubling for their inherent potential, cannot disguise that Iran also is lacking in strong ground forces and a modern air force capable of challenging Israel for regional military supremacy. Building such capabilities is a lengthy and highly expensive undertaking for any nation. In this respect, a nuclear weapons program may be seen as a "great equalizer" for those conventional force shortfalls.

The United States remains committed heavily to military actions in Afghanistan (which borders Iran) while winding down its military presence in Iraq. Moreover, U.S. success in Afghanistan, if defined as bringing a modicum of stability to that long-suffering nation, could, from Tehran's perspective, have negative consequences if in the wake of that outcome Pakistan, long enmeshed in the fighting, had renewed opportunity to refocus on some its past anti-Shiite sentiments. The Obama administration, which had offered in the president's first months in office to extend Iran an open hand of friendship, more recently has been demonstrating

enhanced efforts diplomatically to lead the international community in a new round of Security Council sanctions. The United States also maintains formidable naval capabilities in the Persian Gulf, a vitally important transit route for Iranian exports. Moreover, Iran's neighbors in the Persian Gulf pose no security threat but watch developments from Tehran warily. From the forgoing it is likely that any Iranian strategic assessment of the region appreciates the opportunities as well as myriad political and military danger spots there.

Tehran may have few longstanding allies in the region, save Syria, and that relationship appears based as much on shared loathing of others in the region as on shared values. Nonetheless, in a complex regional security environment, the long-term political ambitions of Tehran's ruling regime are expansive while its short-term posture toward the region, in the main, has been cautious. Supreme Leader Ali Khameini has made frequent reference to the belief that Iran should have a say in every major regional issue. Beyond this bravado, Iran's current leadership may well have concluded that their past vulnerabilities and current strategic milieu demand a nuclear weapons option, while they also appreciate that a nuclear weapons capability can serve more than defensive or deterrent purposes. Iran almost certainly has observed both how North Korea's nuclear ambitions have isolated the country yet also provided the Hermit kingdom bargaining leverage in dealing with the West and a deterrent against possible hostile military actions against it. Such benefits likely would hold considerable appeal and importance to Iran in its strategic calculus. For example, an Iranian leadership in possession of nuclear weapons may perceive those weapons as an ideal "cover" to carry out various forms of more aggressive actions, possibly including increased terrorist actions against Israel. The problem in such assessments for the international community has been the uncertainty surrounding Iran's intentions which have been kept deliberately vague save the mantra-like chant of disavowing any nuclear weapon aspirations. It is often difficult to mobilize the international community to take concerted action even in the face of even overt threats to peace; Iran has walked a thin but clear line to avoid conveying that it is an impending military threat to regional peace.

By virtue of history, a sense of destiny, size, and geography, Iran may view itself as destined to become a regional hegemon. However, it has not converted these goals into political reality. As summarized by one observer:

> Iran lies at a natural crossroads between the Caspian and the Gulf and the Arab world and the subcontinent, but it has been unable to translate its geopolitical assets into political advantage. As a non-Arab Shiite state, Iran lacks a natural constituency, either regionally or in the wider Muslim world . . . Iran also lacks dependable friends or strategic partners.[6]

SHIFTING POLITICAL SANDS: IRAN AND TURKEY

A confluence of pragmatic imperatives may be shifting the political orbits of two of the region's largest nations, Iran and Turkey, closer. Sharing a common border of more than 300 miles, Turkey and Iran also share a lengthy and complex history. That relationship traces its roots to the rivalry of two empires, the Ottoman and Persian empires, as well as competing interpretations of Islam, Sunni, and Shia. Nonetheless, by the admittedly low standards of the Middle East, relations between the two nations since the beginning of the 20th century have been proper and generally amicable. Modern Turkey has sought to have at least one foot in the Western world; hence its membership in NATO and its long-standing interest in becoming a member of the European Union (EU). At the same time, since the 1923 founding of the Turkish Republic, Ankara has largely eschewed a foreign policy dominated by religious or political aggrandizement, seeking good relations wherever they could be found as its leaders attempted to modernize the country. The 1979 Iranian Revolution raised many questions in Ankara over Iran's long-term aspirations in the region. That contributed to a cooling of the bilateral relationship as did the immigration to Turkey of thousands of Iranians in the wake of the revolution, raising questions in Tehran as to whether Turkey would become a base for fomenting unrest against the theocratic regime. That cooling proved to be temporary, not permanent, in large measure because of strong mutual economic interests. Both nations are members of the Economic Cooperation Organization. Perhaps most importantly, both nations share a mutual interest in strengthening existing trade ties, particularly in the energy sector. The total trade volume between the two countries is $10 billion and expected to double in the next three years. A large percentage of this trade is a result of the transfer of natural gas from Iran to Turkey, much of which ultimately is sent to Europe.[7]

Because of Iran's lack of regional allies as well as economic considerations, Tehran has ample motivation to continue bolstering its bilateral relationship with Ankara. The situation for Turkey is more complex. Turkey was one of the few nations to congratulate Iranian President Ahmadinejad after his disputed June 2009 reelection. Such actions have symbolic importance in international politics, beginning in Israel which for years had maintained positive relations with the large Arab nation. The United States also plays an important role in Turkey's foreign policy as does the EU. Prolonged stalemate by EU members regarding Turkey's ascension to permanent membership has soured Turkey's views of the West. Nonetheless, Turkey

doubtless shares and maintains Washington's (and Tel Aviv's) view that a nuclear armed Iran would be a dangerous and destabilizing factor in the region. However, the Turkish government has been putting some distance between itself and Israel with which it had enjoyed strong relations for years. Israel was excluded by Turkey from participating in a planned October 2009 joint military exercise because of Israel's actions in Gaza earlier in the year and Turkish officials have taken to noting, in clear reference to Israel, that there are nations in the region who are nuclear powers but not members of the NPT. To the dismay of Washington and Tel Aviv, Turkey also touts the necessity of the Middle East being a nuclear free zone. Through 2010 Turkey has a seat on the Security Council as a nonpermanent member. As the United States was seeking to rally broad international support for a new round of sanctions against Iran, it was apparent that Ankara viewed skeptically their likely effectiveness and said so publicly at the United Nations and elsewhere. Washington may be finding that at least one NATO ally is adopting a policy of independence on an issue of critical importance as demonstrated by Turkey's subsequent refusal on June 9, 2010 (along with Brazil) to vote for a new round of UN Security Council sanctions against Iran.

Notwithstanding its confrontational rhetoric toward Israel and the United States, Iran's strategic reality includes continuing U.S. military presence in the region, a strong Israeli military, and a dearth of regional friends and allies. Under these circumstances, Iran almost certainly will continue to feel isolated and challenged on many fronts. Its potential responses are broad but not unlimited. It has stepped up its efforts to reach out to other regional powers such as Turkey and is likely to continue cultivating relations with China and India as both energy customers and possible Asian counterweights to U.S. influence in the region. As noted, Iran's conventional military forces will take years to develop into anything approaching a match for Israeli conventional force capabilities.

Iran's outsized political ambitions, sense of isolation, and commitment of extensive resources to the nuclear and missile programs provide a toxic combination for the region's political stability. The evidentiary base points inexorably to the conclusion that the ruling regime in Tehran will not give up, except under the most extreme conditions, the nuclear and missile programs it has been developing for a quarter century. To begin answering the question posed at the start of this chapter, there are few, and perhaps no satisfactory options for preventing Iran from becoming a nuclear weapons state short of the use of force. As described in the previous chapter, the international community has expended enormous effort seeking a

diplomatic resolution to the Iranian challenge. Those efforts have not succeeded and there exists no reason to believe they will as long as the current regime remains in power. Barring any unforeseen development within the Iranian political scene, any further attempts at sustained negotiation with the theocratic regime call to mind the apt definition of insanity described by the great scientist Albert Einstein; insanity is doing the same thing over and over while expecting different results. The next phase of engagement with Iran, if there is to be any prospect for changing Iran's march toward a nuclear weapon capability, needs to reflect a fundamentally different approach. The question that emerges is what elements should constitute that approach.

Developing a powerful and effective mix of incentives and disincentives as riposte to the Iranian challenge has engrossed the international community as well as countless experts, academics, and pundits. The inescapable conclusion as it appears in 2010 is that not only has the effort to find a path forward with Iran been a long-standing exercise in frustration, but it also has reached the point where few viable options exist. The bitter fruits of years of failure in negotiations, the consequences of delay in fully confronting Iran, and rationalization for those delays are now emerging.

Under current circumstances there are four possible approaches to Iran that may be considered. Each offers opportunities but also conveys limits and risks; the result of the silent artillery of time's erosion of attractive options.

- Development and imposition of a comprehensive set of punitive sanctions designed to cripple the Iranian economy;
- Support for the "Green Movement" or "Green Revolution" that has arisen from the domestic outrage at the ruling regime's conduct during and after the June 2009 presidential elections;
- The prospects for military operations whose mission would be the destruction or damage of at least the most threatening Iranian nuclear and missile facilities; and
- Recognize that Iran may become a nuclear weapons state and develop a series of responses.

SANCTIONS

One of the policy responses used by the United Nations Security Council, the U.S. government, and the European Union in numerous security and proliferation cases is the imposition of various forms of economic sanctions against a nation judged to be developing WMD capabilities. Sanctions are touted by supporters as having the advantage of demonstrating international or as has been the case in the United States, United Kingdom, and other nations, unilateral sanctions actions, by going a step

beyond diplomatic approaches while remaining short of the use of force. The previous chapter described the Security Council resolutions that imposed economic and travel penalties on Iranian entities and individuals allegedly engaged in various forms of WMD work. Politics are an inherent part of the complex mosaic of nations comprising the United Nations and the sanctions list formed by the UNSC resolutions of 2006, 2007, 2008, and June 2010 contains positive and negative features. On the one hand, the list represents in some respects the "lowest common denominator" that could be agreed to by the international community. On a more positive note, it keeps pressure on the Iranian regime and also sheds a useful spotlight on many of the Iranian entities (and individuals) most directly engaged in WMD programmatic activities of greatest concern. These include in the U.N. list:

- Defense Industries Organization;
- Esfahan Nuclear Fuel Research and Production Center and Esfahan Nuclear Technology Center;
- Fajr Industrial Group;
- Kalaye electric Company;
- Parchin Chemical Industries;
- Pars Aviation Services Company; and
- Pars Trash Company.[8]

The Security Council sanctions list also contains a glaring number of omissions. For example, the Islamic Revolutionary Guard Corps, the Aerospace Industries Organization, and key Iranian financial centers known to be supporting the acquisition activities of various Iranian firms, such as the Melli Bank and Mellat Bank, have escaped Security Council sanctions.[9] In the June 2010 Resolution, organizations associated with the Islamic Revolutionary Guard Corps were added to the U.N. sanctions list. There is an element of international embarrassment for Tehran in that the international community has imposed on four occasions various sets of formal sanctions. Nonetheless, the omissions and limits inherent in that list also bolster Iran's confidence reflected in frequent public statements that sanctions have not badly hurt the regime materially and serve to unite the Iranian people behind the regime. This bravado contains a significant element of fact. For example, the Security Council sanctions, while incomplete in targeting the Iranian nuclear and missile programs, also impose few broader penalties on other segments of the Iranian economy such as its energy infrastructure, a reflection of the view of some nations adopted by the Security Council that the Iranian public should not be hurt by sanctions.

The European Union also has taken a series of decisions regarding sanctions against Iran for its WMD work. The EU list includes all the entities

and individuals on the UNSC sanctions list but adds a number of different entities, including the Aerospace Industries, Bank Melli, and Bank Mellat. The IRGC is not included in the EU list, although that may change after the June 2010 sanctions vote that added IRGC elements to the list. The EU also has chosen to refrain from imposing a broader set of sanctions against non-WMD segments in the Iranian economy although in the wake of the 2010 UNSC sanctions vote the EU was reported to have been considering, beyond adding the IRGC to its list, an expanded sanctions list.

The United States has a long history of imposing unilateral sanctions, both on proliferation grounds and because of Iran's support to terrorist groups, against Iranian entities and U.S. entities (including those with overseas operations or offices) doing business with Iran. Since the 1980s, three major pieces of legislation have defined U.S. sanctions policy to Iran:

- Iran, North Korea, and Syria Nonproliferation Act;
- Iran-Iraq Nonproliferation Act of 1992; and
- Iran Sanctions Act.

It can be argued that sanctions called for in these pieces of legislation when implemented effectively enable the United States to punish Iran in several ways:

- Sanctions may slow foreign investment in Iran's petroleum sector;
- Sanctions deny Iran access to the U.S. financial system, decreasing Tehran's ability to conduct dollar transactions; and
- Sanctions demonstrate U.S. concerns, not only to Iran but to the international community.

The plethora of U.S. laws and regulations governing trade with Iran at first blush are unambiguous in their intent and prescribed process of implementation. The Departments of State and Treasury devote considerable resources to these activities, including the complex and time consuming task of sanctions monitoring. Treasury's Office of Foreign Assets Control, for example, has reviewed dozens of cases of possible sanctions violations and can recommend the imposition of financial penalties within legal limits or that law enforcement entities institute a criminal investigation.

On closer review, the sanctions are found wanting on several counts. The first and most damning is that the purpose of the sanctions, forcing change in Iranian policies and programs, has failed. Sanctions can put political pressure on a regime but Iran's programmatic drive remains unbowed in the face of a growing number of years under various forms of sanctions. On the financial side, Iranian banks have turned in many cases to conducting transactions away from dollars and into various currencies,

including the Euro. Iranian companies have been active in recent years in developing commercial projects with various foreign entities to develop the energy sector.

The third shortcoming, and one which begins to explain the first failure, is that implementation of the sanctions under the Bush and Obama administrations has been badly undermined by ineffective monitoring and lax application of the laws. A March 2010 report in *The New York Times* detailed the results of its review of federal records, company reports and other documents related to how effectively U.S. sanctions laws have been applied. According to the findings:

> The federal government has awarded more than $107 billion in contract payments, grants and other benefits over the past decade to foreign and multinational American companies while they were doing business in Iran, despite Washington's efforts to discourage investment there . . . That includes nearly $15 billion paid to companies that helped Iran develop its vast oil and gas reserves . . . Many of those companies are enmeshed in the most vital elements of Iran's economy. More than two thirds of the government money went to companies doing business in Iran's energy industry—a huge source of revenue for the Iranian government and a stronghold of the increasingly powerful Islamic Revolutionary Guards Corps . . . that oversees Iran's nuclear and missile programs.[10]

A closer look at the analysis underscores the sustained laxity and inconsistency of the U.S. government's enforcement of its own laws and regulations:

- Oil and gas companies that have done business in Iran have received lucrative drilling leases for close to 14 million acres of offshore and onshore federal land.
- Of the 74 companies *The New York Times* identified as doing business with both the United States government and Iran, 49 continue to do business there with no announced plans to leave.
- In the 14 years since the passage of the Iran Sanctions Act, which allows for punishment of foreign companies doing more than $20 million annually in business with Iran, the U.S. government "has never enforced it, in part for fear of angering America's allies." *The New York Times* authors describe how the South Korean engineering firm Daelin Industrial in 2007 won a $700 million contract to upgrade an Iranian oil refinery but rather than face punitive actions for its business operations in the United States it was "awarded a $111 million contract by the U.S. Army to build housing in a military base in South Korea." Shortly thereafter, "Daelin announced a new $600 million deal to help develop the South Pars gas field in Iran."[11]

The Obama administration reacted to these findings with a statement noteworthy only for being a paragon of doublespeak when a National Security Council spokesman claimed the U.S. government "was very

aggressive and used a range of tools."[12] A more accurate and honest assessment would be that the administration has not enforced existing sanctions laws aggressively and has far from comprehensive insight into the overall effect of the sanctions on Iran, a judgment also reached in a late 2007 report by the Government Accountability Office (GAO), which concluded that the overall impact of U.S. sanctions on Iran was "unclear."[13] It is difficult to convince other nations, beginning with Israel, that that the United States is serious about meeting the Iranian challenge or that the international community should support the U.S. request for additional sanctions when U.S. laws are enforced with the consistency of porridge. That the EU has enacted its own sanctions regimes may well reflect the perceptions of leading European nations about the nature of the Iranian threat as much as any convincing leadership on the issue demonstrated by the U.S. government.

The sanctions voted by the United Nations from 2006 to 2009 may have had little overall effect on Iranian behavior but reports began circulating in the first part of 2010 pointed to the possibility, albeit slim, that a series of more punitive actions targeted on the aging and fragile Iranian energy infrastructure would be advocated by the Obama administration. Secretary of State Clinton touted these as "crippling." The stated intent would have been to have a more dramatic effect than in the past on the Iranian economy and, by extension, Iranian policies. It became clear in the June 2010 UNSCR 1929 that Washington couldn't convince Russia and China to support a robust sanctions regime. The outcome constituted a missed opportunity Iran's oil and gas exports account for the majority of that nation's export earnings and about 40%–50% of its national budget.[14] Iran's proven oil reserves of about 137 billion barrels place it third behind only Saudi Arabia and Canada. Lurking behind statistics that underscore the central role of energy in the Iranian economy is a series of more negative trends. On the production side, in 1978, the year before the revolution, Iran was producing about 5 million barrels of crude oil a day. By virtue of a subsequent war, inefficiencies, corruption, limited investment, and the natural decline in the productivity of aging oil fields, Iran's current daily production has dropped to about 4 million barrels daily. Iran is seeking to reverse this trend with several major initiatives, including enhanced cooperation with China, second only to Japan in terms of the amount of oil it imports from Iran. The China National Petroleum Corporation in 2009 signed an agreement to help develop Iran's northern Azadegan oil field in two phases with the first phase due to be completed in 2014.

It will take years for Iran to substantially boost oil production and, by extension, its hard currency earnings although the mid-2010 crude oil price of about $80/barrel does no great harm to Iran's budget. The more immediate challenge for Iran, and the most glaring energy sector vulnerability, is Iran's need to import about 40% of its refined oil products. Iran's

growing population continues to demand gasoline (and diesel fuel) for their cars and trucks. Government subsidies of these commodities keep consumer prices artificially low, which hardly discourages conservation. Iran plans to slowly phase out these subsidies by 2015 but demand is unlikely to plummet. At the same time, Iran's limited refinery capacity requires foreign supplies of refined gas to meet consumer demand. In 2009 Iran's foreign suppliers of refined petroleum products included:

- CNPC (China)
- Glencore (Switzerland)
- Trifigura (Switzerland)
- Vitol (Holland)
- IPG (Kuwait)
- Litasco (Russia)
- Petronas (Malaysia)
- Reliance (India)
- Shell (The Netherlands)
- Total (France)
- Zhenua Oil (China)

Reports began circulating in early 2010 that as a possible result of pressure from the U.S. government that the Swiss firms, Glencore and Trifgura, along with the Dutch firm Vitol, have decided to quietly sever their business ties with Iran.[15] In toto, the three firms provide Iran approximately 130,000 barrels daily of refined oil, about one half of the country's entire daily total import. BP, Shell, and Total are reported to have ended their business relationships with Iran as well while two large insurance firms, Lloyds and Munich Re, have decided they would no longer insure cargo in and out of Iran. Perhaps the most noteworthy indicator of changing international perceptions of doing business with Iran has been the 50% reduction between January 2009 and January 2010 of China's import of Iran petroleum from 500,000 bbl a day to 250,000 bbl a day. This has occurred against the backdrop of a blistering Chinese increase in energy demand of 28% over the past year to 18 months. During this period, China was reported by the International Energy Agency to be increasing its reliance on Angola, Brazil, and Russia to meet this growing demand. These are encouraging signs that doubtless have not escaped the presumably less favorable judgment of Tehran's ruling regime.

There has been no official confirmation from the Obama administration regarding the role it may or may not have played in the decisions by the Swiss and Dutch firms. Assuming some U.S. "encouragement" of these corporate decisions, the U.S. government's willingness to play such a role

may be a harbinger of a more broader-based effort to impose, outside U.N. Security Council auspices, more punitive sanctions on Iran. The quiet diplomacy by officials such as Robert Einhorn, a highly experienced and well-regarded State Department expert on nonproliferation issues, has enabled the United States to exchange views with EU members on ways to move beyond the strictures of the U.N. sanctions. It is in this direction that U.S. actions should proceed even as it struggles with developing a sanctions regime within the confines of the Security Council. There has been considerable reservation in Washington policy circles over efforts to impose such punitive measures for fear the Iranian public would be punished, and as such might side with its government. The regime of course would portray the sanctions in exactly those terms. Punitive sanctions by their nature would impose burdens on the Iranian economy and citizens.

To mitigate the Iranian government's charges that it was being unjustly punished by the United States, it would be desirable for parts of the international community other than just the United States to reinforce the message of why the sanctions are being imposed and to convey the long-term support for the people of Iran—including its economic revitalization—when Iran's programmatic challenges are resolved. If imposed, punitive sanctions exact a price on the trading interests of various nations and their international companies, including those from countries friendly with the United States. Nations are loath to put at risk their commercial and political interests for some version of a "greater good," in this case trying to derail Iran's nuclear ambitions. Many of those nations, beginning with Russia and China, almost certainly do not perceive any direct security threat if Iran becomes a nuclear weapons state. As a result, they have been at best reluctant supporters of even the watered down UN sanctions. As noted, some changes in China's perception, for example, of the Iranian threat may be evolving but the international community has not been willing to take on the hard issues attending truly punitive sanctions against Iran. The irony is that this unpalatable step may be one of the last best chances to forestall Iran's attainment of a nuclear weapons capability short of the resort to force.

Frustration over Iran's programmatic advances and the international community's failure to slow them through effective sanctions also has driven a renewed effort within the U.S. Congress to force the administration to take more decisive actions. The Iran Refined Petroleum Sanctions Act was passed in the House of Representatives on December 15, 2009 and passed by the Senate on March 11, 2010. In an era where the Congress has found the passage of almost any significant legislation a herculean task, the bipartisan support for the bill—there were 343 cosponsors to Congressman Howard Berman's bill—and rapid passage in both chambers of Congress speaks to the growing sense that the Obama administration needs to change its approach to the imposition of sanctions. The

bill, which had not been signed by the president as of March 2010, would impose sweeping sanctions on the Islamic Revolutionary Guard Corps and the Central Bank of Iran. It also would build on the approach possibly taken already by the administration of making it difficult for Iran to meet its needed imports of refined petroleum products. One of the major provisions would impose sanctions on any governmental or business entity that was paid over $500,000 in a 12-month period for the construction, modernization, or repair of any Iranian refinery.

Even if signed by President Obama and implemented by the executive branch with greater diligence than past U.S. sanctions laws, it is far from apparent that the Iran Refined Petroleum Sanctions Act will compel fundamental changes in Iranian policy. Iran remains a major energy power despite its vulnerabilities in that sector and can be expected to actively seek alternatives foreign supply sources. In addition, U.S. goods can find their way to Iran if they are first shipped to various foreign nations that also actively trade with Iran such as the UAE and Malaysia. There also likely will be limited international support for punitive sanctions. For example, the legislation already has drawn criticism from EU spokesmen who assert that a U.S. law cannot be applied to non-U.S. entities. EU concern about any alleged extraterritorial application of U.S. law would be dissipated by the passage in Europe of legislation complementary to what has been passed by the U.S. Congress. Moreover, Russia and China may take quiet steps such as China's move to greater reliance on other foreign sources of petroleum, but for strategic and commercial reasons, are unlikely to avidly support any significantly expanded sanctions regime. If even the adoption of the type of punitive sanctions described above prove unsuccessful—and clear metrics to judge that question accompanied by a short timeline to do so should be established—there remains a final step short of war, a broader blockade of Iranian imports and exports. There is little evidence that the international community would support such a confrontational policy, in large measure because this could easily trigger a political crisis between Iran and the international community, the consequences of which would be difficult to calculate.

IS REGIME CHANGE A VIABLE OPTION?

The Green Movement or Green Revolution is the moniker given to the growing mass dissatisfaction with and demonstrations against the theocratic regime following the disputed and fraudulent June 2009 presidential election that returned Mahmound Ahmadinejad to power. A scant two hours after the polls closed official results were announced, trumpeting Ahmadinejad as the victor with 63% of the votes over his primary challenger, Mir Mousavi. Albeit often unreliable, no Iranian polling done before the election indicated that Ahmadinejad would draw anything

approaching that level of electoral support. Making the official results even more questionable was that the Iranian president by official count received uniformly high support throughout Iran, including in Mousavi's home regions.

The Green Movement can trace its origins to the mowj-e-sabz or green wave of Mir Hussein Mousavi, a leading reformist candidate for the presidency. Mousavi campaigned on a platform of criticizing the "excesses" of Ahmadinejad's foreign policy as well as the Iranian president's handling of the economy. From these modest roots the Green Movement in the election's aftermath has become significantly broader, both in terms of its mass appeal and objectives. On the latter point, its objectives at first focused on seeking a recount of the votes but have expanded into broader discontent with the regime's legitimacy. As a result, since June 2009 there have ensued a series of mass demonstrations, often timed to national days of remembrance or celebration, not only in Tehran but in other major cities, which have demonstrated the deep distrust of the regime. Swept to power by its own revolution in 1979, regime leaders beginning with Khameini and Ahmadinejad from the outset authorized a forceful and even violent response, using the police, the IRGC and the Basji as tools of repression. Estimates vary but at least 70, and perhaps many more, demonstrators have been killed, including Neda Agha-Solton, a young student whose needless death was recorded and seen by millions through various media outlets. Iran in early 2010 was planning the execution of six citizens arrested in the wake of December 2009 protests for "crimes against God." Scores more have been arrested and "show trials" have been staged against demonstration leaders. The two remaining opposition parties also have been banned as of April 2010.

This sequence of events shines a powerful spotlight on the moral bankruptcy of an Iranian government that has broken whatever faith it had with its citizens. Some observers in the United States and elsewhere have viewed these developments as a possible means to resolve the Iranian nuclear and missile challenge. Their logic is that the Green Movement could evolve into a sufficiently strong political force to overthrow the ruling regime, paving the way for a new government willing to implement fundamental change in Iranian policy, including negotiation of an acceptable outcome to the West's concerns regarding the nuclear and missile programs. They also advocate enhanced efforts by the United States to support the Green Movement with statements of support and financial assistance.[16] The appeal of a political solution from within Iran that ends both the regime's hold on power and potentially its military programs holds great appeal.

The more complex issue is whether the Green Movement can deliver on the domestic or international hopes invested in it. Contrary to some Western media portrayals, the Green Movement is neither monolithic in its

goals nor a juggernaut in its momentum. More than a year after springing to life, fundamental questions requisite for assessing the nature and prospects of the Green Movement are far from being answered definitively. For example, it is unclear who is running the Green Movement or whether in the foreseeable future it will have recognizable leadership. As described by one commentator, "But the solidarity on the streets hides wide—and growing—splits within. The ostensible leaders of the movement, Mir Hossein Mousavi, Mohammad Khatami and Mehdi Karroubi, are former high-ranking officials of the Islamic Republic who would likely keep much about the Islamic Revolution in place. Contrast this with the young men and women on the streets . . . the protesters are aiming to bring down the very system of which their leaders are a part."[17] This last point is perhaps the most critical; Mousavi and Khatami have made little secret of their view that Iran should be returned "to the ideals of Ayatollah Khomeini and the original principles of the Islamic Republic."[18] In addition, neither Mousavi nor Khatami would have chosen, under other circumstances, to lead a popular movement and each have played but a minor role in organizing and shaping the movement.[19] Moreover, President Ahmadinejad, although viewed by much, not all, of the international community with disdain, has delivered considerable governmental assistance to Iran's poorer classes and those living in rural areas and enjoys a measure of support from them for having done so. As such, some elements of the Iranian populace are not united in opposition to their president.

In terms of policy choices, the drawbacks for the course advocated by various commentators of increased U.S. support for the Green Movement are easy to discern and clearly have held sway with the Obama administration since the June 2009 Iranian elections. The most obvious is that the success of the Green Movement is far from assured. To date, the ruling regime has managed to keep the lid on the discontent of the demonstrators, albeit at a high price. The government has considerable resources at its disposal and has shown no reluctance to continue employing them. The Green Movement's putative "leaders" also are becoming increasingly distant from the aspirations for fundamental change expressed with growing fervor by the masses participating in the demonstrations. A new set of leaders may emerge, possibly from the younger generation, but it is far from certain when that will occur or who be in the leadership vanguard. Such uncertainties hardly encourage Washington support.

Concurrently, the Iranian nuclear program has advanced in many directions but still several technical challenges remain to be resolved. One of the favorite pastimes of various foreign policy pundits (and governments) has been predicting when Iran would "cross the nuclear threshold." The variables attending Iran's programmatic activities are of such magnitude to render almost any prediction either foolish or prescient. For our purposes it is estimated that Iran, currently in possession of enough LEU to make

two nuclear devices, will resolve by the second half of 2011 or soon thereafter any remaining technical problems associated with nuclear weapons production, design and delivery. From this perspective, it becomes a race against time as to whether the Green Movement can succeed soon enough, at least within the next year or two, to have a material bearing on the future direction of Iran's nuclear development. In the first half of 2010 it appeared that the Green Revolution had begun evolving into a civil rights movement that eschewed violent confrontation in favor of a longer-term strategy of agitation. Finally, any overt U.S. support for the Green Movement runs the distinct risk of being branded by the theocrats around Khameini and Ahmadinejad as U.S.-inspired or controlled, a damning critique in a nation chronically allergic to even the hint of foreign intervention in its internal affairs.

Against this backdrop of conflicting indicators, four possible, and widely varying, scenarios seem possible:

- The regime survives largely in its present configuration;
- The regime chooses or feels compelled to make some accommodations of reform with the Green Movement;
- Right-wing elements such as the IRGC stage a putsch that pushes Iran toward a military dictatorship; or
- The Green Movement succeeds in overthrowing the regime.[20]

Even with the considerable uncertainties attending the future of the Green Movement, on balance it is a reasonable and even desirable strategy for the United States to shed its posture of moral agnosticism regarding the Green Movement by embracing a policy of more overt, political support. Regime change is and should be considered a difficult but viable option whether it succeeds in time to affect Iran's nuclear plans. For the previously cited reasons, public expressions of support from Washington will have to reflect more nuance and subtlety than sometimes displayed in U.S. foreign policy circles but doing so is not impossible and there are reasons to make that effort. The Green Movement may well succeed; history is replete with examples where a political crisis reaches a "tipping point," possibly in a way or at a time wholly unpredicted, after which the situation is fundamentally altered. For Iran an outcome along those lines not only would offer a considerably better chance of diffusing the nuclear and missile threat than currently exists if it were to occur quickly but also would offer the Iranian public a long-overdue and well-deserved opportunity to shed the oppressive yoke of theocratic rule.

The Iran Democratic Transition Act of 2010, introduced by Senators John Cornyn and Sam Brownback, offers practical steps that should be considered by the administration. According to the bill, it should be U.S.

policy "to support the Iranian people in their efforts to oppose and remove the current regime and replace it with a freely elected, open and democratic government in Iran."[21] To accomplish this goal, the bill calls for "establishing U.S. assistance for democratic opposition groups by providing them non-military assistance, as well as humanitarian assistance to victims of the current regime."[22] It also would create a Special Envoy for Democracy and Human rights in Iran with the rank of ambassador to coordinate the U.S. government's efforts. President Obama has gone to considerable lengths to offer the Iranian regime the opportunity to engage the United States in a dialogue without preconditions. That offer has been spurned by Tehran, another in a long line of indicators that the current regime has no interest in reaching a political accommodation with the United States. The time has come for U.S. policy to accept that message and move its policy in a new direction. Honesty demands recognition of how difficult will be the chances of success if the administration changes its policy regarding the Green Movement, beginning with identifying a core of leaders committed to bringing about fundamental change.

In addition, to diffuse the charge that the administration's support is just a new version of a "U.S. government plot," the administration should solicit the widest base of international support possible for regime change. The leading European nations of course should be approached but In this respect it is worth focusing particular attention on the moderate Arab states in the region. They have as much at stake in Iran's future political course as does the United States or Israel and yet they seldom receive their political due in Washington. As in so many other areas of Middle East politics, there exist myriad reasons for approaching this issue with considerable caution. Many of the smaller Arab nations harbor deep suspicion, but also fear, of Iran and almost certainly would be reluctant to become publicly associated with calls for regime change. Many of those same Arab nations also have their own internal sensitivities to the issue of regime change. Nonetheless, the Green Movement would benefit from the political and financial support of the Arab governments in the Middle East.

Albeit far from a panacea, the appeal of U.S. policy support for the Green Movement is that it offers an option short of war and one that goes to the heart of the Iranian challenge, its political dimension. The limitations are the difficulty of bringing about forced regime change given the regime's still considerable instruments of oppression and the uncertainty of when regime change might occur. In contrast, the imposition of punitive sanctions (or in the extreme a naval blockade) and their success is not dependent on regime change but rather targets the regime and makes it clear those sanctions are in fact the result of the regime remaining in power. Both options merit the administration's strong consideration although punitive sanctions would appear to offer a greater chance of success.

The Military Option

For more than a decade, the use of military force against Iran as a policy option for delaying or stopping its nuclear and missile programs has loomed over policy debates in Washington and Tel Aviv. Many other nations doubtless have viewed this debate with considerable interest (not to mention concern), recognizing the significant, complex, and largely unpredictable long-term consequences of the use of force against Iran. Iranian officials, also obviously aware of possible Israeli or U.S. military actions against their nation, have taken a series of preparatory countermeasures.

- Their public pronouncements on the question include the oft-repeated assertion that Iran could withstand a major attack, and that it would respond in powerful and unexpected ways, including with attacks on U.S. military facilities in the region.
- The successful 1981 Israeli attack on Iraq's Osiraq reactor doubtless has factored into Iranian planning. Unlike the truncated status of Iraq's nuclear assets in 1981, Iranian facilities are numerous and scattered throughout the country. Many potential, high value targets are hardened, others are at least partially buried, or in the case of the recently uncovered facility near Qom, constructed in a mountainside for protection against attack. The attacking force, whether United States or Israeli, would find any Iranian attack scenario a much more daunting task than what the Israeli Air Force encountered in Iraq 30 years ago.
- Iran also has sought through arms purchases abroad to enhance its air defense capabilities around sensitive sites while developing improved capabilities to launch missile attacks against enemy naval combatants in the Straits of Hormuz and parts of the Persian Gulf.
- In late 2009, Iran conducted a major five-day air defense exercise, probably as much as a signal to Israel of Iran's readiness to rebuff an attack as it was a preparation of the Iranian air defense forces.

Senior officials of the Bush administration according to various sources are reported to have advocated and made extensive preparations beyond the usual military contingency planning for a U.S. military strike against Iranian nuclear and missile facilities.[23] In contrast, Obama administration officials have stated unambiguously that attacking Iran is the last thing they want to do given the current state of the U.S. military and its commitments in Afghanistan and Iraq. About as far as the administration is prepared to go is to formalize, after considerable debate, in its Nuclear Posture Review that in case of war it would reserve the right to use nuclear weapons against a nation in violation of its NPT obligations, a clear reference to Iran as well as North Korea. The U.S. nuclear arsenal is much reduced in size from its Cold War totals but still remains quite formidable. The announced change in U.S. nuclear strategy drew a stinging response from Ayatollah Khomenei who claimed the United States was "making atomic

threats against the Iranian people and that we will not allow America to renew its hellish dominance over Iran."[24]

Notwithstanding the fervor of Khamenei's rhetoric and how it might at some point be used to justify Iran's own nuclear plans, it is highly unlikely that the U.S. government under Barack Obama has seriously contemplated resorting to conventional attack let alone nuclear warfare against Iran. In April 2010, there appeared a report of a leaked three-page memorandum prepared in January 2010 by Secretary of Defense Robert Gates for the White House that raised questions about whether the U.S. government had effective long-range plans to deal with Iran's march to a nuclear weapons capability.[25] Among other concerns, Gates raised the prospect that Iran could become a "virtual" nuclear weapons state by advancing its program just short of actually crossing the nuclear threshold, a distinction he acknowledged would be almost impossible to verify. Publication of some of the memo's contents forced Gates to assert his intent in writing the memo had been misunderstood. Nonetheless, it was difficult to imagine the thoughtful Secretary of Defense penning such a memo if he believed administration strategy was well prepared to respond to an Iran approaching a nuclear weapons capability. The memo also came at a time when the Department of Defense was releasing a report assessing that the United States could be within range of Iranian missiles by 2015, an earlier date than more optimistic assessments previously presented by the U.S. intelligence community that had placed that vulnerability at 2012 to 2015.[26] The administration declared it had contingency plans at the ready for any eventuality; however, its resolve appeared something less than unshakable. Under these circumstances it is appropriate to consider the salient details and much greater feasibility of a possible Israeli attack on selected Iranian facilities.

For Israel, an attack on Iran would be viewed as rejection of past failed diplomatic efforts and a future policy of trying to contain a nuclear-armed Iran. It would be an extreme and final option that would be made only after myriad political considerations. Menachem Begin in 1981 made the hard choice to attack the Iraqi nuclear reactor and it is imaginable that Prime Minister Netanyahu would not shy from a decision to go to war if he and his government felt sufficiently threatened by developments in Iran. As the prime minister told the UN General Assembly in September 2009, the Holocaust has seared into Israeli consciousness the vulnerability of Israelis and that he felt a special burden to ensure there was never a repeat of that history.[27] Many factors would enter into Israel's decision-making on whether to go to war but Netanyahu's resolve would be among the most powerful.

In addition, Israel doubtless would be assessing the level of U.S. support for any Israeli decision that attempted to resolve by force the Iranian challenge. Such assessments are fraught with complexity, not only

because of the inherent dangers of military conflict in the region and all it would portend for America's political relationships in the region but also because of the unbridled antipathy between President Obama and Prime Minister Netanyahu over the question of Israeli settlements around Jerusalem. In the main, Israel would much rather see the United States succeed politically or resort to its own military actions rather than employing the Israeli Defense Forces in a highly dangerous and politically incendiary attack against Iran. The U.S. government under Barack Obama appears to some in Israel and elsewhere as placing its broader interests in the region above Israel's security interests. That perspective feeds the worry of some Israeli observers that the United States would cast considerable blame on Tel Aviv if in the wake of an Israeli attack gasoline prices soared while U.S. relations with the Arab world suffered. Such considerations, while profound, may not be sufficiently powerful to deter Israeli military actions given the life and death quality, often described as an existential threat, the Netanyahu government ascribes to Iran's nuclear ambitions. Under these conditions Israel may well have to look to its own security interest and use all means at its disposal if it deems the Iranian threat to have reached a point of no return.

In addition, any Israeli government's decision to go to war would trigger broad questions and intense debate within Israel's domestic scene, while the implications of an Israeli attack for others in the region as well as important nations outside the region would also factor into the deliberations. Those factors also are unlikely, ultimately, to restrain Israel from a decision to attack but they can't be ignored either. For example, the United States may be unlikely to carry out any punitive political or economic actions against Israel but that is not to say that various unilateral and multilateral responses wouldn't emerge in the wake of an Israeli assault. Israel suffered few, if any, enduring penalties from the international community after its 1981 attack on Osirak and may calculate such a political outcome would result following an attack on Iran, although that is far from assured.

International politics at times bends reality into new shapes and patterns. Only two years ago few would have predicted the noticeable cooling of Turkey's relations with Israel. It is unknown how and to what extent Israeli leaders factor that and other similar variables into their decision making. Conversely, the most useful military assessments demand the coldest light of objectivity unadorned by political posturing or bent to political pressures. The views of senior Israeli Defense Forces commanders regarding what could be accomplished by an Israel Defense Forces attack would come to the fore quickly and doubtless are already well understood in Tel Aviv. The impression that arises from conversations over the years with them is one of cautious optimism on their part mixed with a sober recognition of the challenges posed by such a complex operation.

Israeli civilian and military officials generally concede that no single attack, however robust, is likely to destroy the entire Iranian nuclear and missile programs or even set them back for a protracted period. Perhaps the best that can be hoped for is a several-year delay for critical elements of the nuclear and missile programs. Moreover, at what point should Israel consider launching an attack? For example, it is unclear at what juncture Israel would deem Iran to have crossed a threshold requiring military action given that considerable ambiguity is likely to attend key aspects of Iran's programs as has been the case for many years. One possible benchmark would be if Israel deemed Iran to be successfully enriching sufficient bomb-making quantities of uranium to weapons grade level. Since at least Prime Minister Netanyahu's first term in office in the late 1990s, various Israeli leaders have been pondering the risks and rewards of military action against Iran. They have refrained from pursuing that course of action, almost certainly after various and vigorous high level debates about the wisdom of doing so in the wake of Iran's programmatic activities. Israeli restraint will be sorely tested as it watches Iran continue to pursue its programmatic activities. The price of military action in many respects would be high; the long-term price to regional stability of a nuclear-armed Iran will be far higher.

If the use of force is an undesirable but possibly necessary last resort, it is instructive to assess how it might be accomplished and what are the prospects for success. Iran has constructed an extensive network of nuclear facilities scattered throughout many parts of the nation. A number of attack scenarios involving Israeli military assets have been detailed by highly experienced experts such as Anthony Cordesman and Abdullah Toukan.[28] To illustrate the complexity of the military options, we can assess one plausible attack scenario drawing upon the work done by Cordesman and Toukan. In this scenario an Israeli attack is focused primarily on three nuclear facilities at the heart of Iran's nuclear program, at Esfahan the Nuclear Research Center and uranium conversion facility, at Natanz the uranium enrichment facility and near Arak the heavy water plant and reactor under construction. A slightly more robust and related target set is added to include the hidden facility at Qom. In addition, and rounding out the strike list, there are a number of facilities associated with the Iranian missile program located near the nuclear facilities, including Hasa, near Esfahan, and Manzariyah, Bakhtarun and Khorramabad near Arak.[29]

Myriad factors go into the planning of an attack of this magnitude and complexity. It is assumed that the main attack would consist of aircraft of different types, including fighters, bombers, and refueling tankers. They would be accompanied by aircraft performing electronic monitoring and jamming missions. It is possible that cruise missiles also could factor into Israeli attack-planning as well as other options such as cyber attacks on Iran's computer network or efforts to disrupt Iran's electrical generating

IRANIAN NUCLEAR FACILITIES

Iran has constructed and developed an extensive network of facilities scattered throughout many parts of the country. Because their locations are one factor in any operational planning by Israel, the facilities have been grouped geographically into sites in the northern part of the country or around Tehran while a second grouping is for facilities south or Tehran. The names and locations have been derived from various sources.

Facilities in Northern Iran and Around Tehran

Bonab research and development facility

Tabriz engineering and defense research facility

Ramandeh uranium enrichment facility

Chalus weapons facility

Mo-Allem Kalayeh suspect nuclear research center

Damarand plasma physics research center

Gorgan research facility

Tehran vicinity . . . Atomic Energy Organization, Kalaye Electric, Sharif university research

Facilities South of Tehran

Qom uranium enrichment facility

Natanz enrichment facility

Esfahan Nuclear Research Center and uranium conversion facility

Saghand uranium mine

Arak heavy water plant and reactor

Darkhovin uranium enrichment site

Yazd milling plant

Bushehr light water nuclear power reactor

capacity. It also is possible to assess several key requirements for a successful attack. The first is the training and competence of the pilots. Because of the Middle East geography, Israeli pilots have had some but not extensive experience executing long-range missions. However, in recent years the Israeli Air Force has been exercising to enhance those capabilities. For example, in June 2008 the Israeli Air Force held a major exercise over the eastern Mediterranean involving 100 F-15 and F-16 fighter and attack

aircraft. Joining in the exercise were helicopters and refueling aircraft. The pilots flew about 900 miles, almost exactly the distance between some Israeli airfields and the Natanz facility in Iran. The exercise provided an excellent platform for the pilots to hone their skills while sending a strong political signal to both Washington and Tehran.[30]

Another factor in this assessment is whether Israel has sufficient numbers of aircraft capable of reaching the target set (supported by refueling tankers) and whether they can carry sufficient ordnance to inflict significant damage on those targets. Given that a number of targets in this scenario are hardened and/or buried, the type of ordnance used in the attack also would have to possess specific capabilities to destroy those targets. Could Israel meet these requirements? The answer for each of these issues is yes. Israel maintains a large inventory of U.S.-made F-15 and F-16 aircraft and a robust set of KC-135 and 707-type refueling aircraft manned by a highly capable group of aviators. For this limited attack scenario about 100 aircraft would be required and Israel's current order of battle could meet that requirement easily. Israel also would require an array of earth penetration or "bunker buster" munitions. There exists in the Israeli inventory a 2000-pound penetrating warhead capable of penetrating up to six feet of reinforced concrete and a 5000-pound penetrating warhead capable of penetrating up to 20 feet of reinforced concrete.

There are several attack routes available to Israeli pilots, including a southern attack route similar to what in 1981 was flown against Iraq. That route took Israeli pilots over a small part of Jordan and over Saudi Arabia before proceeding to target. Overflight of Jordanian and Saudi airspace would pose little operational risk but potentially higher political costs. A northern attack route also could be used in which Israeli plans would fly north from Israel toward Turkey at which point they would pivot to the East before proceeding southeast toward Iranian targets. Would Turkish military commanders alert Iranian counterparts if Turkish radar detected Israeli aircraft attempting to penetrate Iranian airspace via the northern route? Presumably high on Israeli military planning considerations in this respect would be a decision on how to best maintain tactical surprise and avoid to the fullest extent possible Iranian air defenses. Those air defenses are a mix of surface-to-air missiles and aging Soviet-era attack aircraft. Even Iran's limited air defense capabilities may well inflict some damage on attacking Israeli aircraft; a 20% loss rate would not be surprising. Nonetheless, Israel would have a high probability of inflicting significant damage on any Iranian target not hardened or buried and may be able to inflict at least moderate (and perhaps greater) damage on hardened facilities, depending on the number and accuracy of bombs placed on those targets.

In the aftermath of an Israeli attack there almost certainly would be a wave of regional and global repercussions. As noted, oil prices could be

expected to rise sharply, perhaps topping $200 a barrel, at least initially, and could remain for an indeterminate period at unprecedented high levels depending on the attack's aftermath. In turn, the global financial system, already battered by the depression of 2008–2009, would sustain another shock as investors calculated whether the region would be dragged into another war. Those are significant costs, including some that are largely unappreciated. For example, the United States spends about $400 to transport one gallon of oil to its forces in Afghanistan because of very long supply routes. Those costs would increase further in the face of a spike in oil prices after an Israeli attack. It is highly likely that the U.S. government would have little choice but to bear those additional costs.

Of even greater concern of course would be the responses taken by the Iranian government. What is known of the Iranian decision-making process suggests that the Supreme Security Council would take up the issue, in addition to the prominent roles to be played by key individuals, including Khameini and Ahmadinejad. It is probable but not a certainty that Iran would retaliate quickly or directly; a concerted increase in terrorist or direct military operations by Hezbollah or Hamas against Israel would be likely, with perhaps even greater intensity than the July 2006 military clashes. Iran also might set its sights on fomenting unrest in Iraq as U.S. military forces continue the process of leaving that war-torn nation. Afghanistan could be a target for increased Iranian terrorist activity. It also cannot be discounted that the Islamic Revolutionary Guard Corps would attempt some actions without political authorization. The Islamic Revolutionary Guard Corps controls naval assets and those could be deployed around the Persian Gulf both as a defensive measure and as a prelude to possible attempts to disrupt commercial traffic in the Straits of Hormuz and Persian Gulf. On the international political front, Iran also could seek to develop political support by portraying itself as the "victim" of Israel's attack but its responses are unlikely to end there. Iranian military commanders have threatened to carry out missile attacks using conventional warheads against Israel in retaliation to an Israeli attack. U.S. military bases in the region also could be targeted, an option, as noted, fraught with risk It is impossible to calculate the likelihood of that action but the dangers cannot be discounted. In a similar vein the more radical elements in the Iranian national security and military will command increased authority. Under those circumstances, possible Iranian military actions might be augmented by political gestures such as Iran's withdrawal from the NPT.

In a series of consequences following an attack on Iran that cannot be fully understood, one of the most unpredictable would be the reaction within Iran to news of the Israeli attack. In most similar settings, the conventional wisdom, amply demonstrated by many historical examples, is that citizens will rally to defense of their country in times of war. Given the considerable love of country by many Iranians, such an outcome

would not be surprising. Nonetheless, Iran's regime is under pressure from repeated demonstrations that have challenged its legitimacy. If even a significant percentage of Iranians held their government responsible for the Israeli attack or even deemed the government impotent in responding to the attack (two very different critiques), would the chances of the regime "muddling through" as described above drop precipitously?

The decisions for Washington would be as complex as those for Tehran. Politically, there would be inevitable calls in the UN Security Council for condemnation of Israel's attack. The United States probably would not vote to support such a resolution but it also might not veto it either. After the 1981 Israeli attack on the Iraqi reactor, the United States chose to abstain on a UN Security Council resolution of condemnation against Iraq. Would the Obama administration follow that model? A possibly even more difficult set of choices would attend Washington's responses in the security arena. Israel's many influential supporters in the United States would press the case for enhanced U.S. deployments to Israel of missile defense assets as well as an enhanced contingent of naval assets in the Persian Gulf. The strain on the U.S. Navy to do so would be considerable but probably tolerable. The United States already has one aircraft carrier operating in support of the campaign in Afghanistan. Other carriers at any one time may be deployed in other areas of operation or in U.S. ports for crew rest and refurbishment. It would be possible for the United States to increase its naval presence in the region as a strong deterrent to Iranian military actions but doing so would take as much as two weeks or longer depending on the then current operational situation.

CONTAINING AND COUNTERING A NUCLEAR-ARMED IRAN

Dread of the consequences of another war in the Middle East ultimately may mitigate against any Israeli decision to undertake preemptive actions against Iran. If so, and if the ruling regime remains in power, Iran is likely to become a nuclear weapons state. It may choose to approach the nuclear threshold, stopping just short of developing nuclear weapons in what is referred to as a breakout capability. For our purposes it is assumed that Iran crosses the nuclear threshold, becoming the tenth nuclear weapons state and the first since North Korea. Becoming a nuclear weapons state will impel Iran to a reassessment of its strategic relationships and place in the Middle East. How it might seek to translate this new status into policy changes will be Tel Aviv's and Washington's first concern. In addition, nations in the region (and beyond) also are likely to interpret Iranian nuclear success as a fundamental shift in the regional power balance. They also will have a series of decisions to make in response to that scenario.

There is scant evidentiary base upon which to draw insights into Iran's perceptions of how the regional political as well as military balance might

change once it becomes a nuclear weapons state. Having forsworn publicly and repeatedly the acquisition of nuclear weapons, there is not an available body of literature or series of pronouncements by Iranian senior political or military officials to serve as a guide. The following, albeit largely based on conjecture, offer considerations that may inform Iranian thinking:

- An Iranian nuclear weapons capability does not change the fact that there exist significant military capabilities potentially arrayed against the regime, including Israeli military forces in possession of at least 200 nuclear weapons and the U.S. Fifth Fleet. Iranian conventional forces still lack comprehensive conventional forces capabilities, reflected in an Air Force woefully less capable than that of Israel.
- Possession of nuclear weapons diminishes the likelihood, already probably remote, that any nation would invade Iran. It also may be seen by Tehran as providing "cover" for increased support for terrorist operations.
- Iran as a nuclear weapons state represents an unambiguous diplomatic failure for the United States with a concomitant loss of U.S. regional prestige. Nonetheless, the United States will remain the one nation that not only Israel, but also the moderate Arab nations can turn to for security assistance and support. The United States will not be relegated to second power status simply as a result of Iran acquiring nuclear weapons capability.
- Iran's nuclear status may trigger a new conventional arms race in the region and perhaps the move by some Arab nations to begin nuclear weapons programs of their own.
- A Shiite nation in possession of nuclear weapons may intimidate some Arab neighbors, but it also might foster enhanced cooperation on security issues among the Sunni nation nations that are members of the Gulf Cooperation Council.

In short, the paradox for Iran is that possession of nuclear weapons may signal a major shift in the regional security calculus but that shift may not translate, at least quickly, into tangible political gains. The ruling regime, if it is clever, will refrain from trying to quickly use its nuclear status for political gain as a heavy-handed approach may well backfire and generate responses for which Iran remains unprepared.

Iran may attempt to portray to the world its nuclear status (assuming it is even acknowledged), in relatively benign terms such as claiming a nuclear weapons capability was a necessary and defensive move in a region of hostile forces; but for Israel the inescapable reality is that a nuclear-armed Iran will continue to be seen as a deadly and existential threat. As a nation whose geography provides limited strategic depth, Israeli officials well understand that the use by Iran of even a few nuclear weapons could devastate the Israeli population. David Ben-Gurion's vow of "never again" doubtless will ring loudly in the ears of Israel's political leadership.

If military force is not used by the Israeli government, a variety of other responses could be set into motion.

The first of these could involve possible Israeli admission of its nuclear weapons status. Israeli leaders for several generations have adhered to the position that Israel would not be the first nation to introduce nuclear weapons into the region. They would be very reluctant to change that position but changing circumstances may demand new policies. Would the current Israeli leadership conclude that Iran's ascension to nuclear weapons status had rendered moot that long-standing position? Would Israel then feel unconstrained in acknowledging its own nuclear weapons status as a deterrent to Iran? Would such a choice in Tel Aviv have any meaning or increased deterrent effect in Tehran, already fully convinced of Israel's nuclear capabilities? Adding to the complexity would be the likely negative effect in the Arab world of an Israeli admission, possibly triggering pressures in some capitals for an "Arab response." Such are the ripples in the pond effect of a nuclear-armed Iran.

A nuclear-armed Iran would represent an extremely serious diplomatic setback for Washington. Since the 1950s, various Israeli prime ministers have requested U.S. government security alliances and guarantees. Those overtures have been rebuffed consistently. If Israel refrains from attacking Iran even in the face of Iranian acquisition of a nuclear weapons capability, the U.S. government should commit immediately to an unambiguous nuclear security guarantee for Israel. Secretary of State Hillary Clinton in 2009, the Obama administration's first year in office, had mentioned the possibility that the United States would offer Israel a "defense umbrella" under those circumstances. Most observers in Washington and Tel Aviv interpreted this ambiguous phrase to rule out U.S. nuclear assets as part of the "defense umbrella." Washington was not fully prepared to place its own security at direct risk on Israel's behalf although the Obama administration's nuclear strategy acknowledges the United States may use nuclear weapons in response to an attack on U.S. assets by a nation not in compliance with its NPT commitments, a reference to even a nonnuclear Iran. A U.S. nuclear security guarantee for Israel, a broader commitment than what is enshrined in current U.S. strategy, would be appropriate and it also would be a logical extension of that nuclear strategy. Nonetheless, a nuclear guarantee should not be open-ended nor serve as a cover or "blank check" for any future Israeli military attack against Iran. A U.S. nuclear guarantee would have to be clearly understood in Tel Aviv as being available only as the last resort. At the same time, would Washington have to consider extending some type of probably separate security guarantee to those Arab nations willing to accept such a commitment? Such might be the price for persuading nations such as Egypt or Saudi Arabia to refrain from developing their own nuclear weapons capabilities. The political implications of Washington making such commitments are

extremely complex; commitments by their very nature can limit a nation's freedom of action and force it into actions it might not want to take. None of those decisions can be made without extensive negotiation both within the respective capitals and between the prospective partners. The many elements of these considerations highlight the plethora of issues arising from Iran's nuclear challenge.

Finally, the longer term implications of a nuclear armed Iran are often overlooked by many observers. One such implication meriting particular scrutiny is Iran's development of nuclear command and control procedures. Acquiring nuclear weapons poses considerable technical challenges for every nation as described in Part I. Of equal complexity and importance is how nations decide to maintain and secure their nuclear arsenals and what the procedures will be for possibly authorizing the release of those weapons in a crisis. History shows that vulnerabilities and flaws in command and control procedures can lead to crises as dangerous as any provocative national policy.

The two most experienced nuclear states, the United States and Russia, have decades of experience in developing command control procedures. Nonetheless, both nations have encountered myriad security breaches despite the development of multiple security processes to protect their nuclear assets from theft and diversion. Russia has been the scene of numerous thefts of nuclear materials while security breaches at U.S. national laboratories as well as their epic inability to defend against notional terrorist attack scenarios carried out under Department of Energy auspices hardly inspires unbridled confidence in both nations' command and control procedures. More effective processes appear to be in place regarding the authorization to release nuclear weapons. Even here, inadvertent mistakes caused by technical or human flaws can be catastrophic. Fissile materials or nuclear weapons under the daily care of Iranian military or IRGC elements provides ample cause for alarm because through careless or conspiratorial activities, the security of those nuclear assets would be suspect.

Two incidents from the heights of the Cold War illustrate the kind of risks that may settle upon the Middle East in the future. In September 1983, Stanislv Petrov, a Soviet Lieutenant Colonel standing watch in an air defense bunker near Moscow, observed with growing concern as a newly installed computer warning system showed an intercontinental missile flying toward Russia, only to be replaced by another warning indicating that there were four inbound missiles. Petrov's duty was to alert higher authorities—he had no capability to launch a retaliatory attack on his own authority. Had Petrov alerted Soviet authorities it is unknown how they would have responded to the attack warning. Petrov exercised what turned out to be perfect judgment, deciding not to pass along the alert and judging that what the Soviet computer was displaying as a missile attack was in fact a computer error.

Soviet paranoia about U.S. intentions was at an all-time high during the 1980s for a combination of reasons, including recognition of Moscow's increasingly weakened political position, Ronald Reagan's visceral disdain for communism and, more tangibly, his decision to develop a missile defense system. In addition, the NATO decision to place Pershing II missiles in Germany capable of reaching Moscow in 4–6 minutes was an implacable response to the Soviet decision to put into service mobile SS-20 missiles that could hit European targets. U.S. military capabilities were in the ascendancy from Moscow's perspective. Soviet military doctrine at the time called for the use of preemptive military strikes to minimize the damage that would be inflicted by a massive U.S. attack. As early as May 1981, Soviet KGB chairman Yuri Andropov, who would become Soviet General Secretary a few years later, established Operation Ryan. Andropov ordered selected KGB field offices to begin gathering data on possible U.S. plans to launch a surprise nuclear attack on the Soviet Union. Perhaps mirroring Soviet thinking, Andropov believed the most likely scenario by which this would occur would be under the cover of a NATO military exercise. In November 1983 NATO was conducting a major command post exercise, Able Archer. This was notable for the use of new communications procedures—something the Soviet military had forecasted would be an indicator of possible attack preparations—as well as the unusual, personal participation of British Prime Minister Margaret Thatcher and German Chancellor Helmut Kohl. At the end of the exercise there was to be a simulated nuclear attack by NATO forces. NATO forces had no intention of undertaking any type of actual attack. Nonetheless, Soviet forces were placed on heightened alert. A confrontation no one wanted was averted but not without Soviet authorities seriously questioning NATO's intentions while preparing for the worst.

If Iran becomes a nuclear weapons state, Israeli forces will have no choice but to develop new alert procedures to warn of a possible attack. It too will have to place its missiles on heightened alert. Those procedures almost certainly will reflect Israeli thoroughness but they will be imperfect as are all human endeavors. Concurrently, Iran will be in the process of not only developing from scratch and placing in charge of daily security for their weapons and fissile material either the Iranian military or, possibly, elements of the hypernationalistic IRGC, while also having to develop their own procedures to warn against, and respond to, possible Israeli strikes. A crisis based on misinterpretation or misunderstanding is not inevitable but based on historical precedent, it is possible. Heightened alert procedures, short missile flight times between the two nations, and unsurpassed mutual suspicion and enmity would be a long-term toxic mixture for the stability of the region. Such will be the long and enduring shadow cast over the region by Iran becoming a nuclear weapons state.

CHAPTER 6

The Changing Face of the Nuclear Middle East

At the start of the 21st century, there existed only one (and undeclared) nuclear weapons state, Israel. In the Middle East, where oil is the lifeblood of many economies, there were no operating nuclear power plants, although a smattering of nuclear research reactors were in operation in some nations. Even ten years later the situation on the ground in most respects had not changed dramatically; after a protracted struggle to resolve myriad and long standing problems at the Bushehr nuclear power plant, Iran was finally planning to bring online in mid-2010 the region's first nuclear power plant. Iran's broader nuclear ambitions during the decade progressed significantly as many nations watched those developments anxiously. At the same time there had not arisen any new nuclear programs of proliferation concern, notwithstanding Syria's clearly nascent attempt to develop an alleged covert nuclear reactor that in 2007 was quietly and effectively destroyed by an Israeli air strike.

By the end of the decade, there were a growing series of indications that the relative nuclear quiet "on the ground" would not last. In 2008, the UAE unveiled an elaborate plan for nuclear energy development. At a meeting of the International Organization of Economic Cooperation and Development, both Israel and Syria announced plans for a civilian nuclear future. These were the most recent but not the only such nuclear plans emerging from various Middle East nations. According to nonproliferation expert Mark Fitzpatrick, from February 2006 to January 2007, the likelihood of a greatly changed face for nuclear power in the Middle East soared with no less than 13 countries announcing plans for various nuclear development programs.[1] These developments have been summarized by Fitzpatrick as follows:

Nuclear Announcements by Middle East Nations 2006–2007:

February 2006: Turkish Energy Minister Hilmi Guler announces plans to build three nuclear power plants by 2015.

April 2006: Morocco confirms plans to build its first nuclear power reactor, possibly by 2017.

July 2006: Yemeni president Ali Abdallah SAleh announces intention to foster the development of peaceful nuclear energy.

September 2006: Egyptian President Hosni Mubarak's son, Gamal Mubarak, says Egypt plans to revitalize its nuclear energy program. The first reactor is to be operational in 2017.

November 2006: Tunisia decides to undertake a preliminary study of the feasibility of building a nuclear reactor.

November 2006: Algeria announces interest in launching a "significant" nuclear power program.

December 2006: The six nations of the Gulf Cooperation Council announced a joint nuclear development program.

January 2007: Jordanian King Abdullah announces plans for his nation's nuclear development.

July 2007: Libya and France sign a Memorandum of Understanding on nuclear cooperation.

March 2008: Bahrain and the United States sign an MOU on nuclear cooperation.[2]

In early 2010, this trend continued with announcements by Israel and Syria at a meeting in Paris of the Organization of Economic Cooperation and Development that they each were making plans to pursue commercial nuclear energy development. Israeli Minister of Infrastructure Uzi Landau said Israel was looking to reduce its importation of coal to generate electricity while Syrian Deputy Foreign Minister Faysal Mekdad said that no nation or group of nations should hold a monopoly on nuclear technology.

What factors are leading so many nations in the region to look toward a nuclear future? From a broad perspective, they reflect an ever-growing trend in many parts of the world to look to nuclear power as a viable future energy source. The United States, Russia, China, and India share that perspective. There also are a series of sui generis regional issues contributing to this trend. The proximate cause for some nuclear plans in the region, including Egypt and Saudi Arabia, almost certainly is Iran's continuing drive for a nuclear weapons capability. No Sunni Arab nation will discuss this issue or their perceptions of the threat from a Shiite nation extensively in public, but abiding concern about Iran's intentions is never far from the surface. Some Muslim nations almost certainly see commercial nuclear development, because of the dual use nature of the technology, in their nations as providing, inter alia, a hedge against a future nuclear armed Iran. Concurrently, there also appears to be a growing appreciation in at least some of those same Arab nations that, cognizant of long-term trends in oil production and consumption, have concluded that their extended energy requirements, not unlike those in other nations elsewhere, are best

served by the development of non-fossil energy sources. In addition, mastering nuclear technology can be a source of pride for nations often lagging behind the West in various areas of science and technology.

Those perspectives are supported by a substantial environmental and financial evidentiary base. At a time when meeting the energy demands of the growing economies and populations in various parts of the globe through various fossil energy sources are adding to the planet's climate change, nuclear power reactors are environmentally clean, certainly when compared to other sources of electricity such as coal-fired plants. A complex set of considerations also shows that under certain assumptions that nuclear power plants, albeit expensive to construct, over the long-term can be cost competitive with other sources of electricity. Perhaps the most visible indicator of those factors tipping the balance toward a robust commitment to nuclear power is found in France, where about 80% of that nation's electric supply is provided by nuclear reactors. France has found nuclear reactors safe and reliable investments; a perspective not yet fully shared in the United States. Skepticism about the safety of nuclear reactors cannot be dismissed but may not factor as prominently in decision making in the Middle East.

From an outsider's perspective, nuclear power is far from being an unalloyed regional energy panacea. For example, safety issues may not be in the forefront of issues related to nuclear power but have not been fully allayed and concerns abound over the proliferation pitfalls for nations with limited, if any, experience with nuclear operations. Nuclear reactors sold by various Western entities are far safer than the crude Soviet-era design used at Chernobyl in Ukraine, the site of the world's worst nuclear accident in 1986, although human error also was a major contributor to the disaster. Nonetheless, while sophisticated nuclear power reactor designs exist, equally important for any nuclear power aspirant is creating a nuclear infrastructure and a sufficient number of properly trained technicians, both will require a considerable investment of time. Because all nuclear power plants produce nuclear waste, nations will grapple with the problem of disposing or storing the waste products, an issue that has vexed the United States for decades. Finally, for large nations such as Egypt, nuclear power offers the potential to provide far greater amounts of electricity that alternative energy sources such as solar or wind power; but even nuclear power cannot quickly replace existing methods of power generation.

A clearer picture of the role of nuclear power in the Middle East will require a decade or more to emerge. None of the various national plans, however bold or ambitious on paper, will translate into changed nuclear power capabilities quickly. Too many factors militate against quick success in any Middle East nation regardless of the timelines contained in some of the announcements. The cost of constructing even a single nuclear power plant can easily reach into the billions of dollars, a substantial financial commitment for a number of the "nuclear wannabees" in what remains

a very tight global financial credit system. The construction process for a nuclear power plant alone, once financial and regulatory hurdles are overcome, can stretch on average at least eight to ten years. Russia's efforts to construct Iran's Bushehr nuclear power plant extended approximately 15 years, in part because of the difficulties of melding the original German design with Russian technology and equipment. Finally, changed political circumstances in the Middle East could well affect the plans, or at least timelines, for various nuclear power plant projects. Political change comes slow to the region, the Israeli-Palestinian dispute seems endless and Libya and Egypt, for example, have been governed by the same presidents for decades. However, change also is inevitable and the coming decade will witness a new generation of leadership in Egypt, where Hosni Mubarak is older than 80 years of age, and elsewhere. The priority a new generation of political leadership will ascribe to nuclear power will be a defining element in the region's nuclear power future. For these many reasons, the nuclear picture in the Middle East in 2020 is likely to look much different than it does in 2010 and those changes could be profound in both their economic and security implications. Surveying a mix of large and small nations in the region provides insight into the pace and scope of the nuclear picture in years to come. In so doing, we also can begin to raise a series of questions, the answers to which enable us to better understand the changing face of the nuclear Middle East. In particular, they help to clarify whether there will be a nuclear arms race in the region resulting from nations seeking to counter Iran's nuclear ambitions.

- What are the political motivations underlying these announcements?
- Do the nations professing a commitment to nuclear energy development have the requisite financial and technical resources to implement their plans?
- Are Nonproliferation Treaty (NPT) signatories indicating a commitment to adhere to their NPT obligations?
- Will nations with nuclear energy development plans sign up to the Additional Protocol? Who has done so?
- Will nations with nuclear energy development plans pursue within their borders two of the most potentially dangerous proliferation activities, uranium enrichment or chemical reprocessing?
- How will nuclear fuel be acquired? One sign of the nonproliferation commitment of the nations involved would be their use of the international nuclear fuel banks to the fullest extent practicable.
- Do the national energy development plans call for the establishment of independent nuclear regulatory authorities with sufficient authority to monitor compliance with applicable laws and regulations?
- Within the nations pursuing nuclear energy development programs are there other suspect activities underway, unilaterally or collaboratively, in such areas as long-range missile development or nuclear weapons design?

SMALL NATIONS WITH LARGE POTENTIAL?

The UAE

The UAE has produced a white paper, "Policy of the United Arab Emirates on the Evaluation and Potential Development of Peaceful Nuclear Energy," which is a blueprint for an ambitious nuclear energy program. The document begins from the premise that the nation's energy requirements will increase by about 7% annually for the foreseeable future. The report does not merely rush to the judgment that nuclear energy will meet those requirements. The report claims natural gas and oil were assessed for their long-term viability and found wanting for economic and environmental reasons. Solar and wind sources of electrical power also are considered and are judged to contribute for the UAE only 6%–7% of assessed future requirements.[3] The UAE conclusion is that, "Stacked against the above options, nuclear power generation emerged as a proven, environmentally promising and commercially competitive option which could make a significant base-load contribution to the UAE's economy and future energy security."[4]

The UAE plan also goes to considerable lengths to address the safety and proliferation concerns attending a new nuclear power program, declaring a policy of "complete operational transparency:"

1. The UAE is committed to pursuing the highest standards of nonproliferation.
2. The UAE is committed to the highest standards of safety and security.
3. The UAE will work directly with the IAEA and conform to its standards in evaluating and potentially establishing a peaceful nuclear energy program.
4. The UAE plans to work with other governments and firms of responsible nations.
5. The UAE will approach its nuclear program in a way designed to enhance long-term sustainability.[5]

A closer look at these admittedly sweeping pronouncements indicates the UAE's thoughtful approach to issues of greatest importance from a proliferation perspective. The UAE study includes a commitment to build on its 1995 becoming an NPT signatory and 2003 Safeguards Agreement with the International Atomic Energy Agency (IAEA) by signing the Additional Protocol, which allows for enhanced inspections of nuclear facilities compared to the "basic" Safeguards Agreement. The UAE carried out its commitment and in April 2009 signed the Additional Protocol. The UAE also plans to strengthen its export control regime consonant with Nuclear Suppliers Group Guidelines. The physical protection of nuclear materials is planned for as is a process to store nuclear waste although in both areas

more detailed planning remains to be developed. Any theft or diversion of nuclear material will be treated as a crime.

It is hard to overstate the value of an independent regulatory authority and the UAE plan claims that such a regulatory body "is the cornerstone for any stable, credible, safe and secure nuclear energy program."[6] The UAE plan claims it will provide its regulatory authority the power to:

- Establish requirements and regulations for the nuclear industry;
- Issue licenses;
- Inspect facilities;
- Monitor and enforce compliance with regulations; and
- Establish a State System for Accounting and Control.[7]

The UAE has recognized correctly that a program of this magnitude requires a robust regulatory authority. There is to be established a Nuclear Energy Program Implementation Organization, an IAEA recommendation and described by the UAE as a "cornerstone" of its nuclear work, to guide all elements of the nuclear program, including regulations, licenses, inspections and compliance issues. Many of the aspects of the UAE plan have been incorporated into a 2009 Nuclear Law Act.

The UAE has begun to set these plans in motion. After considering ten candidate sites for the first round of nuclear power plant construction, the Braka site, located approximately 30 miles from Ruwais in Western Abu Dhabi in a lightly populated area with few environmental concerns and near the Saudi Arabian border, was selected as the site for four nuclear power plants. In part, the location reflects the UAE focus on Saudi Arabia becoming a major customer for the electricity that will be produced. A Japanese consortium led by the Korea Electric Power Corporation (KEPCO) and Doosan Heavy Industries will play leading roles while the U.S. firm Westinghouse will be part of the consortium.[8] Infrastructure construction is underway and the first reactor is planned in 2017 to come online, an ambitious timetable.

The Bush and Obama administrations have been supportive of the UAE desire to develop commercial nuclear power and that nation's program for implementation. A few days before leaving office, the Bush administration signed a 123 Agreement with the UAE (named after a section of the 1954 Atomic Energy Act) which promises "U.S. cooperation on civil nuclear power in return for safeguards against sensitive technology being diverted to a weapons program or another country."[9] The Obama administration has fully backed its predecessor's decision. In testimony on July 9, 2009 to the House Foreign Affairs Committee, Ellen Tauscher, Under Secretary of State for Arms Control and International Security, cited the

UAE's strong nonproliferation credentials as justification for the Obama administration's support of the 123 Agreement. She described it as a "ground-breaking achievement" in large measure because of UAE commitment to the Additional Protocol and that it agreed voluntarily to forgo uranium enrichment and chemical reprocessing of plutonium, the two elements of the fuel cycle with the largest proliferation potential. If all proceeds along expected lines, the UAE will become a significant regional supplier of nuclear energy, adding to the region's mix of energy sources.

Jordan

With a small and impoverished population of just 6 million people, Jordan does not possess robust financial resources but King Abdullah II has decided to invest heavily in a nuclear energy future for his kingdom. That decision reflects the reality that Jordan currently imports 95% of its energy and because of a growing population expects to double by 2030 electricity consumption. Jordan also confronts because of its growing population a substantial and increasing water deficit, compelling it to add nuclear desalination plants in coming years. Beyond these domestic considerations, by 2030 or perhaps a decade later, Jordan would like to become a net exporter of electricity, an ambitious goal.[10]

To operationalize these plans, Jordan has taken the conventional and appropriate steps of establishing in 2007 a Commission for Nuclear Strategy and enacting a law that creates a Jordan Atomic Energy Commission (JAEC) and a Jordan Nuclear Regulatory Commission (JNRC) with traditional division of responsibilities. Jordan will be highly dependent for many reasons on external technical assistance and his signed various nuclear cooperation deals with the United States, Russia, China, France, and the United Kingdom. The JAEC also has been working with KEPCO to carry out site surveys and feasibility studies for both nuclear power and desalination projects. The strong likelihood is that the nuclear power plants—four are envisaged in the long-term—will be located on the Red Sea coast about 25 miles from Aqaba. Construction on the first reactor is expected to begin in 2013 and in 2020 ready for operations.[11] The likelihood is that the first reactor will be supplied by the French firm Areva.

As one of the first nations to sign the NPT on July 10, 1968, Jordan has a long history of understanding its nonproliferation obligations. In a May 2009, Dr. Khalid Toukan, head of the JAEC, described some of the technical details and direction of Jordan's long-term nuclear energy efforts. He emphasized that Jordan mines would produce the uranium used to make yellowcake, an early stage in producing enriched uranium. Toukan added that the enrichment operations for use in the nuclear reactors will be carried out abroad, stating without equivocation that "no uranium will be enriched in the kingdom."[12] Given that a nuclear weapons program

requires not only fissile material but delivery means and weapons design expertise, both of which Jordan lacks and seems to have no interest in acquiring, Jordan's nuclear energy program should pose no long-term threat to regional security assuming appropriate security measures are put in place.

REGIONAL POWERS WITH HIDDEN AGENDAS?

Saudi Arabia

Saudi Arabia's political and financial influence has made it a regional power and leader of the Gulf Cooperation Council (GCC). As a leading Sunni nation (about 85% of the population are Sunni Muslims) Saudi Arabia to a significant extent views Iran, a Shiite nation (about 90% of the population are Shiite Muslims), not only a potential security threat, but also a global ideological competitor. Those perspectives will color the future direction of Saudi nuclear development, but they are not Riyadh's only considerations. For example, official Saudi estimates state that without diversification in the energy mix that the Kingdom by 2028 will have 3 million fewer barrels a day, down to about 7 million barrels a day for export, due to increased domestic demand. Nuclear energy is seen as an important way to fill that potential gap but doing so will take years to unfold. Saudi Arabia does not possess a robust national scientific cadre or nuclear technology infrastructure on which to base an indigenous nuclear power or nuclear weapons program. That situation will change assuming an emerging nuclear strategy is implemented.

A source of perhaps greater long-term concern is an evidentiary base suggesting that Riyadh's regional interests at least on several occasions may have brought the Kingdom into various cooperative activities dating to the 1970s with other nations related to nuclear weapons development. Reports from Mohammed Khilewi, a Saudi diplomat who in 1994 defected to the United States, assert that Saudi Arabia may have considered developing its own nuclear weapons program at a military base south of Riyadh as a result of Israel's 1973 military victory over Arab nations. The program would have been designed to provide Saudi Arabia a crude deterrent capability. These reports have never been confirmed by any official source. What appears more likely based on other information provided by Khilewi is that around the same time Saudi Arabia in the 1970s and 1980s became a heavy financial contributor, the total may have been as high as 2 billion dollars, to Pakistan's fledgling nuclear weapons program in the presumed but never documented hope of sharing in the glory and tangible rewards of aiding the development of a "Muslim bomb." Those financial contributions continued into the following decades. Saudi Arabia also may have provided in the 1970s and 1980s extensive financial support to Iraq,

possibly to include a quid pro quo of nuclear weaponry being provided to Riyadh if the Baghdad government succeeded in its nuclear ambitions.[13]

More recently, other reporting indicates that in 1998 as Pakistan was preparing to carry out a series of nuclear tests that would place it in the ranks of nuclear weapons states the Saudi government offered Pakistan "fifty thousand barrels of oil a day to overcome the impact of any Western sanctions that resulted from testing."[14] In May 1999, Saudi Defense Minister Prince Sultan made an official visit to Pakistan, escorted by A.Q. Khan and Pakistani Prime Minister Sharif to Khan's KRL facilities. The purpose of the visit was never fully revealed and probably covered a range of issues but speculation centered on Sultan's expression of possible Saudi interest in purchasing nuclear warheads, a rumor vehemently denied by the Saudi government.[15] In 2002–2003, as Khan's activities were being watched closely by various Western intelligence agencies, information began to suggest that Saudi financing of KRL was continuing, raising new questions of what Saudi Arabia may have been receiving in return for its financial generosity.[16] This reporting has never been fully corroborated but its timing raises its own set of questions.

In the aftermath of the 9/11 attacks in which Saudi nationals played a prominent role, in Riyadh there were questions whether U.S. political support for the Kingdom would remain untarnished. Concurrently, the continuing nuclear activities of its regional rival, Iran, fueled by the sensational reporting of the Iranian dissident group, hardly escaped notice in Riyadh. From this perspective it is not surprising that in September 2003 *The Guardian*, a major London-based newspaper, reported ". . . that a Saudi Arabian strategy paper was proposing the acquisition of nuclear weapons for their deterrent value as one of a number of options."[17] This report also was denied by Saudi authorities. There is no corroborating evidence that Saudi Arabia has tried to purchase recently nuclear weapons from any external source. Senior Saudi spokesmen also have stated repeatedly the Kingdom's support for a nuclear weapons free zone.

This backdrop serves to underscore the political considerations that may have influenced Saudi perspectives on nuclear weapon issues. Iran's continuing defiance of the international community regarding its nuclear ambitions almost certainly will continue to stoke Riyadh's concerns on nuclear questions as it sets out on a path of nuclear energy development. It would be contrary to Saudi diplomatic practice to seek to antagonize its regional rival gratuitously. Instead, Riyadh has taken a low-key approach to the creation of civil nuclear power even as it has invested heavily in solar energy development.

The Saudi government has chosen to participate in the GCC plan announced in 2007 for development of regional nuclear energy capabilities with advice from the IAEA. These plans are not nearly as well formed as those, for example, contained in the UAE national plan although the

UAE is supporting politically its GCC partners in the plan. It is unclear how nuclear fuel would be produced for any reactor although Saudi King Abdullah envisions creating a consortium in which uranium would be made available to anyone in the region, including Iran. Conversely, financial considerations appear much less murky; the funding for a series of nuclear power plants would be accomplished with little difficulty given that GCC members have garnered hundreds of billions of "petro dollars" over the past few years alone given the persistently high price of oil.

Saudi Arabia also is in the process of creating a national entity to move forward its nuclear plans, which are to contribute to a broader focus on creating greater diversity of power generation. Former Commerce Minister Hashem bin Abdullah Yamani has been named to head the King Abdullah Center for Nuclear and Renewable Energies located in Riyadh. Yamani's organization will oversee various implementation issues for the nuclear program such as the storage of radioactive waste and the drafting of a national policy on nuclear development. As with other nations in the region, part of that policy will be to use nuclear power for water desalination projects.[18]

The details Saudi Arabia has revealed to date suggests in the immediate future that it does not plan to undertake through its civil nuclear power program activities of proliferation concern. Saudi Arabia has hired the Finnish management firm Poyry to prepare a draft national nuclear strategy. David Cox, who is leading that effort, has opined that over time Saudi Arabia may want to get involved in many elements of the fuel cycle, including uranium enrichment, but initially would outsource such activities. The Kingdom joined the NPT in 1988 and has worked openly with the IAEA in developing the GCC plan. At the very least, Saudi Arabia appears to have no interest in generating the type of suspicions that have surrounded Iran's nuclear program for decades. At the same time, Saudi Arabia will continue to watch closely the progress of Iran's program and the directions it takes. Should the Iranian program continue to advance in threatening ways as seems likely, the pressure will only increase in Riyadh to consider its own nuclear weapons program. This is not to say that Saudi Arabia would make that decision quickly or lightly as many factors will be taken into consideration. For example, in addition to its threat perceptions regarding Iran, a critical factor in any Riyadh decision is likely to be its assessment of future U.S. commitment to Saudi security interests. Nonetheless, in the past Saudi Arabia has been willing to pursue policies and partnerships not only with Pakistan but also China—the 1980s purchase of 50–60 long-range CSS-2 missiles is a prime example—that underscore that Washington ignores Saudi security concerns at its peril. The Saudi dilemma of whether to look to the East or West for its future security partnerships illustrates the enduring challenge of Iran's activities.

Egypt

Egypt has a long history of interest in nuclear technology and nuclear energy. This interest dates to the mid-1950s and may have been influenced by President Eisenhower's Atoms for Peace plan as well as a 1955 Conference on Peaceful Use of Atomic Energy, which provided insights into how nations could develop nuclear energy. In 1955 President Gamal Nasser established an Atomic Energy Commission.[19] Until about 1953 the Soviet Union had been an ally of Israel but soon thereafter became a supporter of Arab causes, including Nasser's political ambitions and security agenda. One result was the 1956 signing of a bilateral nuclear cooperation agreement. During this period Egypt also began investing in a ballistic missile program. Egypt acquired subsequently from the Soviet Union a small, light water nuclear research reactor located in the Nile Delta. The reactor was not under any type of international inspection regime but produced only minute quantities of plutonium.

Egypt was an early (1968) signatory of the NPT but delayed ratifying it almost certainly because of mounting concerns over the activities of Israel's nuclear program. The Israeli announcement on December 21, 1960 that it was developing what it termed a research reactor at Dimona was greeted with great concern and subsequent skepticism in Cairo but through the 1960s Egypt chose not to attempt to match Israel's nuclear developments. Its preferred path after the bitter results of the 1967 conflict was to concentrate on enhancing with Soviet assistance its conventional military forces although even with years of preparation the Egyptian military would again fall short of success in 1973 as demonstrated by the outcome of the war with Israel. In 1975, the United States and Egypt set in motion a plan by which the United States would provide up to eight nuclear power plants. Within several years the agreement fell through when Washington began to impose a series of unilateral demands related to the operating parameters of the plants, resulting in Egypt deeming the codicils unacceptable. As a result, Egypt in 1981 ratified the NPT with the intention of using its "peaceful uses" language as a means to develop a new set of international partners. For example, President Anwar Sadat in 1981 announced plans develop at least two nuclear plants but those plans were never fulfilled.

Egypt's contemporary thinking on nuclear issues mixes nuclear energy development plans (albeit more slowly developed than those in neighboring states) with a warning to the region and beyond that raises a series of concerns about possible proliferation activities. On the one hand, Egypt describes its growing need for electricity—estimated at 7% annually over the next decade—as requiring the development of Egypt's first nuclear power plant. The Nuclear Safety Authority has been assessing the feasibility of locating such a plant near El Dabaa, about 100 miles from Alexandria

on the Mediterranean coast. The 1000-MW project would cost at least $1.5 billion. Egypt has described plans to construct an additional three nuclear power plants by 2024.

On the other hand, Egypt has not committed to signing the Additional Protocol and its view of emerging political forces in the region may partially explain this. Egypt, proud of its long history of leadership within the Arab world, has been the most vocal of all the prominent Sunni Arab nations in its possible response to Iran becoming a nuclear weapon state. While professing support for the long-standing idea of a nuclear free zone in the Middle East, senior Egyptian officials also have warned they will not sit by idly if Iran's nuclear ambitions reach fruition. In May 2010, Egyptian ambassador to the United Nations Maged Abdel Aziz, at the conclusion of the NPT Review Conference, presented the Egyptian positions succinctly, stating:

> We in Egypt are against even the presence of nuclear weapons in our region. But if others will acquire nuclear weapons—and if others are going to use these nuclear weapons to acquire status—we are not going to accept to be second class citizens in the region of the Middle East.[20]

If such statements are more than an Egyptian attempt at "rhetorical deterrence," two issues arise relevant to a possible Egyptian response to a nuclear-armed Iran. The first is the inevitable evolution of Egyptian politics. Since October 1981 President Hosni Mubarak has governed with a strong hand. Born in 1928, Mubarak has not enjoyed robust health in recent years and almost certainly has been grooming his son, Gamal, who has worked as an investment banker in London before returning home to ascend rapidly in Egypt's ruling National Democratic Party, as Egypt's next president. Gamal has been developing his own political persona and as far back as 2006 called for Egypt to enhance its nuclear technology capabilities. Presidential elections are scheduled for September 2011; the elder Mubarak has not ruled out running for another term either. Egypt's intricate and cumbersome process for selecting presidential candidates resulting from constitutional changes in 2005 and 2007 makes it very difficult for individuals outside established political circles, such as former IAEA Director General el Baradei, to even mount a legally approved campaign for the presidency.

The likelihood is that either Hosni Mubarak or his son will run the country after the next election. As has been the case for decades, they will do so with the Army wielding considerable influence on security (and other) issues. If it felt compelled to do so, Egypt may be prepared to back up the Ambassador Aziz's rhetoric with the commitment of resources for a robust nuclear weapons development program. However, that decision, doubtless the product of intense internal debate, would be anything but

automatic or an easy matter given the myriad demands for those resources by Egypt's large and impoverished population. Moreover, Egypt is one of the largest recipients of U.S. foreign aid and military assistance; Washington's ties to Cairo run long and deep. Egyptian officials almost certainly would recognize they would be placed in jeopardy if there was established a nuclear weapons program. It is highly unlikely that the Obama administration would do anything, if circumstances arose, but press Egypt to refrain from undertaking a nuclear weapons program. Israel and Saudi Arabia also would figure into the Egyptian calculus of how to respond to Iran becoming a nuclear weapons state. Israel is highly unpopular among the Egyptian population but the current state of peaceful relations serves the interests of both national capitals. Cairo also would watch closely for signs of Saudi Arabia instituting a nuclear weapons program and may feel compelled to take a similar path.

One of the enduring lessons for many nations seeking nuclear weapons capabilities is that there exists a considerable gap between aspiration and capability. Even if the government in Cairo decided in the next few years to ignore its NPT obligations and commit the resources requisite for developing a nuclear weapons capability, presumably as a hedge against Iran, acquiring that capability would likely be a lengthy process. For example, at present Egypt lacks the nuclear infrastructure to produce fissile material and overcoming that would be a significant stumbling block. This is not to say Egypt wouldn't pursue that path for the reasons cited previously. It has been at odds previously with the IAEA in the early years of the past decade over what was termed in an IAEA Report to its Board of Governors as "repeated reporting failures" related to uranium conversion experiments and "activities related to reprocessing."[21] In addition to Aziz's assessment of regional political development, other Egyptian officials also have spoken of Egypt's right to acquire and develop all parts of the nuclear fuel cycle. The course of Egypt's nuclear development in the coming decade likely will be tied closely to a complex assessment of its domestic energy requirements as well as developments in Iran, Saudi Arabia and Israel. This mosaic of factors will only serve to reinforce the fragility of security relations in the region.

Turkey

Assessing Turkey's nuclear future requires recognition of several unique factors. Turkey is the only NATO member in the Middle East and, as discussed in the previous chapter, the only Arab nation that over the past several years has moved its foreign policy appreciably closer to Iran. This policy tilt was demonstrated by Turkey's vote against the June 2010 UN Security Council Resolution that imposed a new round of sanctions on Iran. Having been denied membership in the EU for years, Turkey seems

prepared to adopt an increasingly activist posture in Middle East politics. Moreover, by virtue of its strategic location Turkey already has a number of non-nuclear energy options not available to many other nations in the region.

A number of factors also suggest Ankara's likely nuclear path does not include becoming a nuclear weapons state in response to any developments in Iran. It is unclear that the Turkish government even sees a nuclear-armed Iran as the biggest threat in the region. Turkey is grappling with its own problems, beginning with the ever-restless Kurds, and has little reason to view an Iran with nuclear weapons as any direct security threat. Moreover, and also unlike other Arab nations, Turkey is a functioning democracy and popular opinion, often not a decisive element in the decision making in other Arab countries, long has opposed (and effectively) Turkish pursuit of commercial nuclear power. On the foreign policy front, Turkey probably judges it can rely on its NATO membership as a security umbrella and likely would be reluctant to alienate its still important ally, the United States, by development of a nuclear weapons program. Turkey's nonproliferation bona fides also are appreciable; it was a 1969 signatory to the NPT, ratifying it in 1980, and has signed the Additional Protocol. Finally, on a more practical level, Turkey has two small research reactors but no operating nuclear power plants and no industrial scale enrichment or reprocessing facilities.

These factors suggest Turkey would not seek to acquire its own nuclear weapons capability without considerable provocation. Nonetheless, Turkey would not take a sanguine view of developments that led Iran to becoming a nuclear weapons state. Part of that perception has an historical basis. The bilateral relationship has been far less tumultuous than many in the region and much of that traces to a rough balance of power between the two large neighbors. It is well understood in Ankara that Iranian possession of a nuclear weapons capability would shift the balance immediately and dramatically in Tehran's favor.[22] That perception goes a long way to explaining Turkey's extensive efforts and recent cooperation with Brazil to negotiate with Iran the transfer of Iranian low enriched uranium which could be enriched to higher levels in exchange for fuel that could be used to support the operations of a research reactor.

On balance, it appears Turkey will make another attempt to develop commercial nuclear power. As long ago as 1956 Turkey established an Atomic Energy Commission, which was replaced in 1982 by the Turkish Atomic Energy Authority (TAEK). Both organizations were involved in various efforts in the 1970s and 1980s to construct nuclear power plants but those plans fell through for various reasons. TAEK has used its authority to develop a wide ranging set of regulations that would govern virtually all facets of nuclear plant operation, including accounting procedures for special nuclear materials, the physical protection of facilities, assessment

of compliance with applicable regulations and specialized technical training. Under Turkish law the Ministry of Environment will conduct environmental studies of possible nuclear reactor sites.

In May 2010, Turkey appeared to be taking additional steps toward developing nuclear energy. During a visit to Istanbul, Russian President Dmitry Medvedev singed a series of agreements with his Turkish counterpart, Abdullah Gul and met with Prime Minister Erdogan. At the top of the bilateral agenda were agreements furthering plans for an oil pipeline from the Black Sea to the Mediterranean. In addition, a deal was signed for Russian assistance in developing a nuclear power plant near Mersin on the Mediterranean.[23] Reactions to the nuclear agreement were not universally favorable. Necdet Pamir, a Turkish energy expert, was quoted as saying that, "if we add dependency on nuclear energy on top of the current energy trading from Russia, it's inevitable that we get concerned."[24] Those concerns may explain Turkey's subsequent decision to hold talks with a South Korean consortium for other future nuclear power plant development.

1. Our survey of key individual nations and their nuclear programs—civilian or possibly military—provides a useful gauge of the evolving security challenges in the region. Progress in the nuclear development plans of even some of the nations considered herein may yield a new energy mix that transforms the region and in a wholly positive way that one day may come to be seen as a renaissance for nuclear energy. Nonetheless, there is ample cause to ponder the proliferation consequences of Middle Eastern nations pursuing nuclear development programs. In a region where suspicion reigns supreme, it is almost impossible to imagine that these programs three, five or ten years in the future will be viewed universally in a benign light. In addition, these individual programs, even if overwhelmingly consistent with NPT principles and commitments, will, over time, introduce large quantities of nuclear technology and expertise to the region. The consequences of that development require additional future study by experts and consideration by policymakers.

CHAPTER 7

Beyond the Middle East: The Changing Face of Nuclear Security Challenges in the 21st Century

At the dawn of the 20th century there were those in the scientific ranks who held that almost everything worth knowing in physics had been discovered already. They were wrong. Lying in wait of discovery was the secret of the vast energy inherit in the atom. By the second decade of the 20th century, there had emerged a small cadre of scientists who began delving feverishly into the research and experiments that would uncover those secrets. Europeans such as Albert Einstein, Leo Szilard, Eugene Wigner, Niels Bohr, Hans Bethe, and Enrico Fermi were at the forefront of this research, joined in the United States by another group of first-rank physicists such as Robert Oppenheimer and Ernest Lawrence.

As it would in so many other countless ways, the rise of fascism in Germany and Italy and militarism in Japan that led to the outbreak of World War II would dramatically alter the trajectory of nations and radically alter the scientific focus on the atom. Perhaps most significantly, the rise of Nazi Germany and its unrelenting hostility toward Jews led to the flight from Europe of many of the best scientific minds of the generation. Displaced but unbowed, many of those scientists came to the United States to carry on their work. As Hitler's Germany marched from one military victory to another, beginning in Poland in 1939 and extending through much of western Europe by 1941, it became apparent that scientific research into nuclear energy could no longer remain an academic exercise. The scientific elite, now mainly working in American laboratories, understood the theoretical possibility that atomic energy could be harnessed and turned into the most fearsome weapon devised by mankind. They also understood

that if developed and brought to fruition by the demonic political regime of Nazi Germany, the scales of war could be tipped against the allies and conceivably plunge the world into another dark age.

For Szilard, a Hungarian, and Einstein, a German, the outbreak of war in Europe had a galvanizing effect. They realized that Hitler's Germany, although now largely depleted of its best scientific talent, still might commit whatever resources were available in Germany or in the conquered nations (such as trying to acquire the heavy water produced in Norway) to develop an atomic device. The question became what to do about these concerns. Despite having an ego matching his prodigious intellect, Szilard realized his voice alone probably was insufficient to sway the U.S. government into action. For this reason he turned to his closest colleagues, including Edward Teller and Eugene Wigner, to begin what in modern parlance would be termed a lobbying campaign to warn the U.S. political establishment, beginning with President Franklin D. Roosevelt, of Germany's looming threat. The centerpiece of this campaign would be Albert Einstein as there was no more respected scientist alive than the diffident former German patent clerk whose general theory of relativity made him not only a Nobel laureate in 1922, but also one of the most famous men in the world. Szilard held his friend Einstein in especially high regard and set out to enlist the eminent scientist's assistance in convincing President Franklin Roosevelt of the dangers posed by a possible German mastery of nuclear energy. An exchange of several drafts between Einstein and Szilard, as well as a visit to Einstein's Long Island home by Szilard, Wigner, and Edward Teller resulted in a letter dated August 2, 1939 from Einstein to President Roosevelt. Delivered to the U.S. president by his unofficial adviser Alexander Sachs, Einstein's letter conveyed his belief that recent work by Fermi and Szilard "leads me to expect that the element uranium may be turned into a new and important source of energy in the immediate future" and that "vast amounts of power . . . would be generated." Einstein expected that this would "lead to the construction of bombs."[1]

Within a month the world would be plunged into war on September 1, 1939 when Germany invaded Poland. Einstein's letter did not have much immediate effect on Roosevelt. The U.S. president harbored no illusions that the country would be spared getting dragged into the conflict but isolationist sentiment in America was strong at the time. The United States would not enter the war until after the December 7, 1941 Japanese attack on Pearl Harbor. Nonetheless, once America had entered the war Einstein's letter set the stage for what would become the massive and secret Manhattan Project to develop an atomic weapon. Led on the scientific side by Robert Oppenheimer and administered by Leslie Groves, a gruff Army general, the Manhattan Project, for the then princely sum of 2 billion dollars, would produce the fissile materials and develop the infrastructure for the U.S. nuclear establishment that would usher in the atomic age. The

success of the Manhattan Project was revealed when on July 16, 1945 the first nuclear device was exploded in what Oppenheimer called the Trinity test (named after the poems of John Donne) at the Alamogordo Bomb Range approximately 200 miles south of Los Alamos, New Mexico, the town that had become the de facto centerpiece of the Manhattan Project work.

The war in Europe as well as Roosevelt's presidency ended in spring 1945 but the program continued apace under the new U.S. president, Harry Truman. As U.S. forces closed on the Japanese home islands, the broad consensus in the U.S. military establishment was that an invasion of Japan could result in 1 million U.S. casualties. Truman, who as a senator in the early parts of the war had inquired about the resources being committed to the Manhattan Project only to have his questions brushed aside by Secretary of War Henry L. Stimson, decided the new weapon could be used to shorten the war and reduce American loss of life. With presidential approval, within weeks of the Trinity test atomic weapons would be used twice over Japan, the first on August 6, 1945 above Hiroshima and on August 9 above Nagasaki. Fire bombings over Dresden, Germany and Tokyo, Japan had inflicted enormous damage and casualties in the latter stages of the war but atomic weapons were an entirely new form of weaponry. The frightful devastation that befell both cities in mere seconds ended the war in the Pacific and also established the United States as the most powerful nation in the post-war world. America's atomic monopoly would last only for four years when the Soviet Union, benefiting from a highly successful espionage campaign, exploded its own nuclear device in 1949.

In the ensuing years what would soon become a Cold War clash of competing ideologies between the superpowers would lead the world to the brink of nuclear conflagration when Nikita Khrushchev, no stranger to reckless schemes, attempted to place nuclear-tipped missiles in Cuba, triggering the 1962 Cuban missile crisis. Seared by the prospect that even a handful of nuclear weapons could devastate any nation, President John Kennedy, who displayed extraordinary sang froid during the crisis, became a fervent opponent of the proliferation of nuclear weapons, including strong opposition to what he feared (correctly) was Israel's clandestine attempt to acquire nuclear weapons. Not long before his tragic assassination in late 1963, Kennedy prophesized that by 1970 there could be as many as 15–20 nuclear weapons states. His estimate was badly overstated although by 1964 the nuclear club had been expanded by successful nuclear tests being carried out by the United Kingdom, France, and China.

Since the Kennedy era, nuclear weapons have not been used once in war. During the decades of the Cold War, the United States and Soviet Union developed and deployed approximately 30 thousand nuclear weapons of

various types, a figure that aptly demonstrated the notion that in their nuclear competition they were "apes on a treadmill." Nonetheless, at the same time the United States and Soviet Union came to understand that nuclear weapons had utility as weapons of deterrence and their greatest utility was in the mere fact of their existence. In the face of these developments it is perhaps no small wonder that the proverbial nuclear genie was kept in the bottle.

The superpower nuclear rivalry was only part of the unfolding story of nuclear weapons in the international community. After China achieved nuclear weapons status its poor political relationship with India triggered India's own nuclear weapons program which culminated in the successful 1974 detonation of a "peaceful nuclear device." The response from the international community was largely muted but Pakistan, India's bitter rival, surely took notice. By the mid-1970s, the young Pakistani metallurgist A. Q. Khan was stealing sensitive uranium enrichment plans from the European consortium Urenco. Khan's clandestine efforts also were coupled with Chinese assistance to Pakistan that underscored the maxim that "the enemy of my enemy is my friend." In 1998 this combination resulted in Pakistan becoming a nuclear weapons state. In the 1990s North Korea, that most troubled of nations, embarked on its own quest for nuclear weapons, ultimately withdrawing in 2003 from the Nonproliferation Treaty (NPT).

More recently, Syria provided in several respects an unusual and complex proliferation challenge. Syria was a July 1968 signatory to the Nonproliferation Treaty. As part of that commitment it also has agreed to full scope safeguards allowing for an International Atomic Energy Agency (IAEA) inspection regime, although it has not signed on to the Additional Protocol allowing for enhanced inspections of any nuclear facilities extant in the country. Syrian political support to terrorist organizations long had been a source of deep concern to U.S. and Israeli officials. Nonetheless, prevailing conventional wisdom held that Syria lacked the financial and scientific resources to develop a credible nuclear weapons program although beginning in 1979 Syria had develop some limited nuclear research reactor capabilities allegedly for medical applications. Some U.S. officials such as Undersecretary of State John Bolton in 2002 did warn of a Syrian weapons program possibly benefiting from external assistance from Iran or elsewhere but there was little sustained attention paid to Syria until late 2007.

On September 9, 2007, Israeli warplanes attacked what was reported subsequently as "a partly constructed nuclear reactor, apparently modeled in size and shape on one North Korea had developed at Yongbyon to create its stockpile of nuclear weapons fuel."[2] The suspect facility, located in eastern Syria within about 800 meters of the Euphrates River, consisted of a large building and a possible pumping station adjacent to the river to

provide the large amounts of water used by a nuclear reactor. The ultimate strategic intent of the Syrian project of course has never been revealed but the project, whatever its purpose, clearly was in its nascent stages. Adding to the uncertainty was the source of the funding for the project although unconfirmed rumors swirled that Iran may have provided assistance in this area. Within approximately 1 month of the attack, Syria took a set of well-documented actions to totally raze the facility, leaving virtually no traces of its existence.[3] Some have suggested that Syria had no obligation under the NPT to declare a facility in the early stages of construction to the IAEA. This can be disputed as the IAEA Safeguards Glossary calls for design information for new facilities "is to be provided by the state as early as possible before nuclear material is introduced."[4] Many drew parallels between the attack on Syria and the Israeli 1981 attack on the Osirak reactor as both were preventive and not preemptive in nature. The legal distinctions may be important to scholars but Israel's security concerns clearly were judged to be paramount.

These cases of nuclear proliferation are still only part of a story that also has some positive elements. Smaller nations were proving that nuclear capabilities were no longer the sole province of the major, scientifically-advanced nations but a number of nuclear-capable nations also were forgoing the option of becoming nuclear weapons states. Japan, Germany, Italy, Argentina, and Brazil, among others, had the requisite understanding of nuclear energy to develop their own nuclear weapons programs. In the cases of Japan, Germany, and Italy, it is widely understood that an invisible but credible U.S. nuclear "umbrella" weighed heavily on the directions taken by Tokyo and Rome.

There also have been several cases where nations in possession of nuclear weapons have taken the political decision to abandon those programs. It is worth considering what factors are responsible for those decisions. Why do nations decide to give up a nuclear weapons capability? Two nations, Ukraine and South Africa, provide insight into this question. In the aftermath of the 1991 breakup of the Soviet Union there emerged three newly independent states, Ukraine, Kazakhstan, and Belarus, suddenly in possession of their own nuclear arsenals. The U.S. government, first under President George H.W. Bush followed by President Bill Clinton, took the firm position that the security interests of all concerned would be best served by those states returning those nuclear weapons to the Russian Federation, which had emerged as a legal entity after the USSR dissolved. This was one issue on which the new Russian government agreed completely with the United States' position.

In Ukraine's case this was a particularly vexing problem. As the Soviet Union was collapsing as a legal entity in late 1991, Ukraine, on the cusp of independence, found itself almost literally overnight in possession of the world's third largest nuclear inventory, approximately 1800 strategic

nuclear warheads, 4000 shorter range tactical nuclear warheads, and 560 air-launched cruise missiles.[5] On the best of days, Kiev's relationship with Moscow was suffused with long-standing enmity and rancor toward Russia; it was further strained by the August 24, 1991 Ukrainian proclamation of independence, which was a body blow to the USSR's survival. Moreover, there existed a visceral sense in Ukraine that Russia was now receiving its due comeuppance. Russian officials, struggling desperately to build a nation, reform a badly dysfunctional economy, and instill some sense of democracy in a land that had never embraced such freedoms, were eager to cooperate with Washington in having its former USSR republics disarm.

The issue was much more uncertain in Ukraine. The imposing nuclear arsenal inherited from the Soviet Union's breakup, if it was to be maintained in Ukraine for any length of time, would have required an extensive financial and infrastructure commitment to the maintenance and security of the weapons, burdens borne previously by the Soviet military. The more thoughtful elements of the Ukrainian security establishment understood this requirement immediately, as well as the remote chance Ukraine could have met it, but the politics of the issue took a decidedly negative turn when it was learned that Russian military units had smuggled the tactical warheads out of Ukraine surreptiously. Enraged by Russia's perceived arrogance, Ukrainian parliamentarians found it easy to take the politically expedient route, demanding that the Ukrainian government develop a strategy for the removal or disposal of the remaining warheads. In addition, Ukrainian officials not only were embarrassed by the Russian tactics, but also chagrined by their failure to exact any financial recompense for the considerable amount of highly enriched uranium (HEU) in the warheads. These issues, inherently contentious, were made even more unpleasant by the broader disputes regarding the disposition of the Black Sea Fleet and the sale of many former USSR assets. As if this political and security thicket weren't already complex, at the time of the dissolution of the Soviet Union, Washington was in the process of negotiating a strategic arms treaty with the USSR. What legal entity or entities would continue those negotiations on the former Soviet side?

Ultimately, mutual recognition in Washington and Kiev that the most important security outcome for Ukraine was to emerge as a viable, recognized and independent nation led Ukraine to accept denuclearization. This was not an easy process because difficult negotiations over timing and procedures unfolded between Ukrainian and U.S. counterparts. The Bush administration gave way to the Clinton administration but U.S. policy still held to the fundamental view that Ukraine should be integrated into the West. Following a policy review by Clinton's National Security Council, the United States developed a "three pillars" approach designed to convince Ukraine to accept denuclearization. Washington offered a

comprehensive package of dismantlement assistance, economic aid, and security assurances.[6] The process took several years to play out but Ukraine, along with Kazakhstan and Belarus, ultimately removed or destroyed all nuclear weapons on their territory. Each nation also joined the NPT.

Far removed from Ukraine strategically and politically, the South African government as early as March 1971 was conducting "preliminary investigations into nuclear explosives technology. By 1974, the Atomic Energy Corporation concluded that South Africa could build nuclear weapons."[7] South Africa's strategic calculus in at least one fundamental respect was similar to what had stimulated nuclear programs in other nations, namely, perceived regional rivalries and threats. In South Africa's case its racial policy of separation (apartheid) had left it isolated from almost every nation. In addition, and regardless of the abhorrent nature of its political system, through the 1970s South Africa was confronted by regional political challenges. The 1975 Angolan civil war, in which South Africa attempted to intervene, resulted in the new Luanda government embracing a policy of overt hostility toward Pretoria followed by Cuba's decision to send fifty thousand troops into the country. The ascent to power of a Marxist regime in Mozambique on South Africa's northeastern border brought additional political discomfort to the ultra-conservative South Africans. The Pretoria government also suffered a very public political embarrassment in 1977 when it was removed from the IAEA Board of Governors because of its racial policies.[8] The evolving strategic environment led the South African Ministry of Defense later that year to issue a report in which it concluded, "We are today involved in a war, whether we wish to accept it or not."[9]

Trailing in the wake of this threat assessment was a series of political decisions and resource commitments that set South Africa on a path toward developing nuclear weapons. A test site in the Kalahari desert, already started in 1974, moved forward. More importantly, a pilot enrichment plant, called the Y Plant, was constructed and in 1978 produced a small quantity of HEU. By late 1979 enough bomb grade material had been produced to make a simple, gun-type nuclear device.[10] The government took considerable precautions to maintain the security of the first and subsequent five devices, storing the two halves of each device in separate security vaults.[11] The United States and other nations, including the Soviet Union, had become suspicious of South Africa's intentions, concerns underscored by a mysterious "double flash" reminiscent of a nuclear detonation detected in a remote portion of the Indian Ocean on September 22, 1979 by a U.S. Vela satellite.[12] Speculation centered on possible South African or Israeli nuclear testing activities, subsequently denied by both nations. Several official studies conducted by various elements of the U.S. government failed to reach a consensus on the cause of the double flash.

It is unclear how South Africa planned to incorporate its small nuclear arsenal into its broader defense planning in terms of either employment scenarios for the weapons or means of delivery. Such concerns do not appear to have been a high priority of the South African military despite feeling surrounded by hostile forces. If a crisis arose, the South African strategy seems to have been willing to acknowledge to the United States (probably as a way to generate U.S. engagement) that it was in possession of nuclear weapons but there is little evidence that Pretoria had anything resembling a sophisticated nuclear strategy, perhaps because it had such limited capabilities.

What is much clearer is that the South African government over time came to recognize the sweeping changes unfolding not only in the region, but also within the country. As summarized by one expert, South Africa took 16 years to build its six nuclear device arsenal (a seventh device was partially constructed), but only 24 months to end the program.[13] Much of the credit for the reversal of South Africa's program belongs with President F.W. de Klerk who was elected to office in September 1989. De Klerk long had known of the nuclear program but rather than looking backward chose to focus on the unfolding political situation around him. By the time de Klerk took office the regional threat had diminished considerably. Cuban troops were being withdrawn from Angola under a 1988 tripartite agreement involving South Africa, Cuba, and Angola. Other regional political problems were being addressed and by 1989 it was apparent that Soviet influence in the region, probably never a serious threat to South African interests, was collapsing along with the rest of the Soviet empire. Moreover, closer to home de Klerk may well have judged that historical forces were propelling South Africa inexorably toward majority black rule. De Klerk almost certainly was not prepared to turn over the reins of government to black rulers who would be in possession of nuclear weapons. Upon the completion of several governmental studies and the ordering of the closing of the Y Plant, South Africa had begun the process of denuclearization.

Our review of cases where nations have pursued nuclear weapons capabilities (Pakistan and North Korea) and other cases where nations in possession of nuclear weapons chose to denuclearize (Ukraine and South Africa), provides a very similar underlying rationale for their decisions. In both sets of examples, the overriding factor in each national decision was the prevailing set of threat perceptions and how each nation's national interests could be maximized viz. a viz. those perceived threats. This is not to assert that Ukraine, for example, was unmoved by broader considerations such as the acceptance accorded them by the international community by joining the NPT. Similarly, South Africa sought international acceptance as well given its years of isolation. Nonetheless, the record suggests more fundamental security interests were at the heart of both

nations' decisions. Conversely, international nonproliferation mores and strictures have held little sway over the actions of North Korea and Pakistan as well as Syria and Iran, all, at one time, signatories to the NPT.

During the 2008 presidential campaign and since being elected to office, Barack Obama has made nonproliferation and arms control centerpieces of his foreign policy agenda. Obama's oft repeated goal of a world without nuclear weapons has sparked broad support in various quarters and doubtless was a factor in his being selected for the 2009 Nobel Peace Prize. For all his powerful rhetoric, the record, as demonstrated in this chapter, underscores the considerable gap between Obama's lofty aspiration—which he has acknowledged would take many years to unfold—and the prevailing reality in many parts of the globe, beginning in the Middle East where the previous chapter described the unfolding of a likely new series of nuclear programs, some of which could permanently disrupt the putative march toward a nuclear free world. The Obama administration has attempted to lead by example, completing a bilateral arms control agreement with Russia that will limit the number of deployed nuclear weapons to 1550 each, the most recent reduction that builds on the efforts of past U.S. and Russian officials to reduce the Cold War totals of several tens of thousands of nuclear weapons in the arsenals of the United States and Soviet Union. Obama followed up the bilateral agreement by hosting in April 2010 a Nuclear Summit, a gathering of approximately 47 governments to discuss ways to enhance the security of extant nuclear materials. In May 2010, New York City was the site for the standing five-year review of the NPT. By any standard, U.S. leadership in these areas is essential but as Obama's own outreach to many nations aptly demonstrates, it is not sufficient in a world where nuclear materials of different types can be found in 40 nations.

THE POLITICS OF NONPROLIFERATION, VERSION 2010

After signing an arms control agreement with Russia in early April 2010, the Obama administration set its sights on an ambitious international agenda on nonproliferation issues. Building on his 2009 Prague speech in which Obama said America would work toward a world free of nuclear weapons, and calling the prospect of nuclear terrorism the greatest single threat to humanity and a cruel irony after mankind survived the nuclear arms race of the Cold War; the U.S. president convened a Nuclear Summit in Washington on April 12–13, 2010, a gathering of 47 nations. Much of the focus was on preventing nuclear terrorism and to this end the participants endorsed Obama's call for all nuclear materials to be secured within four years. Few specifics were offered as to how this would be achieved given the sheer

volume of the materials in question and their presence in, in various amounts and forms, in approximately 40 nations. As a start, Ukraine, Mexico, and Canada agreed separately to give up the highly enriched uranium in their inventories. On a more negative note, Libyan President Qaddafi complained that it was a mistake that his nation was not represented in Washington. He added that excluding Libya, which had abandoned its nuclear weapons efforts for reasons described in Chapter 2, and not "rewarding" it for its efforts was not the way to induce future would-be proliferants from doing the same.

Obama and his counterparts are but the latest in a long line of national leaders committed to controlling nuclear proliferation. In addition to the individual national decisions where governments weighed their own security requirements involving the acquisition or forgoing of nuclear weapons, there has been a concomitant and broadly based development since at least 1970 of what is often termed the international nonproliferation regime. This phrase denotes the amalgam of treaties, regulations and policies forged and accepted by many nations sharing the belief that a world without nuclear weapons cannot be achieved without first controlling their proliferation.

This shared belief is reflected in the NPT, which was entered into force in 1970 after several years of negotiation. Albeit short, it is often described as the centerpiece of the nuclear nonproliferation regime. There are 189 signatories representing most of the international community but it is just one piece of the nonproliferation regime that can be divided into four other constituent parts:

- Treaties that prevent the testing of nuclear explosives;
- Treaties that establish nuclear weapons free zones (NWFZ);
- Various export control arrangements; and
- Mechanisms through the IAEA to control the spread of nuclear energy, principally by monitoring that nuclear materials are not diverted from declared facilities.[14]

Are these arrangements, individually and collectively, of sufficient robustness and durability to materially contribute to Obama's goal of limiting the spread of nuclear weapons in the Middle East and elsewhere and paving the way for a world without nuclear weapons? To assist in making these judgments, we can focus on four elements of the nonproliferation regime, the NPT, the supporting work of the IAEA, the Nuclear Suppliers Group, and the Proliferation Security Initiative.

Like almost all multilateral international agreements, in significant respects the NPT is a series of compromises reflecting the era in which it

was negotiated. The NPT also is a voluntary commitment and as of 2010 North Korea, Pakistan, India, and Israel, all with controversial nuclear programs, are not members. The core elements of the NPT can be summarized as:

- Preventing the spread of nuclear weapons as reflected in Articles I and II. There are no punitive measures built into the NPT for noncompliance with Article II.
- Providing through international safeguards that peaceful activities of states not in possession of nuclear weapons will not be diverted to weapons making (Article III)
- Promoting consistent with treaty purposes the peaceful uses of nuclear energy, to include the potential benefits of any peaceful application of nuclear explosion technology being made available to nonnuclear parties under appropriate international observation (Articles IV and V)
- Expressing the determination (albeit in very vague language) of the parties that the Treaty should lead to further progress in comprehensive arms control and nuclear disarmament measures (Article VI).[15]

Central to these provisions is the raison d'être that nuclear weapons use is unacceptable. Reflecting the realities of the 1960s when the treaty language was shaped, it describes two classes of states. Nuclear weapons states (NWS) are taken to mean the United States, Russia, the United Kingdom, France, and China, and all other nations are treated as non-nuclear weapons states (NNWS). It was assumed that the NNWS would not become nuclear weapons states and as compensation for maintaining that status all NNWS signatories would have the "inalienable" right to economic development and, more specifically for treaty purposes, the inalienable right to nuclear energy development. This is a "right" claimed repeatedly by Iran. What the NPT envisages, and what Iran chooses to ignore so blithely, is that in asserting the right to nuclear energy development, signatory nations take on the concomitant obligation to forgo the acquisition of nuclear weapons and that all exports to NNWS would be under IAEA safeguards. Nonetheless, the NPT, in trying to square the circle of limiting nuclear weapons proliferation while promoting nuclear energy development reveals its inherent limitations and one of its most serious flaws. As discussed in the previous chapter, the emerging nuclear plans of more than a dozen nations in the Middle East alone—all under the guise of commercial nuclear energy development—may well weaken the central goal of the NPT while reinforcing one of its initial compromises, allowing states that sign on to the treaty and accept NNWS status to pursue nuclear technology. Under different political conditions this dichotomy would be addressed on a priority basis; perhaps in a new treaty to separately address the contemporary complexities of the likely looming expansion in this decade of nuclear technology programs in the Middle East and

beyond. The NPT's current ambiguous arrangement that conflates nuclear weapons issues with nuclear energy serves the interests of many nations, making it highly unlikely such a sweeping change will occur.

As the Iran case illustrates, another glaring NPT limitation is the lack of enforcement authority. As noted, NPT signatory nations come to the treaty voluntarily. They do so with full understanding that the NPT cannot compel or any way "punish" even the most flagrant violations of treaty provisions. Iran has violated numerous NPT commitments since the 1980s but it has taken the international community enormous effort and time to reach consensus on even a modest set of punitive sanctions through the political thicket that is the United Nations Security Council. In an era where national sovereignty still holds sway in the international system, it is again difficult to envision any near-term commitment by a significant segment of the international community to develop a system under NPT (or NPT replacement) auspices that would provide for a timely assessment and decision on any nation's alleged NPT violation.

The IAEA is the means by which the NPT is implemented and the organization plays that role by its inspections and subsequent reports on what was learned through those inspections. These reports can shed invaluable light and insight on a nation's suspect activities but they are not foolproof; traditionally often there have been limits on the length of visits and access granted visiting inspectors. The IAEA merits much of the support and accolades it has received; those who have worked with the Vienna-based organization have seen the skills and dedication of many international civil servants. At the same time, few would dispute that the IAEA can be on occasion heavily politicized in its actions. One facet of this issue traces to the cooperation of states themselves, many of whom recognize the IAEA seeks consensus in much of its work, a laudable goal but one that can impede decisive action. On balance, the IAEA needs strengthening, in terms of its budget, the number and qualifications of its professional staff and its authority to not only shed light on suspect activity but also to recommend appropriate remedies and, ultimately, penalties, to nations violating the NPT. The early indications are that its new Director General will take close notice of these issues.

NPT signatories also commit to a system of safeguards inspections administered by the IAEA. These inspections are intended to ensure that nuclear materials being used ostensibly for peaceful purposes are not diverted to weapons-making purposes. In practice, the Iraq and Iran cases underscore the limits of the safeguards program that arises when nations willfully seek to deny IAEA inspectors appropriate access and information. In the 1990s the North Korea case highlighted the limitations of safeguards inspections. These nations took advantage of underlying limits and flaws in the system to systematically deny visiting inspectors insight into their respective nuclear activities. Drawing appropriate lessons from

these situations, the IAEA initiated a process for a system of enhanced inspection rights, commonly referred to as the Additional Protocol.

According to the official IAEA description, the Additional Protocol is a legal document granting the IAEA complementary inspection authority to that provided by the safeguards agreement. A primary aim is to assist IAEA inspectors in reaching judgments about both declared and possible undeclared activities. The mechanism to do this is through expanded right of access to information and sites. Through the Additional Protocol, the IAEA gains access to a nation's entire fuel cycle activities, including uranium mines, fuel fabrication and enrichment plants and nuclear waste sites. Short notice inspections, which in some cases can be carried out as quickly as within two hours of official notification, reduce the likelihood of nations successfully carrying out denial and deception activities. At a facility, the inspectors may carry out a range of activities, including record checking, visual observation, environmental sampling, utilization of radiation detection equipment and the application of seals and other identifying and tamper-resistant devices. The IAEA also can collect environmental samples beyond declared locations under the Additional Protocol.[16]

Albeit another voluntary commitment on the part of individual nations, at this writing the Additional Protocol has been signed or been entered into force by 139 nations. Almost every nation with nuclear facilities, including the United States and Russia, has entered into force Additional Protocol agreements with the IAEA. Iran committed to do so but reneged on that commitment. The Additional Protocol represents a qualitative improvement over the original safeguards agreements and merits the support of the international community whose constituent parts should be encouraged to apply their collective weight to nations that have yet to make the legal commitment to the Additional Protocol. As with the NPT in general, the Additional Protocol is not a panacea for the problem of stemming proliferation activities; as with the NPT it also lacks any punitive element for violations. Nonetheless, it also represents the type of international cooperation that can contribute to the process of monitoring the proliferation of nuclear weapons.

In the aftermath of India's 1974 nuclear test, it became apparent to members of the international community that it could no longer be assumed that only technically advanced nations could master nuclear technology. Meeting in London over the course of several years, a group of 15 nations, including the United States and Russia, formed what was first dubbed the London Club and later became known more formally as the Nuclear Suppliers Group (NSG). The NSG, another organization with voluntary membership, has expanded to 46 nations. Its core objective is to develop and promulgate a series of Guidelines, first published in 1978, that govern the transfer of nuclear materials, equipment, and technology.[17] The basis for this guidance is a "trigger list" of nuclear and other materials for which

certain conditions would have to be met before they were exported. In 1992 subsequent Guidelines were published to more explicitly address issues attending dual-use materials, equipment and technology. The effectiveness of the Guidelines and the overall integrity of the NSG work rest with the application of those Guidelines within the export control laws of individual nations. The rigor, commitment and competence of national export control authorities can be the elevating element of the NSG or its Achilles heel. As a means to enhance national efforts, a "catch all" provision was adopted, encouraging nations to take proactive efforts, based on a reasonable suspicion, to prevent suspect transfers. The NSG is a useful adjunct to the broader approach taken by the NPT.

After the September 11, 2001 terrorist attacks, the Bush administration developed a new strategy, reflected in the December 2002 publication of "National Strategy to Combat Weapons of Mass Destruction." Placing greater emphasis than in preceding administrations to counterproliferation approaches and informal, cooperative mechanisms, the Bush administration developed, under the leadership of Undersecretary of State John Bolton, the Proliferation Security Initiative (PSI). The PSI was promulgated in a May 31, 2003 speech in Krakow, Poland, delivered by President George W. Bush. What started as a cooperative endeavor of a small number of core members, the United States, Russia, the United Kingdom, Poland, Italy, Denmark, Portugal, Spain, Italy, France, Germany, Australia, Japan, and Singapore who defined its basic principles, were joined by Denmark and Turkey who did not shape the basic principles, the PSI is now endorsed by 97 nations.

According to the U.S. Department of State description, the PSI "is a global effort that aims to stop trafficking of weapons of mass destruction, their delivery systems, and related materials to and from states and non-state actors of proliferation concern."[18] The Obama administration has endorsed the PSI by which countries commit to:

- Interdict transfers to and from states and non-state actors of proliferation concern to the extent of their capabilities and legal authorities;
- Develop procedures to facilitate exchange of information to other countries;
- Strengthen national legal authorities to facilitate interdiction; and
- Take specific actions in support of interdiction efforts.[19]

The PSI is that rarest of diplomatic mechanisms in that it has no international headquarters or secretariat nor within the U.S. government is there any operating budget, database or administrative structure supporting the PSI, although the State Department coordinates activities related to the PSI's implementation. Some have suggested this informality makes it difficult to develop a clear picture as to how the PSI is operating and how

much success it is achieving. A more focused controversy, especially in the PSI's formative period, arose over the legal authority to interdict cargo in transit on the high seas. Traditionally, the right of safe passage of sea-borne cargo has been well protected legally. The PSI, from the creation of its founding principles, acknowledged that both national laws and UN Security Council guidelines were to be observed before undertaking any interdiction activities and, even more specifically, seizing any cargo. The clear intent of the PSI is not just to identify shipments of suspect materials but, when appropriate, to seize them. The PSI received a political as well as useful legal boost in carrying out its objectives when in April 2004 and by unanimous vote the UN Security Council passed Resolution 1540, using Chapter VII of the UN Charter to do so which made the Resolution mandatory for all states. Under UNSC Resolution 1540, all member states "are to refrain from providing any form of support to non-State actors that attempt to develop, acquire, manufacture, transport, transfer or use nuclear, chemical, biological weapons or their means of delivery."[20]

Faulty or poorly shared intelligence, slow interdiction responses, and poor coordination within or between governments can undermine the PSI's objectives and those factors can never be fully eliminated. Nonetheless, the easy embrace from the Obama administration of one of its predecessor's signature nonproliferation programs speaks to the creativity inherent in the PSI as does the rapid growth in the number of nations sharing that view. The PSI's effectiveness in the short run is likely to be to a large extent judged by the number of interdiction cases resolved successfully in any given timeframe. Over the long term, a highly aggressive approach to the PSI's objectives across the globe might induce would-be proliferators to seek new means of shipping suspect cargo—something that must be anticipated by participating nations. Even more important in gauging the success of the PSI will be if it begins to shape a different perspective on how the international community can proactively counter weapons of mass destruction (WMD) proliferation activities.

Whether viewed individually or collectively, the workings of the NPT, IAEA, NSG, and PSI constitute appropriate and in critical ways valuable approaches to the problems of nuclear proliferation. Nonetheless, there exists considerable room for improvement in international mechanisms to curtail nuclear proliferation. Over the past several decades the most dangerous proliferation cases—North Korea and Iran—at best were barely mitigated by the "weight" of the nonproliferation regime. Commentators may stress that in both cases the activities of those nations were slowed, as demonstrated by the 1994 Framework Agreement negotiated by one of America's most respected experts, Robert Gallucci, and the North Korean government. Similarly, the engagement of the EU-3 with Iran in the first years of the past decade may have caused Tehran to slow some of its programmatic activity although other factors may have been involved as well.

Even from that perspective, these accomplishments are best described as modest and transient.

The nonproliferation regime is a useful but flawed set of mechanisms in need of various reforms. The current configuration of the regime encourages and supports a number of cooperative measures that impose significant restrictions on activities that fuel the proliferation of nuclear weapons. At the same time, in its current form the nonproliferation regime has more than enough limitations, loopholes and flaws to support a conclusion that the spread of nuclear weapons cannot with confidence be controlled as various nations around the globe, beginning in the Middle East, move toward a nuclear renaissance.

If the nonproliferation regime is buckling under the weight of this nuclear renaissance, it is no less challenged by the threat of nuclear terrorism, the focus of President Obama's Nuclear Summit, on the part of transnational groups. Because nuclear materials and technology are the province of nations, transnational groups either have to steal, divert or enter into some type of political or financial arrangement to acquire those materials. Without the fissile material or actual nuclear warhead itself, the discussion (and threat) becomes moot. All of those scenarios are a formidable challenge for any terrorist group; nations in possession of nuclear weapons almost universally commit sizable resources to the security requirements attending those weapons. Acquiring a nuclear device also is but the first step in meeting the equally challenging tasks of transporting and detonating the device. Nonetheless, every nuclear weapons state has had security problems, ranging from securing materials at sites to defending its borders from the smuggling of many types of illicit materials. For example, within the United States the security procedures at Los Alamos National Laboratory and Sandia National Laboratory have been ignored or flaunted repeatedly. As we will discuss, there remain even larger security problems in other parts of the globe.

It is appropriate to inquire how real the threat of nuclear terrorism appears at the beginning of the second decade of the 21st century. Concerns about nuclear terrorism are not a new phenomenon. The first U.K. nuclear test occurred in 1952 when an atomic bomb was detonated on a ship; the purpose for doing so was to assess the consequences of a simulated attack on London by a ship sailing up the Thames River. In the immediate aftermath of the September 11, 2001 terrorist attacks, understandable questions arose over the vulnerability of the United States to even more devastating attacks than fuel-laden aircraft flying into buildings. These would involve the use of nuclear or, in some scenarios, radiological weapons. On any given day, week, or month the odds of a nuclear weapon being used are extremely remote; since 1945, nuclear weapons have not been used outside of testing purposes. While certain academics with no policy or program responsibility point out these long odds as part

of their argument that the threat is overhyped, they fail to give much credence to the extraordinary consequences of a nuclear detonation in the United States.[21] For example, a report by Harvard University's Project on Managing the Atom calculated that a ten-kiloton nuclear device (smaller than the yield of the Hiroshima bomb) would kill one-half million people instantly and inflict at least 1 trillion dollars in damages.[22] The psychological costs would be incalculable. Those numbers define the paradox of nuclear terrorism; the probability of occurrence is very low, but the consequences of a nuclear terrorist attack would change history.

Under these conditions contemporary policy makers have concluded, including President Obama, that nuclear terrorism represents the greatest threat to mankind. A review of the security practices of two nations, Russia and Pakistan, illustrate that the dangers are real, not hypothetical. After the breakup of the Soviet Union, the once hermetically sealed borders of the Soviet era became porous. Political collapse was accompanied by economic collapse (notwithstanding the wealth created by a handful of oligarchs), creating an even larger and more impoverished class than communism's nearly 75-year bitter legacy to hundreds of millions. As a result, desperate people will and did resort to desperate measures. In what became the Russian Federation's vast nuclear world of approximately 1 million workers under the aegis of what is now called the Russian Ministry of Atomic Energy, access to fissile materials for some proved an irresistible temptation. What followed through much of the 1990s was a series of theft and diversions of sensitive material, always with insider participation or collusion. The underlying motive was greed and in many cases the thieves did not even have an identified buyer but rather first stole the material and then looked for someone willing to provide the financial payoff. Despite the amateurish quality of much of these episodes, on several occasions small amounts of fissile material were smuggled out of Russian laboratories, across the Russian border and into Europe. A few of the more prominent cases included:

- 1993—In Murmansk, a Russian naval officer stole 4.5 kilograms of HEU;
- 1994—A small amount of plutonium that had been produced in Russia was seized at the Munich Airport;
- 1994—in Prague, police seized 2.7 kilograms of HEU that had been produced in Russia; and
- 1998—Russian authorities uncover a plot at Chelyabinsk, one of Russia's premier nuclear weapons laboratories involving about 18.5 kilograms of HEU, enough to make a nuclear bomb.[23]

More recently, Oleg Khinsagov in February 2006 was arrested in the Republic of Georgia while in possession of a small amount of

89%-enriched HEU. As in past cases, Khinsagov was seeking a buyer. Simply put, and despite the commitment of large amounts of U.S. funding to improve this situation throughout the former Soviet Union, sizable risks remain. Part of this vulnerability is attributable to the management practices of those at the U.S. Department of Energy charged with implementing the security program known as MPC&A. The program's current practices describe success by the number of buildings that have received security upgrades. At first blush this appears to be a reasonable standard except for the fact that, according to program insiders, in about half the cases Department of Energy officials do not know how much, if any, fissile material actually exists in the buildings they are committing U.S. funds to secure. Distrust by Russian authorities unwilling to share nuclear data, often at local levels, contributes to this charade. From a U.S. perspective, what is equally unfortunate is that Department of Energy program officials are not honest with the president or Congress in what taxpayer money is or is not accomplishing. Such practices are hardly consistent with the president's national security objectives or congressional intent.

Albeit for different reasons, Pakistan presents another set of concerns regarding the vulnerability of its nuclear assets. Since Pakistan became the world's first Muslim nuclear weapons state it has produced, according to a 2010 Congressional Research Service study, about 60 nuclear weapons but many analysts believe the number could be higher.[24] There almost certainly are large amounts of fissile material stored at various sites as well. Pakistan's chronic political instability raises the specter that at any time a political failure could trigger a worst case scenario involving the theft or diversion of nuclear warheads or materials. General David Petraeus, former Commander of the U.S. Central Command, in March 2009 testified before a Congressional committee that "Pakistani state failure would provide transnational terrorist groups and other extremist organizations an opportunity to acquire nuclear weapons and a safe haven from which to plan and launch attacks."[25] In its nuclear program's nascent stages Pakistani officials worried most about an attack from India its bitter rival. As a result, many Pakistani nuclear sites are thought to be located in the country's north and west, far from India but in areas of Pakistan populated with al Qaeda and Taliban supporters.

What Petraeus did not comment on is that even in the absence of a political crisis Pakistan's nuclear command and control system is suspect. Both Pakistani and U.S. officials for public consumption take the opposite view, claiming Pakistan is a responsible custodian of its nuclear assets. They are correct in pointing out that Pakistan has an established nuclear infrastructure directed by a National Command Authority. Army and Air Force personnel, who must pass security checks, often are drawn from the Punjab Province, an area deemed supportive of

governmental authority. Their professionalism is a key element in preserving the security of Pakistan's nuclear assets. Nonetheless, there also are elements within the Pakistani Inter-Services Intelligence Agency (ISI) with access to sensitive nuclear materials and the consensus of most observers is that the ISI harbors extremist sympathizers. As the Russian cases illustrate, it is insiders with access that can pose the most dangerous ongoing risk.

At the same time, there also have been at least three documented external attacks on the Pakistani nuclear-associated facilities:

- November 1, 2007—an attack is launched against the missile storage facilities at Sargodha;
- December 10, 2007—a suicide bomber attacks the Kamra nuclear air base; and
- August 20, 2008—a Taliban bomber commits an incident at the nuclear weapons assembly site at Wah cantonment.[26]

There is a critical difference between launching attacks on these targets and the more daunting task of being able to successfully remove special nuclear materials or warheads if that indeed was the goal of the attackers. Properly protected sites have multiple security layers, often referred to as guns, gates and guards. In a worst case scenario, even if Pakistani weapons were compromised or acquired in an attack, Pakistan is believed to use a Permissive Action Link (PAL) system by which a code must be entered before a weapon can be detonated.[27] Such procedures have no value if fissile material is the intended target because it is not in bomb form. Nonetheless, the boldness of the attacks illustrates the inherent vulnerabilities of these sites to possible future attacks and the attraction they hold for terrorists.

It is impossible to assess with confidence whether Iran or any other future nuclear weapons state in the Middle East would encounter similar security and command and control problems but that cannot be dismissed. The possibility that within Iran the Revolutionary Guard Corps would be involved in guarding fissile material or warheads would be cause for concern. Would the IRGC, of its own accord, or under orders from political authorities, allow some of Iran's nuclear assets to be diverted to extremist groups long supported by Tehran such as Hezbollah? What passes for conventional wisdom in the West might judge that Iran would never allow any outside organization to possess such fearsome weapons or special nuclear materials. That may well become Iranian policy but there is no reason for high confidence in that judgment at this point. A more confident judgment would be that there is no command and control structure in place in even the most experienced and advanced nuclear countries (the United States and Russia) that is foolproof. Would any emerging nuclear weapons

state be able to develop quickly a robust and impregnable command and control structure?

The importance of those vulnerabilities, of course, would be greatly reduced if there were not credible threat scenarios against them. Some skeptics argue that high value targets, regardless of location, are too difficult for terrorist groups to plan and execute successfully an attack designed to acquire special nuclear materials. The evidentiary base, as illustrated above, suggests a different story. Perhaps the most lamentable failing of the U.S. government in the run-up to the 9/11 attacks was the failure to imagine "unthinkable" events were possible. Falling into that trap again could prove catastrophic. As far back as 1998 Osama bin Laden described obtaining weapons of mass destruction as a "religious obligation."[28] Al Qaeda leaders have spoken of killing 4 million Americans, something that can't be accomplished using conventional weapons and an Islamic cleric endorsed as a permitted activity the killing of even more millions of Americans.

It would be tempting to dismiss such accounts as little more than fiery rhetoric but doing so would be self-deceiving. More alarming is the reported meeting involving bin Laden and his deputy, Ayman al-Zawahiri, and two Pakistani nuclear weapon scientists. By most accounts the relentless pressure by U.S. military and intelligence assets has made it much harder for bin Laden to carry out subsequent discussions along those lines but that assessment is far from foolproof. It is to be hoped that Al Qaeda's aspirations to be able to use some type of WMD against the United States, its military forces, or its allies will far exceed its capabilities to do so. Far more powerful than hope will be the continuing application and strengthening of the panoply of policies, programs, and international cooperation that can drive to low levels bin Laden's chances of success. Those mechanisms exist; as we have seen they are useful and in some cases effective in carrying out their objectives. They also are far from providing an iron-clad defense against nuclear proliferation.

The risk of theft or diversion of nuclear weapons and special nuclear materials stored in various nuclear nations has direct implication for U.S. homeland security. In the aftermath of the September 11, 2001 terrorist attacks the creation of a Domestic Nuclear Detection Office (DNDO) in the Department of Homeland Security was designed to develop those capabilities to detect and interdict seaborne nuclear or radioactive cargo that might be smuggled into the United States. U.S. strategy to do so begins far from U.S. shores where U.S. companies such as Veritainer have been working on creative solutions to monitoring the possible shipment of such materials through crane-mounted systems that don't disrupt port operations.

Because no one system is 100% reliable—the volume of seaborne traffic transiting to the United States is enormous—the DNDO is critical in

developing the technologies that can be used by customs and border agents at U.S. ports of entry. Securing U.S. points of entry—the number exceeds 300 by one count—against nuclear and radiological smuggling is another significant security challenge.[29] The United States has very long borders, placing enormous burdens on border patrol officers. DNDO has had limited success in integrating its mission into previously established U.S. border protection efforts and the technologies DNDO has been trying to develop have fallen far behind established timelines, in part because Department of Energy experience with these technologies has not been adequately shared with DNDO (part of the Department of Homeland Security) while some U.S. national laboratories are seeking to convince DNDO to commit huge sums of money for expensive new monitoring technologies that do little to improve already existing, reliable and much less expensive equipment.

There also exist threats to U.S. nuclear power plants and those threats take different forms. In recent decades, the U.S. nuclear industry has lagged behind other major industrial nations, including France, China, and Russia, which have integrated nuclear power into their respective national energy planning mix. Nonetheless, the United States has 106 operating nuclear power plants located in about 30 different states. The Obama administration appears willing to support through loan guarantees at least some expansion of the domestic nuclear industry, a process that will take many years, as will be the case in the Middle East, to reach fruition.

Nonetheless, the large number of nuclear power plants operating in the United States today poses their own risks. The U.S. Nuclear Regulatory Commission provides oversight of nuclear plant operations, developing

LENGTHS OF U.S. BORDERS (MILES)

Alaskan coast, 6640
Hawaiian coast, 750
Pacific coast (excluding Hawaii and Alaska), 1293
Border with Mexico, 1933
Gulf of Mexico coast, 1631
Atlantic coast, 2069
Great Lakes-Canada border, 970
Alaska-Canadian border, 1538
Border with Canada excluding Alaska and Great Lakes, 3017
Total: 19,841 miles[30]

policies and regulations, including those governing nuclear reactor and nuclear material safety.[31] The U.S. civilian nuclear industry is well established and long has studied and taken measures designed to defeat the various security challenges posed by daily operations. For example, nuclear materials in transit can be targets of terrorist attack although various security measures greatly limit that risk. For the nuclear plants themselves—large, fixed targets that are easily identified—a different set of security challenges exist. Perhaps the most discussed and analyzed is a scenario by which an aircraft is used as a suicide weapon to fly into the facility with the intent of damaging or destroying the reactor core and releasing radioactivity. As a rough analogy, this scenario would be an attempt to create a U.S. version of the 1986 disaster in Chernobyl, Ukraine, in which an enormous explosion caused by a combination of equipment failure and human error led to the release of a large amount of radioactivity across Ukraine and beyond.

The Nuclear Regulatory Commission understands well this scenario and, in addition the Federal Aviation Administration's enhanced security measures taken after 9/11, has expended considerable effort to developing various countermeasures. The official Nuclear Regulatory Commission assessment of the capability to protect against aircraft is summarized as follows:

> Since 9/11, the issue of an airborne attack on this nation's infrastructure, including both operating and potential new nuclear power plants, has been widely discussed.
>
> The NRC has comprehensively studied the effect of an airborne attack on nuclear power plants . . . These classified studies confirm that there is a low likelihood that an airplane attack on a nuclear power plant would affect public health and safety, thanks in part to the inherent robustness of the structures.[32]

This reassuring assessment is not shared universally. The Union of Concerned Scientists, a leading observer of nuclear developments and the nuclear industry, concludes that U.S. nuclear power plants were not designed to withstand suicide attacks from the air.[33] It takes on directly the optimism expressed by industry insiders, stating that:

> The nuclear power industry is confident that nuclear plant structures that house reactor fuel can withstand aircraft impact, even though they were not specifically designed for such impacts. This confidence is predicated on the fact that nuclear power plant structures have thick concrete walls with heavy reinforcing steel . . . But what the nuclear industry asserts as confidence appears more like a confidence game. The thick, reinforced walls do not surround all vital parts of a nuclear power plant—as the industry knows very well. One study of aircraft hazards, jointly prepared by the owners of two

> similar nuclear power plants more than twenty years ago concluded, "The control building is the only single building which, if hit, could lead to core melt." The control buildings at every nuclear plant in the United States are located outside the robust structures described by the industry. Thus, the nuclear industry's proclamation about the robustness of thick, reinforced walls may be accurate, but they fail to tell the entire story.[34]

As with so many of the threats and nuclear challenges discussed herein, it is impossible to quantify the level of threat posed by various nuclear terrorism scenarios. We are again left with the reminder that such threats are not hypothetical only. One of the most troubling trends for U.S. officials has been the apparent emergence of a new trend toward "home grown" terrorism. Nations such as the United Kingdom in recent years have had to endure attacks arising from the large number of Pakistanis, some British citizens and some not, who travel in and out of the United Kingdom but maintain deep ties to Pakistan. In contrast, the Muslim community in America has been seen as more assimilated into the fabric of American society. That assessment, however accurate in the past, may be in need of revision. The massacre at Fort Hood, Texas, a failed attack by a Nigerian engineering student against a passenger aircraft on Christmas 2009, and a failed May 2010 attempt by a naturalized American of Pakistani origin to blow up an SUV in Times Square in New York City all can be traced to individuals of some accomplishment who became radicalized in the United States or in the Nigerian's case while studying in the United Kingdom.

That is only part of the story; they clearly drew "inspiration" and in some cases training and guidance from extremist groups in Pakistan. Their weapons of choice were not any type of WMD in the customary use of the phrase (nuclear, chemical, biological, or radiological weapons), although mass murder surely would have resulted from the successful downing of the aircraft on Christmas 2009. It would be as misleading to assert that attempted WMD use will be the logical next step for those plotting attacks on the United States as it would be to blindly label or "profile" Muslims as susceptible to the tenets of hate and extremism. The reality is far different for the vast majority of Muslims practice their faith peacefully in America and beyond. As terrorists know and seek to exploit, the spectacular, not the routine, gets the headlines. What should concern authorities is that a new type of extremists in America (America long has had to deal with other forms of extremism such as white supremacists) may become a persistent problem on a larger scale than previously experienced. Under these circumstances prudence would demand the most thorough and honest appraisals of U.S. vulnerabilities to nuclear and other WMD terrorism.

The case of Sharif Mobley illustrates this problem.[35] Mobley was a New Jersey native and high school wrestler. He would ultimately move to Yemen

where he was arrested by Yemeni security authorities for allegedly joining al Qaeda. It is the period between his youthful athletic pursuits and decision to leave the United States that has triggered law enforcement alarms. Mobley worked at five nuclear power plants in the eastern United States. He did not have a high security clearance but he understood the perimeter security procedures at the plant. It is unclear how much, if any, information about plant security was shared with al Qaeda. One of the more obvious vulnerabilities of a nuclear plant is its almost total reliance on the cooling system to circulate water through the reactor. Critical components of the cooling system, including pumps and pipes, are poorly protected outside the containment vessel. Simply put, massive damage to a nuclear power reactor, including a meltdown that could release radioactive gas, could be inflicted without ever directly attacking the more heavily protected reactor core. Protecting the cooling system at nuclear power plants is as important as protecting the reactors; a priority often overlooked by regulatory authorities.

Given the diversity and nature of continuing threats to the security of the international community and concomitant limits of the nonproliferation regime, it is highly possible that one or more currently non-nuclear weapons states may cross the nuclear threshold and acquire nuclear weapons status. Nuclear terrorism also will remain a threat that can never be fully defended against or dismissed. Faced with the unpalatable consequences if either scenario materializes, is it possible to develop a widely accepted standard of what can constitute in the 21st century the legally accepted use of force against a proliferating nation or a transnational organization intending to carry out nuclear or WMD terrorism?

At different times and under different circumstances, the United States and Israel each have felt compelled to ponder those types of questions. For example, actions taken or contemplated by the United States government in the nuclear age have included:

- Senior U.S. military officers considered and even proposed the use of preemptive strikes in the 1950s against Soviet nuclear assets.
- Imposed a quarantine against Cuba in 1962 to prevent the introduction of a further buildup of offensive arms.
- Considered in 1963–1964 the use of force against Chinese nuclear facilities.
- In 1989–1990 threatened military action against Libya on the grounds that a Libyan chemical facility at Rabta was producing chemical agents. The Libyans shut the plant subsequently, claiming it had been damaged by fire.
- Considered the use in 1994 of preemptive military attack against North Korea over the question of North Korean threats to remove the fuel rods from the Yongbyon reactor.
- Attacked in 1998, the Al Shifa chemical plant in Sudan based on indications that the plant had ties to al Qaeda and may have been engaged in chemical weapons manufacturing.

- Invaded Iraq in 2003, in large measure because of the mistaken belief that Iraq was in possession of or close to acquiring various types of WMD, including nuclear weapons.

These examples demonstrate that the threat of the use of force—with the exception of the attack on the Al Shifa plant and the Iraq war no military actions were taken by the United States in these examples—can in limited circumstances be a tempting policy initiative that may at times obviate military action depending on various circumstances, beginning of course with the response of the targeted nation. It was not until the first years of the George Bush administration that the preemption option was elevated to a declaratory and integrated U.S. policy option. In a June 2002 presidential speech at West Point and in the fall 2002 publication of its National Security Strategy, the administration stated explicitly that the United States would act preemptively to prevent the use of WMD against it or its allies. This policy was reinforced in the 2006 National Security Strategy. The updated version was more explicit in laying out the desire for diplomatic solutions rather than the use of force but the administration's commitment to preemption as a policy option remained unaltered.

Central to the administration's case was the belief that while deterrence and containment had been the bulwark of America's defense through the Cold War, changed circumstances—the rise of "rogue" nations and extremist or terrorist organizations and the weapons they seek or might come to possess, WMD, demanded new defense strategies. For the Bush administration, the emerging threat environment, described as the crossroads of radicalism and technology, required "as a matter of common sense and self-defense, America will act against such emerging threats before they are fully formed."[36] The Obama administration in its first year in office had not endorsed the Bush administration's strategy of preemptive attack and in a May 2010 commencement address at West Point President Obama seemed to be moving the United States away from President Bush's emphasis on "American internationalism" to a greater reliance on the power of alliances and by U.S. advocacy of liberty and justice.

Israel also has confronted those policy choices and on two occasions—the 1981 attack on the Osirak nuclear reactor and the 2007 attack on the alleged Syrian reactor—are unmistakable signs of how Israel regards any potential WMD threat in the region. In the Israeli cases the international condemnation of the attack against the Osirak reactor (the Syrian attack was of much smaller drama) was significant as reflected in the UN censure of Israel (UNSCR 487) but hardly withering. It is not hard to imagine that in the quiet recesses of a number of Arab nations that there was a measure of relief that Israel had taken action against the Hussein regime.

In the aftermath of the devastation of World War II, the major powers who formed the United Nations sought to establish a formal mechanism

to promote peace through discussion and negotiation. There is little in the record that memorialized the work of the drafters at the San Francisco Conference (that resulted in the UN Charter) that indicates robust discussion on the permissible uses of force. Subsequently, Article 2.4 of the UN Charter proscribes the use of force but there are two exceptions where it is recognized that the use of force may be required and authorized. Realizing that warfare could never be "outlawed" as Woodrow Wilson advocated for the international system after World War I, the UN Charter's Article 51 establishes the right of member states to individual or collective self-defense.

Many practitioners and legal scholars recognize that included in Article 51 is the right to use force not just in response to armed attack but preemptively. The codicil is that preemptive force implies a nation was compelled to undertake military action because it possessed incontrovertible evidence that an attack against it was imminent. Israel claimed its attack against the Osirak reactor was permitted under Article 51. The UN's disagreement with Israel's position, reflected in Resolution 487's censure of Israel, a political as much as legal outcome, only served to underscore that what constitutes a threat as "imminent" in practical terms ultimately is in the eye of the beholder. In addition to Article 51, the UN Charter also recognizes the authorized use of force under Chapter VII of the UN Charter. Changing realities have forced revision in the UN's approach and thinking. After the 9/11 attacks the Security Council also recognized in two Resolutions—1368 and 1373—that large-scale attacks by nonstate actors constitute armed attack justifying the use of force by state actors, a concept not envisioned during the San Francisco Conference held some 65 years ago.

The issue has an additional element and one even harder to assess; the preventive use of force when an enemy attack is not imminent. The long-established approach in the international community is that preventive attack is not sanctioned, in part because of the destabilizing effect of such practices on international politics. Chaos would reign if multiple states were going to war on the (perhaps slight) pretext they would be attacked at some point in the future. Conversely, those who feared such preventive measures might turn that possibility into reality by undertaking their own aggressive military buildups or actions.

The UN also took some initial steps in addressing the complexities of preventive attack. Secretary General Kofi Anan convened a High-Level Panel on Threats, Challenges and Change. In late 2004 the panel issued a report acknowledging that preventive attack might be justified but that such a case should be taken to the Security Council for consideration rather than left in the hands of any nation. That perspective notwithstanding, the barriers against preventive action, as shown by the "new thinking" of the Bush administration which, deliberately or not, blurred the distinction between preemptive and preventive military action, are crumbling in an

era where terrorist organizations and rogue nations not only might not be deterred but also where they might have access to nuclear or other forms of WMD. For example, in the aftermath of a nuclear terrorism incident (or the use of a radiological weapon), what would be the response of the public in the country that was attacked? There is no evidentiary base to draw upon but it is likely that there would an enormous amount of pressure on the governing officials to undertake preventive attack as a means to prevent similar future occurrences, regardless of any international law strictures.

In the second decade of the 21st century, there are at least three scenarios that could be used to justify the use of preventive force:

- Preventive force against a transnational group thought to have acquired or may be about to acquire WMD;
- Preventive force to deprive a potential nuclear adversary the capability to attack; and
- Preventive force in the case of state failure (Pakistan would be a good example) where a potential threat is removed because a state can't resolve it alone.

Even in these cases there is ambiguity and room for debate as to whether preventive force can be justified. In future scenarios the devil would be in the details. However, for those resorting to preventive force the case for doing so would be best made if to the fullest extent possible the attacker sought to follow the established rules for a just war, including right purpose, proportionality, and balance between ends and means. Prevention should be a last resort but under current and evolving conditions it also should remain a viable option in selected cases. One commentator opined that "there are unlikely to be many cases where the preventive/preemptive use of military strikes or preventive war will be chosen as the best option."[37] That may well be the case, but little in the evolving picture of the nuclear Middle East suggests that option will be cast aside.

CHAPTER 8

Shaping the Nuclear Future: Nuclear Renaissance, Nuclear Disarmament or Both?

> Do not spoil what you have by desiring what you have not, remember that what you now have was once among the things you only hoped for.
>
> Epicurus

The nuclear ambitions of Iran, the threat of nuclear terrorism, the likely emergence of a number of nuclear development programs in the Middle East, and the myriad shortcomings of the nonproliferation regime illustrate the current challenges of controlling nuclear proliferation. These challenges almost certainly will remain for the foreseeable future as central to the national security concerns of many nations, including the United States. In coming years the nuclear Middle East will become more, not less, complex.

There also is another unfolding dynamic that has been gaining momentum, is more promising and challenges decades of conventional thinking. In articles in *The Wall Street Journal* in January 2007 and January 2008, four prominent American statesmen, Henry Kissinger, George Shultz, William Perry, and Sam Nunn, called for a concerted effort to rid the world of nuclear weapons. Their January 2008 article opens with this assessment:

> The accelerating spread of nuclear weapons, nuclear know-how and nuclear material has brought us to a nuclear tipping point. We face a very real possibility that the deadliest weapons ever Invented could fall into dangerous hands. The steps we are taking now to address these threats are not adequate to the danger.[1]

In essence, their focus represents an attempt to not only challenge but to "leap frog" past thinking and the current realities, including a call for rapid acceleration of the often incremental approaches to nonproliferation over the past decades. Theirs is a vision at once bold and radical for as recently as five years ago such a proposal (which they describe as looking up at a tall mountain) would have seemed hopelessly naïve, notwithstanding the decades-old call in Article VI of the Nonproliferation Treaty (NPT) for international negotiations leading to disarmament, a process greeted in most nuclear nations with some enthusiasm and limited action. The appeal and power of the statesmen's proposal, which they invited senior officials in other nations to support (former Soviet President Mikhail Gorbachev was one of a number to offer an endorsement), has been embraced by President Barack Obama who on various occasions has spoken of a world without nuclear weapons. Obama has acknowledged that this aspiration almost certainly is many years from becoming reality but his willingness to use the presidential bully pulpit has galvanized the imagination of many and breathed life into the question of whether it is realistic to conjure a world without nuclear weapons. Is the pursuit of a world free of nuclear weapons, however appealing, a realistic pursuit for the United States and other nations given emerging trends or a noble idea that in practice is little more than a siren song?

Should the international community be content, as Epicurus advises, with what has been accomplished in its approaches to limiting the proliferation of nuclear weapons? At first blush, and as argued throughout this book, much remains to be accomplished both in meeting specific challenges and in improving the nonproliferation regime. At the same time, our story is not entirely negative. Nuclear weapons have not been used in war since 1945. Today almost 190 nations are committed to the NPT. A growing number of nations are participating in the Proliferation Security Initiative and the United States and Russia, the nations with the largest nuclear inventories, continue to reduce the size of their nuclear inventories to levels that would have been considered impossible a scant decade ago. These are significant accomplishments and worthy of at least some level of satisfaction.

To assess whether it is possible, or even desirable as Obama and others have advocated, to take a giant leap beyond what has been accomplished by pursuing a new era in nonproliferation thinking that focuses on a world free of nuclear weapons we need to address three issues. These are the continuing presence of nuclear technology, the challenges of verifying any disarmament process, the role of nuclear strategy in the defense planning of various nations and the unintended consequences of policy inconsistencies. The vision of a world without nuclear weapons can begin to come into focus only as we answer them.

NUCLEAR TECHNOLOGY

The nuclear technology genie can never be placed back in the bottle. Approximately 40 nations have acquired or developed various combinations of nuclear power or research reactors, uranium enrichment facilities, and plutonium reprocessing facilities. The technology represented by this infrastructure is a reflection of and supported by a near global phalanx of nuclear scientists and technicians. In one respect they stand on the shoulders of past scientific luminaries like Einstein, Teller, and Szilard, but they also have pushed the boundaries of nuclear technology in new directions. The nuclear power reactors that have been developed and produced over the past 10 to 15 years are far more sophisticated than those of past generations. Given the presence of and demand for nuclear power—and its growing presence in the Middle East and beyond, including in the United States—there is no prospect that there will be anything resembling the disappearance of nuclear technology. Because of its dual use features, nuclear technology will always pose a potential threat of being diverted to bomb-making purposes without inspection regimes far more intrusive than today's standard.

One idea to limit the proliferation risks of nuclear technology that is being instituted is the creation of an international fuel bank. Its genesis can be traced to an idea contained in President Eisenhower's Atoms for Peace program. The idea has gained wide-ranging support in more recent times. *The Wall Street Journal* authors, along with former International Atomic Energy Agency (IAEA) Director General el Bardei, have championed the importance of an internationally controlled "bank" of enriched fuel for reactors which, in theory, would minimize or obviate the need for any nation to maintain its own uranium enrichment

Recent developments are transforming this idea into reality. In November 2009 the IAEA Board of Governors endorsed the idea of working with Russia to create a fuel bank. On March 29, 2010, the IAEA and the Russian government signed an agreement to establish the fuel bank which will be located near Irkutsk. Under the agreement, 120 tons of low enriched uranium (LEU) will be set aside for use by any nation—the process is said to be non-political—needing such fuel supplies for their reactors. It also is anticipated that Kazakhstan will establish a second fuel bank of 60 tons of LEU that also will be placed under IAEA control. The plan received a major financial boost from the Washington-based Nuclear Threat Initiative, a private organization founded by media mogul Ted Turner. With substantive leadership from the highly respected Sam Nunn and former Department of Energy senior official Charles Curtis, the Nuclear Threat Initiative succeeded in securing a total of $50 million in funding from various governments, including the United States, Kuwait, and the UAE, to match the funding its own leadership had pledged. This was an

exceptional achievement. The UAE, Syria, Jordan, Turkey, Vietnam, and Indonesia have indicated interest in drawing from the fuel banks. Unfortunately, its establishment comes too late to influence Iran's uranium enrichment plans but that should not diminish the plan's future contributions to the principles of nonproliferation.

VERIFICATION

As the United States and the Soviet Union (and since 1991, Russia) have shown in various arms control negotiations, the process of verifying compliance with a negotiated agreement is exceptionally complex, imperfect and often contentious. President Ronald Reagan's oft-quoted maxim to "trust but verify" has become a mantra chanted by many arms control advocates. The new START Treaty signed by the United States and Russia reaffirms this principle with a set of negotiated verification measures. If this description of the role and complexity of applying verification procedures applies to the bilateral arms control process, the rise of an even more challenging set of issues can be envisioned if or when the disarmament process was expanded to include other nations. Nonetheless, verification is no less important in a multilateral setting. The verification process is critical in convincing nations that they can safely embark on the path to abolishing nuclear weapons. As noted by two experts, "Verification serves a number of functions . . . It helps to build confidence that states are abiding by the terms of an agreement. By detecting non-compliance, it acts as a trigger for enforcement actions, and is therefore also a deterrent. Without strong verification provisions, it is difficult to generate political will among states to give up military capabilities."[2]

The verification process triggers a number of issues requiring resolution in support of any broad disarmament process. During the bilateral arms control negotiations conducted since the 1970s by the United States and its Soviet and then Russian counterparts, the interests of allied non-nuclear states with interests in the outcome were not ignored entirely but they hardly dominated the shaping of either side's negotiating strategy either. A multilateral process of disarmament likely would raise a series of concerns from some non-nuclear states. For example, Japan and South Korea are politically and psychologically dependent on a U.S. nuclear umbrella. North Korea's epically paranoid regime remains among the most hostile of nations; the March 26, 2010 sinking of the South Korean warship Cheonan, almost certainly by North Korea, and the subsequent rise in tensions on the Korean peninsula is only the most recent of a series of incidents that illustrate that South Korea almost certainly will continue to feel vulnerable to North Korean military actions as long as the communist regime remains in power, underscoring the need for continued U.S. nuclear as well as conventional military deterrence capabilities. Moreover, it is almost inevitable

that at least a few of the emerging nuclear programs in the Middle East will raise concerns from other nuclear and non-nuclear states alike about the direction of those programs. The United States will attempt to mitigate those concerns by working with willing partners in the region such as the UAE. At the same time, it is highly unlikely that the United States will be able to influence the direction of other nuclear programs such as may be undertaken by Syria given its likely past support from North Korea for technology and Iran for financing. Will existing nonproliferation controls be adequate to the task? Syria may have been in the process of trying to flaunt its NPT commitments in 2007 when Israel launched its successful air strike. Will Damascus be willing to pursue commercial nuclear power in a way that does not raise new alarms? Its current political posture suggests that such an outcome is far from assured.

Another situation that mixes politics with nuclear technology could emerge if Iran achieves nuclear weapons status. At the very least, it is highly likely that the United States will expand its already considerable support to Israel's missile defense capabilities and if Iran becomes a nuclear weapons state should, as discussed elsewhere in this book, extend a nuclear umbrella to Israel. In the long-term, the credibility of such a policy commitment would arise if the United States chose an accelerated process of nuclear drawdown. What would be the policy implications and reactions of the nations allied with the United States if Washington began a process that sharply reduced its nuclear capabilities and, by extension, their deterrent value? From this perspective it is likely that some long-time beneficiaries of U.S. nuclear protection would not feel more secure in a nuclear free world or even a world of accelerated nuclear disarmament absent a number of attending political and conventional force agreements reducing underlying tensions and threats. The process of nuclear disarmament would be exceptionally complex and lead in directions not bounded only by nuclear but also political issues.

Another verification question that builds on the first is the question of outlawing certain types of delivery vehicles.[3] In theory, the risks of nuclear war are lessened if nations are constrained in their ability to deliver such weapons to targets. The most obvious limitation or destruction regime to implement would be related to ballistic missiles, the weapon system most readily identified with delivering nuclear weapons over long distances. There is no clear demarcation possible without the most intrusive of inspections between what might be defined as a nuclear-armed ballistic missile as ballistic missiles also can deliver conventional and other types of munitions. Moreover, other weapons systems, also with multi-use capabilities such as cruise missiles and long-range aircraft, would have to figure in the mix. They also have dual-use features. A verification element that sought to address delivery systems also would open another Pandora's Box of security questions given the almost certain reluctance of many

nations to put a range of weapons systems at risk of destruction or abolition. As with the preceding discussion, would nations uniformly perceive their national security enhanced by a process of nuclear disarmament that included delivery systems?

In any verification regime numbers of weapons and delivery systems can be of critical importance in shaping any future nuclear disarmament agreement. When the United States and Soviet Union each possessed approximately 30,000 warheads during the height of the Cold War, it was not strategically significant if one side or the other might attempt to hide or fail to declare even several hundred warheads in an arms control agreement. Failure to account for even a few hundred nuclear weapons with inventories exceeding thirty thousand had little military significance in any practical sense. As warhead numbers continue to decline—the current bilateral arms control agreement will take each side to 1550 deployed warheads—a militarily significant total might be only 50 to 100 undeclared or unverified warheads.

At lower numbers, the standard for accuracy and confidence in inventory numbers will be high—perhaps at unprecedented levels. Such standards will call not only for new levels of trust among nations. Often overlooked is the challenge for those tasked with monitoring compliance with any future agreement. The United States and Soviet Union during the Cold War formally agreed to rely on their own monitoring capabilities referred to as national technical means (satellite reconnaissance for the most part) to verify compliance with their negotiated arms control treaties. Those monitoring capabilities, developed originally to observe the military activities of the other side, represented the extensive investment of billions of dollars in sophisticated hardware and thousands of trained personnel. Albeit imperfect, these capabilities provided a considerable measure of confidence that the treaty commitments were being met and, just as important, provided an evidentiary base for raising questions when there may have been reason to question if treaty provisions were being implemented.

Those capabilities almost certainly can't and won't be replicated by other nations. They also may not be required given the growing use, for example, of commercial satellite capabilities. Moreover, no nation comes close to the nuclear infrastructure and deployed nuclear capabilities of the United States and Russia, reducing the need for the type of extensive monitoring capabilities used by the former Cold War adversaries. This does not suggest a sanguine approach to verification and ways to monitor any future agreements is justified. Rather, innovative ways for monitoring, perhaps to include increased reliance on ground inspections such as what was used in Iraq in the early 1990s could be developed. Reaching agreement on such issues will be difficult given the asymmetrical nature of the intelligence capabilities of various nations but need not become

an insurmountable obstacle given sufficient political will. As it has been for decades, the question posed for governments will be what level of assurance they will require to support significant reductions in nuclear weaponry.

NUCLEAR STRATEGY

The workings of international politics among the nuclear weapon states impose another set of challenges for those advocating a world without nuclear weapons. If the United States' use of atomic weapons against Japan in 1945 had the proximate effect of forcing an end to history's bloodiest war, the long-term implications of the advent of nuclear weapons were no less profound. The Soviet Union under Josef Stalin could not tolerate that its ideological foe might have a monopoly on the ultimate weapon of mass destruction. Through a mixture of espionage and scientific effort, the Soviet Union in 1949 became the second member of the nuclear club. The U.S. nuclear monopoly would prove to be short-lived; the arms race would not.[4]

What the United States, followed by the Soviet Union and a handful of other nations would come to understand was that nuclear weapons had no direct military utility in the various conflicts that have plagued the globe since 1945 but conferred several distinct political advantages. The first advantage was that nuclear weapons could not only deter attack—their primary utility—but also could be a political instrument of suasion by the threatened use of force. America understood this advantage well as discussed in the previous chapter. Albeit somewhat more selectively, the Soviet Union also was not above using "nuclear diplomacy" as it did in the 1973 Arab-Israeli war. The recurring crises between India and Pakistan over Kashmir have included veiled "reminders" by each side of its nuclear capabilities. Other nuclear nations such as the United Kingdom and France have looked closely for several reasons, including financial considerations, at their future nuclear weapons requirements and over the next decade are likely to deploy a smaller number of nuclear assets. It is unlikely they will abolish their nuclear arsenal, maintaining the belief that some level of nuclear capability is in their national security interests and contributes to their defense posture. Similarly, since the breakup of the Soviet Union, Russia under President Dmitry Medvedev may well decide to go beyond the 2010 agreement regarding new limitations on strategic nuclear forces, driven as others have been by a mix of changing threat perceptions and budgetary concerns. Would Moscow be willing to consider even deeper cuts? For Russia, its defense calculus is a mixture of acknowledging the growing might of China, its eastern neighbor, Russia's still unresolved domestic problems, including a troubling demographic trend reflected in a diminishing population base, and quiet recognition

of the enduing nature of the problems plaguing its conventional military forces which have scarcely distinguished themselves in fighting in Chechnya or Georgia. Russia's historic sense of vulnerability to threats real and imagined suggests that nuclear weapons are likely to play for the foreseeable future an integral role in Russian defense planning. Some additional reductions in Russia's nuclear arsenal may be agreed to but those reductions are unlikely to be extreme.

The role of nuclear weapons in U.S. defense strategy is evolving under President Obama but, at least for the time being, not radically changing. In early 2010 the Obama administration presented in an unclassified document its Nuclear Posture Review (NPR), the administration's official thinking about the circumstances under which it might use nuclear weapons. Many commentators seized immediately on the NPR's narrowing of the scenarios that might allow for the use of nuclear weapons, such as against a nation found to be in violation of its NPT commitments, a clear reference to Iran. What is perhaps of equal significance is that notwithstanding the Obama rhetoric regarding his desire to help create a world free of nuclear weapons, the United States still endorses nuclear weapons as an important element of its defense planning. The bureaucratic force represented by the U.S. military almost certainly will continue to support that policy as well. If the United States continues to maintain some reliance on nuclear weapons and a defense budget larger than the combined defense spending of the next eight nations, what prospects exist for nations with far fewer conventional and nuclear capabilities than the United States, such as India and Pakistan, to commit to even significant reductions in their nuclear inventories? Pakistan is considering an expansion of its nuclear inventory, not a contraction. The United States, at least under President Obama, will attempt to continue the now established arms control process with Russia. Even if new successes are achieved, it is problematic that they will serve as an inducement for other nuclear nations to contemplate reductions in their own nuclear inventories or nuclear plans.

THE UNINTENDED CONSEQUENCES OF POLICY INCONSISTENCIES

The decision by the George W. Bush administration to sign the so-called 123 Agreement allowing for increased U.S. nuclear cooperation on civil technology with India served several important but largely disjointed purposes. In part it was clearly designed to demonstrate Washington's desire for improved relations with a growing regional power and the world's largest democracy. India long had enjoyed a close relationship with the Soviet Union and then Russia and from one perspective Bush's decision reflected the ongoing give-and-take of international politics. The nuclear agreement also offered the prospect of considerable financial benefit for

U.S. industry. On the surface, these goals are laudable. However, the agreement at the same time stood on its head decades of U.S. nonproliferation policy supported by Democratic and Republican administrations alike that had refused to enter into any such agreements in such sensitive nuclear technology areas with nations who are not NPT signatories as is the case with India, a nuclear weapons state.

The Obama administration has sought, and with strong justification, to portray its policies as championing the cause of nonproliferation and arms control. Nonetheless, it also has decided to support the Bush decision regarding U.S. nuclear cooperation with India. Administration officials understand well the proliferation implications of doing so and will assure the Congress, which has to vote approval of the deal, of the mechanisms it has put in place to minimize any risks that US technology and assistance will be diverted to India's military program. What the administration apparently has lacked is the foresight to anticipate the effects of its actions on others. Pakistan, ever sensitive to India's nuclear activities, had made clear its desire to be offered a similar deal by the United States. Neither the Bush nor Obama administration was willing to do so.

In another case of nations feeling compelled to keep pace with regional developments, Pakistan has turned away from seeking nuclear cooperation with the United States and agreed to purchase two nuclear power reactors from China.[5] At first blush the deal appears to have a business as usual quality given that Pakistan already is a nuclear state and China has been a decades-long source for Islamabad of various forms of nuclear assistance. A more disquieting assessment lies beneath the surface. As described in one report, "the damage will be huge beyond just stoking the already alarming nuclear rivalry between Pakistan and India. That does not deter China, which still seethes about the way the Bush administration in 2008 browbeat other Nuclear Suppliers Group members into exempting America's friend India from the group's rules . . . The deal incensed not just China and Pakistan but many others . . . an immediate casualty was the effort to get all members of the NPT . . . to sign up to an additional protocol on toughened safeguards. Many have but Brazil's president is reputed to have flatly ruled that out. And where Brazil has put its foot down, others have also hesitated . . . China is trying a legalistic defense of the reactors at Chasma. But the real point is this: if America can bend the rules for India, then China can break them for Pakistan."[6] The United States has set aside its obligations as a Nuclear Suppliers Group member to enhance its political and commercial standing with India while China, in turn, has decided that its NSG commitments can be set aside in order to further its ties to Pakistan. Such decisions do not move the international community toward a world without nuclear weapons.

The second decade of the 21st century will be a time of heightened proliferation risk but also great opportunity. These two trends—risk and

opportunity—will form the mosaic of the nonproliferation tapestry. On the risk side, Iran's emergence as a nuclear weapons state at some point in the decade—probably sooner rather than later—will pose substantial and even unacceptable risks to regional stability. Moreover, Iran's long-standing efforts to master all parts of the nuclear fuel cycle and the proliferation implications of those activities is well understood in the region and beyond and almost certainly informs and influences the nuclear programmatic decisions of some of the most prominent nations in the region. The threat of nuclear terrorism is unlikely to significantly abate, even as nations continue to carry out efforts to reduce the risk of theft and diversion of nuclear materials and warheads, if for no other reason than large amounts of material will remain at risk for years to come.

Positive forces reinforcing the principles of nonproliferation also will be in play in the years ahead. The bilateral U.S.-Russian arms reduction process, as noted, is likely to continue. A large majority of nations in the Middle East and beyond will continue to share the goals of preventing the spread of nuclear weapons. The NPT and the U.N. Security Council will continue serving as integral elements of the nonproliferation regime, although the process of rapidly and effectively challenging the actions of would-be proliferators requires considerable improvement. The IAEA, under a new Director General, may play an expanded role in calling the international community's attention to the need for enhanced international engagement on proliferation issues while also emphasizing the importance of expanded and more robust international safeguards procedures.

The complexity of the politics of proliferation is well illustrated by the results of the 2010 NPT Review Conference held in New York City. Held every five years to review treaty-related issues, the Review Conference in 2005 ended in rancor, mostly over disputes regarding the Bush administration policies. In 2010, the Obama administration hoped to carry on the momentum it had built earlier in the spring in signing an arms control agreement and hosting the Nuclear Summit by addressing a number of the NPT's gaps and limitations. After a series of meetings lasting the entire month, the administration achieved little of what it had sought to accomplish. The Review Conference endorsed the Obama goal of a world without nuclear weapons but did little substantively to advance that agenda. A proposal for the elimination of all nuclear weapons by 2025 was derailed by the nuclear nations as was a proposal for a legally binding commitment from states with nuclear weapons not to use them against non-nuclear states.

Even more problematic from Washington's perspective was language in the Mideast section of the painfully negotiated 28-page final document. For years the idea of nuclear weapons free zones in various regions has circulated and made some progress. For example, the Treaty of Tlatelolco was conceived in 1962 and entered into force in 1995, prohibiting all 33 nations in Latin America and the Caribbean from introducing nuclear

weapons into the region. Also in 1995, a number of Arab nations proposed a resolution for a Middle East nuclear weapons free zone. The proposal did not advance as it was intended to a large degree to force Israel to acknowledge its nuclear weapon status, an outcome at direct odds with Israel's policy of nuclear ambiguity. The issue surfaced again in 2010 with Arab nations threatening to scuttle the meeting without progress on the issue. As a result, the final document called for a meeting in 2012 on the question of establishing a nuclear weapons free zone in the Middle East, mentioning only Israel and calling on Tel Aviv to join the NPT, which would require it to give up its nuclear weapons. Israel objected to being singled out for mention in the document; asserting that Iran's decades-long nuclear ambitions were the real threat to peace in the region. The scab on a simmering political and proliferation problem again had been opened.

From the forgoing, it is impossible to answer with confidence or precision whether the risks or opportunities as they appear in 2010 will in the coming years predominate. Perhaps a more interesting and related question is what factors might tip the scales in one direction or another. An underlying premise of this book has been that the myriad technical issues associated with nuclear weapons programs and nuclear technology are best understood through the prism of international politics. It is but a small handful of nations, beginning with Iran and North Korea, which pose political as well as nuclear threats to international order and stability. Considerable differences of opinion exist over how those political problems can resolved, ranging from accommodation to containment to confrontation. Political change in either or both capitals would constitute a significant step forward in the path to a more stable world in which nuclear weapons represent an ever diminishing threat.

The challenges of nuclear proliferation are not limited to any one region but we should conclude our discussion by returning to the challenges of the Middle East. The first decades of the nuclear era centered on the U.S.-Soviet superpower rivalry of the Cold War. The more recent and most important evolution of the nuclear saga has been the pursuit of various nuclear capabilities by less advanced and technologically capable nations. That trend will continue and much of that will center on the Middle East, the most politically fragile of regions. The Middle East long has borne witness to seemingly endless enmity, disappointment, and pain. The spread of nuclear technology in the region offers opportunities for a new era of economic development. At the same time, it also could exacerbate the existing political situation if not managed with more diligence, resolve and creativity than has been the case to date. This will pose an enormous challenge for the major regional actors as well as the rest of the international community. In one way or another, the Middle East is rapidly moving beyond sand and oil.

Notes

CHAPTER 1

1. U.S. recognition of Israel by President Truman came within minutes of the Israeli May 1948 declaration of independence.

2. Of the many books that recount the dramatic events surrounding the state of Israel, one of the most interesting is Noam Chomsky, *The Fateful Triangle: The United States, Israel and the Palestinians* (New York: South End Press Classics, 1999).

3. An excellent and authoritative account of early Israeli thinking about nuclear weapons is contained in Seymour M. Hersh, *The Samson Option*. (New York: Random House, 1991), See chapters 2–5.

4. Ibid., pp. 22–23.

5. See biography of Ernst David Bergmann at www.weizmann.ac.il.

6. Ibid.

7. www.fas.org. See the section on "WMD Around the World: Israel."

8. Hersh, op. cit., p. 26.

9. Ibid., p. 27.

10. See www.arableague.com for an overview of the early days of the Arab League.

11. Hersh, op. cit., pp. 21–22.

12. Ibid., p. 36.

13. www.fas.org., op. cit.

14. Mycle Schneider, *Nuclear France Abroad*. Study prepared in conjunction with the Centre for International Governance Information, Ontario, Canada. May 2009.

15. An excellent source of information on some of the operations and scope of the work at Dimona is found at www.globalsecurity.org/Dimona.

16. Following what were perceived by Israel to be a series of hostile moves by Egyptian President Nasser, including signing an arms agreement with Czechoslovakia in 1966, the closing of the Strait of Tiran and the nationalization of the Suez Canal on July 26, 1956, in late October 1956 the Suez War against Egypt broke out with France and Great Britain committing to support Israeli war aims. Operation Kadesh, the Israeli war plan, had the goals of weakening of the Egyptian Army by conquering the Sinai and, more broadly, President Nasser's air of authority in the Arab world. The prearranged deal called for French and British military support to the operation. Israeli military forces scored initial tactical victories but the coalition encountered a blunt Soviet warning that it was prepared to send military assistance to the suddenly beleaguered Egyptian military. The United States, enraged by what it saw as Israeli perfidy in not informing Washington about its plans, sided with the Soviet Union, leading the Israelis, French and British to accept a cease fire that resulted in little advancement of Israeli military or political objectives. The resulting Israeli sense of betrayal toward its Western partners was palpable but it may have had the unintended effect of increasing French willingness to move forward with the nuclear aspects of the relationship. Shortly after the incident France, also smarting from perceived lack of NATO support, would accelerate its own nuclear program, the Force de Frappe.

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