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Iranian Nuclear Weapons?

Options for Sanctions and Military Strikes

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Table of Contents

There is no way to know what strategy Iran will choose in the future, or how the international community will respond. Iran's possible efforts to acquire nuclear weapons are an ongoing test of the entire process of arms control and the ability limit nuclear proliferation. At the same time, they raise critical issues about how Iran might use such weapons and the security of the Gulf region -- an area with more than 60% of the world's proven conventional oil reserves and some 37% of its gas.

Iranian acquisition of nuclear weapons is not simply a struggle over issues of national prestige or "rights." It has a major potential impact on regional stability and future war fighting. If Iran does acquire nuclear weapons, it is possible that it will use them largely as a passive deterrent and means of defense. It is also possible, however, that Iran will use them to put direct or indirect pressure on its neighbors, threatening them to achieve goals it could not achieve without the explicit or tacit threat of weapons of mass destruction.

Iranian possession of nuclear weapons, or of highly lethal biological weapons for that matter, would change the military map of the region. It would almost certainly lead to contingency planning by other nuclear powers to attack Iran -- certainly Israel and possibly Pakistan and India. Such planning in potentially "existential" conflicts takes place when there is a possibility, even if there is not a probability.

US and allied forces in the Gulf would have to plan for nuclear war or the risk of nuclear escalation, and for preventive, preemptive, deterrent, and retaliatory options. Iran's would target cities, key civilian facilities, and military targets with nuclear weapons and be targeted in return. The risk of misunderstandings, misperceptions, and miscalculations would be significant in a crisis or war both before any use of nuclear weapons, and during the transattack and conflict termination phases.

At the same time, the previous chapters have shown that it can be difficult to stop a truly dedicated Iran with either military operations or steps like sanctions. They might well simply push Iran into more concealment, more drastic options, or alternatives like biological weapons. This does not mean such options cannot be effective, either in slowing any Iranian efforts or even halting them if political conditions in Iran should change. It does mean that no single set of actions to halt Iran can be decisive if Iran is determined to continue and willing to pay the cost.

Iran’s WMD Capabilities Uncertain Future

It is far from clear whether Iran will stop its pursuit of nuclear weapons, and it may be only a matter of time before it acquires nuclear weapons. However, it is very unclear what kind of a nuclear power Iran is or will seek to be. No plans have ever surfaced as to the number and type of weapons it is seeking to produce or the nature of its delivery forces.

Iran might be content to simply develop its technology to the point it could rapidly build a nuclear weapon. It might choose to create an undeclared deterrent and limit its weapons numbers and avoid a nuclear test. It might test and create a stockpile, but not openly deploy nuclear-armed missiles or aircraft. It also, however, might create an overt nuclear force. Each option would lead to a different response for Saudi Arabia and Iran’s other neighbors, as well as provoke different responses from Israel and the US—creating different kinds of arms races, patterns of deterrence, and risks in the process.

Iran's Options for Riding Out a US or Israeli Attack or Appearing to Comply with EU3 and UN Demands

Iran can pursue a wide range of nuclear weapons development options–many of which could be effective even if Iran was subject to many forms of preemptive attack:

- Simply carry out enough ambiguous activity to convince outside nations it has an active nuclear weapons effort, seeking to use the threat of development to create some degree of nuclear ambiguity.
- Pause long enough to win international belief Iran now complied, while creating new disperse facilities and improving concealment and deception.
- Pause most efforts, but push forward with more advanced centrifuge and possible laser isotope separation. Accelerate efforts to acquire boosted or thermonuclear weapons. Leapfrog a pause in activity by having more advanced production capabilities when large-scale activity resumes and more lethal weapons requiring less fissile material.
- Carry out a low-level research and development effort that was covert enough to steadily move it towards a break out capability to rapidly create weapons production capabilities, but not actually build production facilities. It could maintain ambiguity by using small redundant efforts, canceling efforts when uncovered, or pausing when acute pressure came from the outside. Developing truly advanced centrifuges or LIS facilities, and completing bomb design and simulation, before beginning development of production facilities are particularly attractive options.
- Covertly develop a highly dispersed set of small and redundant production facilities, combing covert facilities like small "folded centrifuge" operations with sheltered or underground facilities. Slowly acquire actual production capability and begin stockpiling.
- Rely on covert simulation to test bomb designs and their weaponization; test a fractional weapon undergone under the cover of an earthquake, or overtly conduct a surface test as proof of Iran's nuclear capability.
- Appear to cancel most of its ambiguous activities, and wait until its civil nuclear reactor and technology program advances to the point where it is no longer dependent on outside supply, and possibly it can use some of its power reactors to obtain Plutonium. Use compliance with the NPT to proliferate.
- Assemble a limited number of nuclear devices without any public statement. Such a "bomb in the basement" strategy could allow sudden testing to prove its existence, be used in surprise attacks, and be linked to covert attack strategies or carried to the level of weaponization necessary for use in missile warhead or bomb.
- Deploy its Shahab missiles with conventional warheads, and create a launch on warning/launch under attack capability mixed with sheltering and mobility. Arm the missiles with weapons of mass destruction once this capability is ready. Alternatively, covertly arm some missiles as soon as the Shahab and warheads are ready and/or seek at least limited missile defenses like the SA-400. Combine Shahab forces with air units and sea-based cruise missile units to create survivable and redundant forces. Either announce nuclear capability once a survivable/retaliatory force is in being or rely on nuclear ambiguity.
- Stop at fission weapons, or go on to develop "boosted" and true thermonuclear weapons.
- Stop building up a force at the level of minimal assured deterrence; participate in an open ended arms race, seek "parity" with other regional powers like Israel – at least in terms of weapons numbers.
- Rely on an area targeting capability or develop a point target capability as well.

- Deploy its Shahab missiles as conventionally armed missiles, and give them mobility to hide them, or organize them with suitable warning and command and control system so they can launch on warning (LOW) or launch under attack (LUA). It can "instantly" convert part of its air force to an LOW or LUA capability simply by arming them with nuclear weapons and putting them on alert. Even a few nuclear deployments of this kind could act as a powerful deterrent to both Israel and the US, and do serious damage to any Gulf state or major Gulf energy facility.
- Deploy satellites to improve targeting, damage assessment, and C^4I capabilities.
- Develop small weapons, and/or radiological weapons, for possible covert delivery or use by extremist and/or proxy organizations. Use the threat of transfer as a further deterrent, execute strikes in ways where deniability of responsibility has some credibility, or use actual transfer to aid in attacks or for retaliatory purposes.

The "CBR" Option, With or Without the "N"

It is also impossible to dismiss the possibility that Iran could respond to any decision to give up nuclear weapons by developing and producing advanced biological weapons, or that it may already have biological and nuclear efforts going on in parallel. It might also choose to develop and use "radiological weapons." Such weapons might take three forms—all of which would interact with its potential use of chemical and biological weapons.

- **The first would be a "dirty weapon"** using fissile material with contaminated or low enrichment levels that would have limited heat and blast effects, but still produce yields of 3 to 5 kilotons, and which would effectively poison a city if detonated near the ground. Such a device would reduce some of the manufacturing and design problems inherent in creating clean or efficient nuclear weapons.
- **The second would be to use a weapon that had not been tested, which was felt to be unreliable, or which was on an inaccurate missile** and detonate it near the ground so that radiation effects compensate for a failure to reach design efficiency or accuracy of the delivery system.
- **The third would be to use radioactive material in micro-powder or liquid form as a terror or unconventional weapon.** It would be very difficult to get substantial lethality from the use of radioactive material, and such a weapon would be less efficient than biological weapons in terms of weight and lethality. It would, however, have the capacity to contaminate a key area and to create panic.

While the US and Russia have rejected radiological weapons because they have the ability to precisely control the yield from their nuclear weapons, such options might be attractive to Iran. As is the case with chemical and biological weapons, even the prospect of Iran's acquiring any such nuclear weapons has increased its ability to intimidate its neighbors.

Iran could deliver chemical, biological, or nuclear weapons on any of its fighter-bombers, use covert delivery means, or use its missiles. It could use its Scuds and some types of anti-ship missiles to deliver such warheads relatively short distances. Its Shahab-3 missiles could probably reach virtually all of the targets in Gulf countries, including many Saudi cities on the Red Sea coast and in Western Saudi Arabia.

As has been discussed earlier, Iran's Shahab-3s are probably too inaccurate and payload limited to be effective in delivering conventional weapons. This does not mean that conventionally armed Shahab missiles would not use terror weapons, or weapons of intimidation, but they could only have a major militarily impact–even against area

targets–if they were armed with warheads carrying weapons of mass destruction. Moreover, Saudi Arabia faces the possibility of an Iranian transfer of weapons of weapons of mass destruction to some anti-Saudi extremist group or proxy. These currently do not seem to be probable scenarios, but Saudi Arabia is worried.

Iran's Uncertain Nuclear Warfighting Doctrine and Capabilities

As has been discussed throughout this analysis, few meaningful data are available on Iranian nuclear doctrine and targeting, and it is uncertain that any current plans would even be relevant in the future. The same is true of Iranian plans to limit the vulnerability of its weapons and facilities–and whether Iran would try to create a launch-on-warning or launch-under-attack capability. It is easy to speculate at vast length on what Iran would do with nuclear weapons. It is impossible, however, to determine how aggressively Iran would exploit such a capability in terms of threatening or intimidating its neighbors, or putting pressure on the West. Trying to guess at Iran's warfighting doctrine and actions in using weapons of mass destruction simply lacks meaningful data.

The Risk Iran is Proliferating Without Meaningful Plans for Actual Possession

It is also quite possible that Iran has not yet looked far enough beyond its nuclear weapons acquisition efforts to work out detailed plans for possession. There is no way to know if Iran would choose a relatively stable model of deterrence or aggressively exploit its possession politically. It is equally difficult to guess whether Iran would develop an aggressive doctrine for use, consider developing a launch on warning/launch under attack capability, or reserve the use of such a weapon as a last resort.[1]

As for warfighting capability, any working nuclear device Iran is likely to develop will be sufficient to destroy any hardened target, area target, or city in the Middle East if the delivery vehicle is accurate enough. Nuclear weapons do, however, differ sharply in their effect as they grow in size and if Iran had to rely on inaccurate delivery systems it not only would have to target area targets like cities and major energy facilities, it might have either use multiple strikes or develop more advanced and higher yield nuclear weapons like "boosted weapons." Alternatively, it might rely on ground bursts and fallout.

Iran's nuclear efforts will also interact heavily with the progress Iran makes in biological and chemical weapons programs and its efforts to improve its delivery capabilities. By the time Iran has significant nuclear capability, it may have significant missile, cruise missile, and long-range strike aircraft capability--although it may not have cruise missiles capable of carrying a nuclear weapon. It may also have rebuilt much of its conventional capabilities to the point where it has significant warfighting capabilities.

The Challenges of Actual Possession

As the previous chapters have also discussed, Iran will encounter certain practical problems regardless of which weapons of mass destruction Iran develops and deploys:

- Unless Iran acquires satellites it will have limited dynamic targeting capability and limited ability to assess the impact of any strikes it launches. Even if it does acquire satellites, it will experience serious problems in trying to assess damage and its target and escalatory options in the event of a chemical and biological strike or in terms of nuclear fall out.

- It would take a major surface testing effort to be certain of the reliability and yield of its weapons designs, and testing of actual bombs and warheads to know the success of its weaponization effort – although a nuclear devise could be tested using non-critical materials to determine that its explosive and triggering systems functioned.

- Quite aside from theoretical accuracy problems, long-range missiles are subject to some loss of accuracy depending on the vector they are fired in, as well as potential weather effects. Combined with targeting, weapons design, and other accuracy problems – plus reliability problems – a significant number of Iranian strikes might miss their targets and some might hit unintended targets.

- Past tests have shown that efforts to apply chemical and biological lethality data based on laboratory or limited human testing simply do not provide anything approaching an accurate picture of area lethality. Nominal lethality data can be wrong by more than an order of magnitude– so far, by exaggerating lethality. The impact of nuclear strikes on large, semi-hard, area targets is very hard to predict. So is the effect of unusual winds and weather.

- Iranian C4I systems might not be adequate and survivable enough to maintain cohesive control over Iran weapons and launch forces. Any reliance on launch on warning or launch under attack virtually precludes such control, and could trigger Iranian action based on false alarms or serious misunderstanding of the developing tactical situation. If Iran was preempted or subject to a first strike, its ability to characterize the result could be equally uncertain.

- Iran might well have equal problems in characterizing enemy responses and retaliatory strikes once exchanges begin.

- For all these reasons, Iranian command and control might well have to operate on the basis of grossly inadequate information in both planning operations and conducting them. The "fog of war" might well be exceptionally dense.

What is clear is that if Iran acquired a working nuclear device, this would suddenly and radically change perceptions of the military balance in the region. Iran is likely to acquire such weapons at about the same time it acquires MRBMs, and this would be a volatile combination. Iran could then destroy any hardened target, area target, or city within the range of its delivery systems. Iran's Southern Gulf neighbors are extremely vulnerable to attacks on a few cities, and even one successful nuclear attack might force a fundamental restructuring of their politics and/or economy. They are effectively "one bomb" countries. The same is true of Israel, although it has limited missile defenses and is steadily improving them, and could launch a massive retaliatory nuclear armed missile strike against virtually all of Iran's cities.

Outside Help to Iran's WMD Program

Any discussion of Iran's CBRN and missile programs is not complete without discussing the role of outside powers. Some of the most important technologies that Iran uses, particularly in its nuclear and missile programs, were acquired from foreign sources. Previous sections have shown just how important foreign technology, equipment, and expertise to Tehran's WMD and missile programs have been.

Iran at times sought the help of countries in their effort to develop their nuclear capabilities in the case of Russia, for example. At other times, Iran worked hard to acquire the technology covertly through legitimate institution and the open market in Europe, Russia, and even the United States before the revolution. It also attempted to acquire such expertise through the back market. In the case of Pakistan, most of the

evidence, point to the fact that Iran was approached by the AQ Khan network in 1987 and given the designs of centrifuges (P-1 and probably P-2).

Regardless of the ways in which Tehran attempted to adapt new technologies, there is little doubt that the Iranian nuclear and missile program—and to a lesser extent its CBW programs—have relied heavily on foreign help and expertise. In 2001, the United States Department of Defense cited Iran as one of the major concerns in international proliferation. It stated that "Iran, with foreign assistance, is buying and developing longer-range missiles, already has chemical weapons, and is seeking nuclear and biological capabilities."[2]

Iranian Efforts to Acquire Technology and Expertise

A European assessment, dubbed an "early warning," by British, French, German, and Belgian intelligence services was leaked to the press following Tehran's decision to resume its nuclear research in January 2006. The estimates, reportedly, concluded that "In addition to sensitive good, Iran continues intensively seek the technology and know-how for military applications of all kinds." According to the Guardian, Iran was working on acquiring such technology through "an extensive web of front companies, official bodies, academic institutes and middlemen dedicated to obtaining—in western Europe and in the former Soviet Union—the expertise, training, and equipment for nuclear programmes, missile development, and biological and chemical weapons arsenals."[3]

The document added that Iran was using "middlemen" in Azerbaijan and Armenia to gather expertise in nuclear and missile technology in FSU states. According to the Guardian, the estimate listed more than 200 front companies, government offices, and academic institutions to engage in "weapons research."[4]

The Role of Pakistan

Pakistan helped Iran advance its nuclear research, but there is no evidence to suggest that the Pakistani government was directly involved. It was, however, revealed that the AQ Khan network played an instrumental role in advancing Tehran's nuclear research efforts. While it remains unconfirmed, US officials have accused Dr. Khan of providing the Iranians with the design and components of the P-2 centrifuge.

The investigation by US, French, Japanese, British, and Russian scientists into the source of highly enriched uranium (HEU) contamination in Iranian nuclear sites proved that it came from equipments that Iran bought from Pakistan during the 1980s and the 1990s. One official, who was involved in this investigation, concluded that "The biggest smoking gun that everyone was waving is now eliminated with these conclusions." Another official was quoted by the Washington Post as saying "the contamination issue is revolved."[5]

In early 2005, Pakistan provided the IAEA with equipments to compare to those found at nuclear sites in Iran. As of August 2005, both the IAEA and the US Administration refused to comments on the findings of the comparison.[6] Many experts, however, believe that Pakistan was the source of some of the centrifuge designs and perhaps equipments. On August 20, 2005, IAEA diplomats argued that the traces of highly enriched uranium on centrifuges in Natanz were not from Iranian domestic experiments, but rather from equipments that were provided by Pakistan. The Iranian government confirmed that "The source of contamination was not related to Iran…We are sure that source is not internal."[7]

The Iranian exile group, NCRI, also claimed that AQ Khan actually delivered to Iran a small quantity of highly enriched uranium (HEU), but the NCRI claimed that amount was too small to produce nuclear weapons.[8] According to a September 2005 report by the IAEA, inspections found traces of weapons-grade uranium on equipments that were imported from Pakistan. These equipments, according to press reports, were bought on the black market—presumably from the AQ Khan network. The report did, however, qualify these findings. It concluded that "it is still not possible at this time to establish a definite conclusion" about the other traces that were not yet enriched.[9]

Pakistan's help to Iran is not only important in knowing what Pakistan offered Iran, but it is also important to know that the HEU contamination did not come from Iran's own uranium enrichment program—which would have meant evidence of a nuclear program. This represents one uncertainty in understanding Iran's nuclear capabilities. No one outside Pakistan has talked to AQ Khan about the type of help he provided to Tehran due to resistance from the Musharaf government. President Preverez Musharaf was concerned that giving IAEA, American, or European inspectors access to Khan may jeopardize Pakistan's own national security.

On March 10, 2005, however, the Pakistani government admitted that its nuclear scientist, AQ Khan, sold Iran crucial components needed for Iranian enrichment. The Pakistani Minister of Information said that AQ Khan "gave some centrifuges to Iran…He helped Iran in his personal capacity, and the Pakistani government had nothing to do with it." Rashid Ahmed added that "Yes, we supplied Iran the centrifuge system. Yes, Dr. Qadeer [Khan] gave Iran this technology."[10]

It was also reported that Bukhary Sayed Tahir--an alleged salesman in the AQ Khan network--has admitted to selling Iran three advanced centrifuges in the mid 1990s. The US fears that these models can be used to manufacture thousands of P-2 centrifuges, which can advance Iran's nuclear research beyond where it is believed to be now. This also seems to contradict Iranian claims that the AQ Khan 1987 offer provided them with the drawings and not the models of the P-2 designs. US intelligence, however, believes that these claims by Mr. Tahir are uncertain; they contradicted his previous statements and claims by other people in the Khan network who were involved in the offer to Iran.[11]

The extent of Pakistan's help is yet to be fully known. Even if complete access was granted to the IAEA inspectors, it is unlikely that they will gather enough information to understand the full extent and history of the network's help. In addition, it remains uncertain as to how Iran used the help and equipment it received from Pakistan to advance its nuclear research efforts or to weaponize its fissile materials.

The Role of Russia

Russia's relationship with Iran has a complex history. Current relations and Russian attitudes toward Iranian proliferation are equally complex. Viktor Mizin, an official in the Russian Ministry of Foreign Affairs, summarized the thinking in Russia concerning Iran as follows:[12]

> To understand Russian attitudes toward Iran, it is important to distinguish three major groups in the Russian political elite. The first could be termed proliferation zealots or proponents. These are the people who exchange a flurry of memos with the U.S. government and who formulate official Russian positions on non-proliferation, including the Iran case, which basically do not differ much from the official American approach as described by U.S. National Security Advisor Sandy Berger.

> Then, there are the people who manufacture armaments, and they could be called neutrals. Finally, the last group opposes of any kind of export control or non-proliferation. They view such regimes as some sort of sly ruse devised by the U.S. government under the pressure of U.S. companies to squeeze out Russian armament makers from lucrative world markets. While the first group, the zealots or proponents, is engaged in endless consultation with Americans and signs all kinds of papers, the third group is constantly undermining the regime Russia signed on to.
>
> It is also important to understand the difference in U.S. and Russian approaches to proliferation concerns. While certain people in Russia pay lip service to the politically-correct notion that proliferation is dangerous, if one looks at the countries that are known as "rogue states," (in official Russian parlance, Moscow rejects the notion of rogue states), all of those countries are former clients of the Soviet Union: North Korea, Libya, Iraq and others. And unlike the situation faced by the United States, the deployment of any ballistic missiles does not threaten Russian troops stationed abroad. There is also no political community in Russia - like in the United States– strong enough to influence the voting in the Parliament.
>
> That is why one always hears very politically correct words from Russian political scientists about the concerns that Iran is developing missile capabilities. No one in the Russian political elite is seriously considering the threat of this development. For example, it was the same case with Saudi Arabia developing an IRBM potential.
>
> Iran remains a very important market for the remnants of the Russian military industry. The collapse of the economy in Russia literally prods the best of Russian industry (the most technologically saturated companies), which have now lost state government procurement orders, literally to search for clients abroad. Russia officially considers the Bushehr reactor deal, for example, legitimate because Iran is under IAEA safeguards.

In January 1995, Iran signed an $800 million contract with the Russian Ministry of Atomic Energy to complete reactors at Bushehr. This included a 1,000 megawatt reactor plant. This was scheduled to finish in 2005, but the revelation in 2002 about Iran's uranium enrichment facility at Natanz and heavy-water reactor at Arak led to further scrutiny of Iran's nuclear program. The Russian President, Vlamimir Putin, promised the US and the EU3 that Moscow would not provide Iran with the reactor unless it complies with the IAEA safeguards. The concern, however, is that Iran would use the technology and the reactors provided by Russia to advance its "covert" nuclear program.[13]

In spite of the perceived concealment activities by Iran, however, Moscow and Tehran signed a fuel supply deal in early 2005 that paved the way for Bushehr to come on-line in late 2006.. In June 2005, Russian President, Vladimir Putin said that Russia would continue its nuclear cooperation with Iran's new president, Mahmoud Ahmadinejad. In addition, the head of the Russian Atomic Energy Agency, Alexander Rumyantsev, announced that, "Tehran intends to build another six nuclear reactors," and that Russia would be willing to help.[14]

Russian engineers continue their work on the Bushehr reactor. The Iranian-Russian negotiations regarding the Bushehr reactor and uranium enrichment continued through the referral of Iran to the UNSC. The US, the EU3, the IAEA, and the UN Secretary General have publicly voice their backing of the Russian plan, but privately, officials in France, Germany, the UK, and the US have voiced skepticism about the chance of success. Many officials in Russia have expressed its determination to stop Iran from acquiring nuclear capabilities at all cost. They argue that it is not in the Russian Federation interests to have nuclear armed Iran 165-kilometers away from its border.[15]

These concerns were reflected in both the Russian willingness to report Iran to the UNSC, and the many negotiations Moscow held with Tehran. In addition to Russia's role in the Bushehr reactor, Russia led the negotiations in convincing Iran to abandon its

uranium enrichment program. During the month of March 2006, Russia and Iran held several meetings regarding Iranian enrichment experiments. Iran refused most of the deals that were offered by Russia, including a proposal that was presented on March 6, 2006. The deal would have required Iran to have a moratorium on production of enriched uranium on an industrial-scale, but allow Tehran to produce a small-scale "research and development" program. The United States, Europe, and many nonproliferation experts expressed their opposition to this deal. They argued that if Iran was able to enrich uranium at a small-scale, it is only a matter of time before it moves to produce it at "industrial-scale."[16]

The Role of North Korea

The history of North Korean help to Iran's nuclear and missile program is long and complex. As noted earlier, North Korea has been a major supplier of missile technology to Iran, but recently, the scrutiny of the international community of the two countries may have limited the cooperation. Intelligence estimates in the summer of 2005, however, accused North Korea of helping Iran's nuclear program even through the IAEA inspections. An intelligence report was quoted by Reuters in July 2005 as saying:[17]

> In the late 1990s, cooperation began between the two countries, which focused on nuclear (research and development)…There has been a significant improvement in relations between Iran and North Korea over the past few months… [Including a] special course to provide technological and practical information to outstanding students… This nuclear cooperation between the two countries has apparently increased significantly during the past year as seen in the arrival of an academic delegation from North Korea in Iran and the existence of this special course…It seems Iran is taking another step to promote its military nuclear project by exploiting North Korea extensive technological information in the nuclear sphere.

While the credibility of this report was in question, some experts argue that this report was plausible. As one IAEA Iranian expert described the report "…It is credible. No one would be surprised if this was true." Other experts went further to argue that the North Korean regime could replace the AQ Khan network as a major proliferator of nuclear technology to Iran.[18]

More recently, it was also reported that Western intelligence services were concerned about possible North Korean sales of plutonium to Iran, which could fast track Iranian nuclear developments. They point to the IAEA discovery of the delivery of 1.7 tons of slightly enriched uranium hexafluoride. Press reports claimed that Iran and North Korea were in negotiations over an offer that would exchange Iranian oil and gas shipments in return for plutonium from Pyongyang. The concern was over the revelation that North Korea was estimated to have produced 43-53 kilogram of plutonium, which would be enough to use domestically and sell the rest to Iran. These negotiations, reportedly, were direct talks between the IRGC and the North Korean regime.[19]

Other press reports have also revealed evidence of North Korean help in building underground bunkers in Tehran to protect important Iranian nuclear sites. A North Korean team of scientists and experts visited Tehran in 2005 upon the request of the IRGC to conduct a feasibility study of building underground facilities to house nuclear sites. The Daily Telegraph in London quoted "Western intelligence" reports as saying that the North Korean plan was to construct several bunkers each with a space of 1,000-2,500 square meters (covering a total area of 10,000 square meters). Each of these

bunkers would be big enough to house the equipment needed to produce weapons grade uranium.[20]

North Korea has also helped Iran develop its missile arsenal, as Chapter IX showed. Iran's Shahab program is highly dependent on North Korean designed missiles such as the SCUD-B, the SCUD-C, Nodong-1, the Taep'o-dong-1, and the Taep'o-dong-2. The later two are more worrisome since they have the range of 3,000-6,000 kilometers that can reach beyond the Middle East. It has also been reported that Iran financed the North Korean missile program in exchange for the missile technology and the option to buy finished missile. While most observers agree that Iran's Shahab-4 and Shahab-5 are not yet operational, advancement in North Korean missile technology can increase the pace of development of these ICBM.

The Role of China

Observers contend that China was Iran's main supplier of nuclear-related technologies during the 1980s. Some of these technologies included a small electromagnetic isotope separation (EMS) machine and 30 kilowatt-thermal research reactor. In addition, the US claimed that China helped Tehran in building its uranium mining capacity, fuel fabrication, uranium purification, zirconium tube production. The US did not believe, however, that Beijing did not provide Tehran with a nuclear weapons design.[21]

In the early 1990s, it was revealed that China had been helping Iran for nearly a decade. The help included training Iranian nuclear scientists, supplying Tehran with two "mini" research reactors, and providing Iran with the equipment used in electromagnetic isotope separation enrichments of weapons grade uranium. These revelations and their implications have often played a major role in the discussion between the Chinese and the Americans.[22]

In 1997, Beijing agreed to halt its nuclear cooperation with Tehran including a uranium conversion project that the US feared would provide Iran with the know-how of producing hexafluoride or uranium dioxide—materials used in manufacturing weapons-grade plutonium. Furthermore, China implemented new export controls in 1998 that also covered the export of dual use equipment, and the US concluded in 2001, "China appears to be living up to its 1997 commitments."[23]

While the Chinese government may have kept its commitments, Chinese companies have been accused by the US of helping Iran. In December 2005, the US State Department sanctioned six Chinese companies along with one Australian and two Indian firms. The United States called the sanctions "an important and effective tool in constraining Iran's efforts to develop missile and WMD capabilities." US sanctions against key Chinese companies such as China North industries and China National Aero-Technology Import & Export prompted the Chinese government to say "We are strongly dissatisfied with and firmly apposed to the US government sanctioning Chinese companies… [China] has always adapted a serious and responsible attitude on the anti-proliferation issue and has adopted a serious of effective measure to strengthen export management control."[24]

In September 2005, the Iranian opposition group, National Council of Resistance of Iran (NCRI), argued that: "The first phase involves the manufacture of 5,000 machines. Some two-thirds have been manufactured, tested and ready to be installed… They have managed to smuggle centrifuges from China, to Dubai, to Tehran ... in the last two years."[25] These allegations, however, remain unconfirmed, particularly those regarding

the number of centrifuges. While some believe that Iran may have the design for the centrifuges, many experts believe that the Iranian nuclear research does not yet have the capabilities to manufacture that many centrifuge machines. It is equally important to note that the IAEA inspections and technical difficulties encountered may well have delayed Iranian efforts.

Possible Economic Sanctions

Economic sanctions are often used when diplomatic solutions fail in order to prevent the exercise of a military option. Many experts, however, believe that sanctions have become what Jeffrey Schott calls a "way station" to the use of military force.[26]

There are numerous cases where sanctions have been imposed. As **Figure 10.1** shows, economic sanctions have, however, had a poor success record. In addition, over time, their success ratio is declining. This is due to several reasons:

- First, sanctions are often violated through smuggling and backdoor deals to benefit the ruling elite while hurting the general population.
- Second, with a globalized economy, countries under sanctions have alternatives. While some countries abide by sanctions, there are many nations and companies that are willing to trade and violate imposed restrictions to advance economic and commercial interests.
- Third, sanctions are highly politicized, and this gives other nations the reasons to violate them. Political rivalries between nations often drive some to utilize sanctions to advance national strategic, military, and commercial interests.
- Fourth, technology and capital markets are widely available to other nations to import from third parties. For example, even if the US stops the export of its computer chips to a nation, the same product of a close substitute exists else where and can be easily imported.

That said, sanctions can be useful diplomatic tools, without resorting to a military option, to pressure nations to change their policies or at least come to the bargaining table. Economic sanctions, arms embargo, trade restrictions, private divestments, and diplomatic pressures worked against South Africa to end Apartheid. The United Nations Security Council (UNSC), the United Nations General Assembly (UNGA), and Organization of African Unity supported by key European powers like France and the UK, and the United States—despite early objections to the sanctions—forced the South African government to end Apartheid. Although they took a long time to be effective, the sanctions worked once they were adapted by key trading partners and once they impacted many aspects of the South African economy.

Figure 10.1: Measuring the Effectiveness of Economic Sanctions

Dates	Total Number of Cases	Number of Successes	Success as a percentage of the Total
All Cases			
1914-90	115	40	35%
1914-45	12	6	50%
1945-69	41	18	44%
1970-89	67	16	26%
1990-98	50	n.a.	n.a.

Cases involving US as part of sanctions Coalition			
1945-69	30	16	53%
1970-89	49	10	21%
1990-98	36	n.a.	n.a.
Unilateral US Sanctions			
1945-69	16	11	69%
1970-89	40	5	13%
1990-98	12	n.a.	n.a.

Source: Adapted from Gary Clyde Hufbauer, Jeffrey J. Schott, and Kimberly Ann Elliott, Economic Sanctions Reconsidered, 3rd ed., revised, Washington: Institute for International Economics.

In the case of Iran, it is too early to predict whether the United Nations Security Council (UNSC) will impose sanctions, the nature of any sanctions, or their effectiveness. It is also uncertain if Iran's key trading partners in the UNSC would allow broad export and imports or even targeted sanctions on certain sectors. China and Russia have said that they would oppose any sanctions proposed by the UNSC, and many attribute this opposition to the two nation's commercial and trade interests with Iran. France and Britain have sent mixed messages about their willingness to go along with an economic sanctions regime. This leaves the US out of the five permanent members of the UNSC.

A European diplomat described deciding on the sanctions as "most difficult debate ever." The difficulty to Europe is that "Sanctions would hurt the people in Iran, not the elite. If we were to talk about sanctions, then may be they would be targeted on certain people. But I repeat, we have no raised the options of sanctions."[27]

Iran's strategy is to utilize this ambivalence amongst the European nations and use its trade and energy leverage with other powers to stop the UNSC from imposing sanctions against it. In addition, Iranian officials have argued that if the US and the EU impose sanctions against Iran, Western economies will suffer more than Iran's.

That's partially true, but it also depends on the type of sanctions. The UNSC has several options—that may exert pressure on the Iranian government—each with different enforcement mechanism, but they are not without consequences.

The Nature of Effective Economic Sanctions

Far too often economic sanctions are levied to serve immediate political or national interests without taking into account the long-term strategic implications. For economic sanctions to be effective they must be tailored and targeted to achieve their objective and their repercussions must be understood.

Experts also argue that the objective of sanctions must be "modest" in order to achieve their intended goals in a reasonable time period. There are no risk-free options or violation-proof sanctions, but the chances of success of economic sanctions can be vastly improved by having well defined objectives. The goal of the UN Security Council, in the case of Iran, is to prevent the Iranian government from acquiring nuclear weapons capabilities. If the debate, however, drifts toward regime change or stopping Iran's support of proxy groups, it is likely to divide the international community and diminish the chances of success of the sanctions. In addition, if the sanctions turn out to weaken the economic well being of the Iranian population, the sanction will likely defeat their purpose.

Iraq makes a good case in point. While the UN sanctions levied against Iraq following its invasion of Kuwait in 1990 were intended to stop the regime of Saddam Hussein from importing weapons technology, most the burden fell on the Iraqi population. The Iraqi regime was able to use the oil-for-food program to build palaces, at the same time blamed the worsening of the standards of living for Iraqi citizen on the UN sanctions, and used the suffering of the population as information warfare to gather sympathy for its cause. In addition, oil was smuggled and sold on the black market to solely benefit the regime. While the sanctions may have achieved one of their goals--to stop Iraq from rebuilding its military and WMD capabilities--some argue that the costs of the sanctions may have outweighed their benefits in the grand strategic sense.

It is equally important to note that sanctions may well fail to achieve their objective of stopping Iran from acquiring nuclear capabilities. Despite the economic and diplomatic cost of the sanction, nations feel that the benefits to their national security interests outweigh the cost of sanctions. India and Pakistan are two examples where the sanctions did not stop them from acquiring nuclear weapons because of their perception of the threat to their national security.[28] The sanctions on both countries have been lifted and they are now accepted as nuclear powers.

The Difficulty of Enforcing Sanctions

One key difficulty in enforcing economic sanctions is the fact that Iran's economy is more of a command economy than a free market. Some estimate that the government controls nearly 80% of the total economy. Experts argue that the absence of a vibrant private sector creates the lack of the business class that could pressure the government to comply with UNSC demands and left the sanctions.[29]

Another equally important question is that while energy exports might be important to Iran's economy; total net trade is only a small portion of its total GDP. In 2005, its total real GDP was $551.6 billion, of which 1% is net exports (current account balance). Iran exported an estimated $55.42 billion (10% of its GDP), and imported an estimated $42.5 billion (8% of GDP).[30]

The difficulty, however, is not in the size of Iran's net trade, but in the diversity of its trading partners. Its key exporting partners are Japan 18.4%, China 9.7%, Italy 6%, South Africa 5.8%, South Korea 5.4%, Taiwan 4.6%, Turkey 4.4%, and Netherlands 4%. Its key importing partners are Germany 12.8%, France 8.3%, Italy 7.7%, China 7.2%, UAE 7.2%, South Korea 6.1%, and Russia 5.4%.[31]

As these percentages show, Russian and China are not the only major players. **Figure 10.2** shows Iran's key trading partners between 2000 and 2004. Iran virtually trades with every country in the world. Its largest trading region is Asia. This largely is due to Iranian oil exports, but it is also due to geographic proximity and lower costs. It also shows that exports and imports are growing, and that Iran's dependence on international trade is steadily increasing. Iran's imports doubled from $14.3 billions in 2000 to $38.25 billions in 2004. The value of its exports increased at slightly lower rates from $25.0 billions in 2000 to nearly $41.0 billions in 2004.

With the exception of the United States, nearly all the permanent five members have strong trade ties. In volume, nearly all of Iran's exports and imports with China, UK, France, and Russia at least doubled between 2000 and 2004:

- **China**: exports to Iran increased by 159% and its imports from Iran grew by 389% between 2000 and 2004
- **France**: exports to Iran increased by 68% and its imports from Iran grew by 416% between 2000 and 2004
- **Russia**: exports to Iran increased by 106% and its imports from Iran grew by 126% between 2000 and 2004
- **UK**: exports to Iran increased by 57% and its imports from Iran grew by 76% between 2000 and 2004
- **US**: exports to Iran declined by 11% and its imports from Iran stayed the same between 2000 and 2004

In addition, enforcing economic sanctions means ensuring that all of these key trading partners stop trading with Iran. If the sanctions target Iranian imports of good and services, then it means removing key markets for many of these economies and that may complicate the dynamics of enforcing such sanctions. If sanctions target Iranian energy exports, China imported 0.30 MMBD (roughly 5%) of its oil needs from Iran.

Others have also argued that Chinese interests go beyond their immediate energy demands, given that Chinese energy demand is estimated to grow at 14% reaching 7.9 MMBD between 2005 and 2007, according to the EIA. In order to secure energy supplies, China Sinopec has been active and successful in obtaining energy deals and investment opportunities in the Gulf. For example, Sinopec has the potential of signing a major deal regarding Iran's Yadavaran oil field.[32] This deal would be worth $100 billion, if signed, and would involve Chinese purchase of 10 million tons of liquefied natural gas per year for the next century.[33]

Observers point the fact that China stopped the passing of UNSC sanctions against Sudan due to China's oil interest. China is seen as not willing to agree to any economic sanctions that impacts Iran's energy exports. The same applies for other UNSC members such as Russia, although Russia's motivation is not energy security per se. Russia has maintained long-term commercial and military relationship with Tehran. Moscow has also been in negotiations to build the Bushehr reactor. Losing that contract would mean a lost to Russia's economy. Other European powers are heavily invested in Iran's energy sector. As note earlier, major French, Italian, and British energy firms have invested heavily in Iran. For example, Total signed a $2 billion with Iran to develop liquefied natural gas.[34]

Figure 10.2: Iran's Key Trading Partners: 2000-2004

(In Million $US)

	Exports					Imports				
	2000	**2001**	**2002**	**2003**	**2004**	**2000**	**2001**	**2002**	**2003**	**2004**
Key Countries										
China	$1,426	$2,203	$2,133	$3,007	$3,691	$565	$887	$1,046	$2,547	$2,762
France	$960	$670	$720	$1,078	$1,614	$617	$1,109	$1,318	$2,592	$3,186
Germany	$478	$330	$273	$292	$443	$1,504	$1,807	$3,777	$3,318	$4,900
Greece	$1,079	$879	$415	$882	$1,296	$10	$19	$8	$11	$24
India	$428	$462	$492	$596	$333	$254	$561	$717	$797	$1,253
Italy	$2,032	$1,920	$1,620	$1,947	$2,452	$856	$996	$1,389	$2,444	$2,962

Japan	$4,869	$4,561	$4,311	$6,764	$7,515	$684	$787	$714	$1,236	$1,231
Netherlands	$989	$206	$620	$1,174	$1,655	$270	$346	$308	$455	$715
Russia	$49	$31	$45	$56	$101	$920	$914	$874	$1,451	$2,081
S. Korea	$2,175	$1,908	$1,214	$1,667	$2,214	$737	$958	$894	$1,956	$2,348
S. Africa	-	-	-	-	$2,357	$103	$73	$36	$40	$59
Turkey	$742	$763	$837	$1,692	$1,783	$233	$291	$369	$587	$891
UK	$46	$39	$49	$46	$72	$510	$666	$769	$852	$897
US	$159	$135	$148	$152	$142	$94	$74	$68	$109	$94
Devel. Regions	**$9,402**	**$9,211**	**$8,096**	**$12,200**	**$17,538**	**$6,893**	**$36,836**	**$9,741**	**$15,538**	**$19,809**
Middle East	$343	$390	$411	$463	$1,234	$1,290	$2,015	$2,704	$3,008	$4,068
Africa	$14	$282	$293	$450	$2,779	$208	$153	$119	$138	$159
Asia	$7,879	$7,407	$6,179	$9,120	$11,201	$2,462	$31,219	$3,740	$7,069	$8,730
Europe	$1,110	$1,115	$1,197	$2,146	$2,313	$1,988	$2,133	$2,132	$4,003	$5,367
W. Hemisphere	$56	$17	$16	$21	$11	$945	$1,316	$1,046	$1,320	$1,485
Indust. Countries	**$12,285**	**$10,297**	**$9,469**	**$14,191**	**$17,169**	**$7,356**	**$8,715**	**$12,468**	**$14,452**	**$18,284**
Total	**$25,064**	**$23,151**	**$21,438**	**$31,087**	**$40,921**	**$14,347**	**$17,685**	**$22,321**	**$30,144**	**$38,257**

Source: IMF, Direction of Trade Statistics, various editions.

These trade and commercial interests complicate the choice of sanctions even further. There is always the incentive to cheat or free ride. Even if countries believe in stopping Iran from acquiring nuclear capabilities, it is unclear if they want to pay for it in domestic political terms. Trade relations are local political issues as much as they are global phenomenon. Countries must be convinced of the danger in order to impose sanctions and give up access to any market. In the case of Iran, countries imposing the sanction have to realize two key things: a) Iran is a threat to their national security and international peace; and b) sanctions will prevent Iran from acquiring WMD capabilities which can impact their vital interests.

In addition, at times long-term strategic interests come ahead of economics. For example, regional powers such as Saudi Arabia and Egypt are unlikely to support a sanctions regime against Iran. While Iran's trade with the region has more than doubled in the last 4 years (Iran's exports to the Middle East increased by 260% and its imports from the region increased by 215%), what may prevent the region from agreeing to economic sanctions against Iran goes beyond the commercial and trade interests.

As noted earlier, while regional powers are concerned about the threat of proliferation, they argue that the US and the UN must adapt a single standard in dealing with the region. They argue for a WMD-free Middle East that must include Israel, Pakistan, and India. This reaction is partly to increase the pressure on Israel and partly out of concern for further escalation of WMD proliferation in the Middle East to include other states.[35]

While other countries in the region are not major trading partners to Iran, they have by and large the same trading partners as Iran. Iran can import goods, and they may in fact defy the sanctions against Iran. While certainly some nations in the region did comply with the UN sanctions against Iraq during the 1990s, many did not enforce the oil-for-food program. Iraq used them as smuggling routes for sanctioned goods and markets for its oil.

These difficulties of enforcing sanctions also bring up another important element in crafting effective economic sanctions: sanctions must universal. Although the US has long maintained sanctions against Iran, as **Figure 10.2** shows, Tehran has maintained strong trading relations with many countries in the EU, Asia, and the Middle East.

The Nature of US Sanctions against Iran

The US has maintained sanctions against Iran since the revolution and the seizure of hostages on November 4, 1979. The US has extended and strengthened these sanctions several times since. President Bill Clinton signed two executive orders in March and May 1995 that banned US companies and their foreign subsidiaries from doing business with the Iranians or financing projects in Iran's petroleum sector. The Clinton administration reinforced the sanctions further in 1997 by prohibited all US nationals from investing in Iran, which were extended by President George W. Bush in March 2003 citing Iran's support for international terrorism.[36]

US economic sanctions against Iran were further strengthened in the Iran-Libya Sanctions Act (ILSA) that was passed by the US Congress in August 1996, and extended for five years in July 2001. The act imposed sanctions of up to $20 million annually to any company from investing in Iran's gas and oil sector. In March 2000, the US, however, allowed for the importation of Iranian carpets, caviar, pistachios, and dried fruits, but did not relax the sanctions against other products or direct investment in Iran.[37]

While US imposed sanctions have stopped US companies from investing in Iran's energy industry, many multinational companies since the passing of ILSA have invested in Iran's gas and oil sectors. Since the passing of ILSA, it is estimated that Iran has attracted $30 billion worth of foreign direct investment in its oil and gas sectors.

The US has investigated Italian, Russian, Japanese, Canadian, French, and Malaysian companies regarding their investment in Iran's energy sector. It is, however, believed that the penalties under ILSA have not been imposed on any foreign or American company since its passing in the summer of 1996.[38]

The US imposed penalties in ILSA that targeted foreign companies were opposed by many countries that had energy interests in Iran. The EU, for example, passed a resolution in 1996 directing European companies not to comply with the US sanctions regime.[39]

Experts question the cost of US sanctions against Iran and doubt their success. The US imposed the sanctions against Iran for several reasons—high amongst them were to stop Iran from pursuing CBRN capabilities, end its support of proxy groups that are attacking Israel, and end incitement against the US. A quarter century later, the US sanctions have not achieved any of their goals—partly due to the lack of meaningful enforcement mechanisms and partly because it was not universal.

US imposed sanctions may have stopped Iran from importing spare parts to their American made conventional weapons, but these sanctions have not deterred Iran from importing weapons, building its missile systems, advancing its nuclear research program, and continue to fund proxy groups. While some of the lack of foreign direct investment in Iran's gas and oil industries have been the result of US sanctions, much of Iran's aging infrastructures are self-inflicted wounds. Iran bureaucracy and lack of meaningful plans

to attract direct foreign investment into its oil and gas sectors have prevented Iran from upgrading its infrastructure and expanding its capacity.

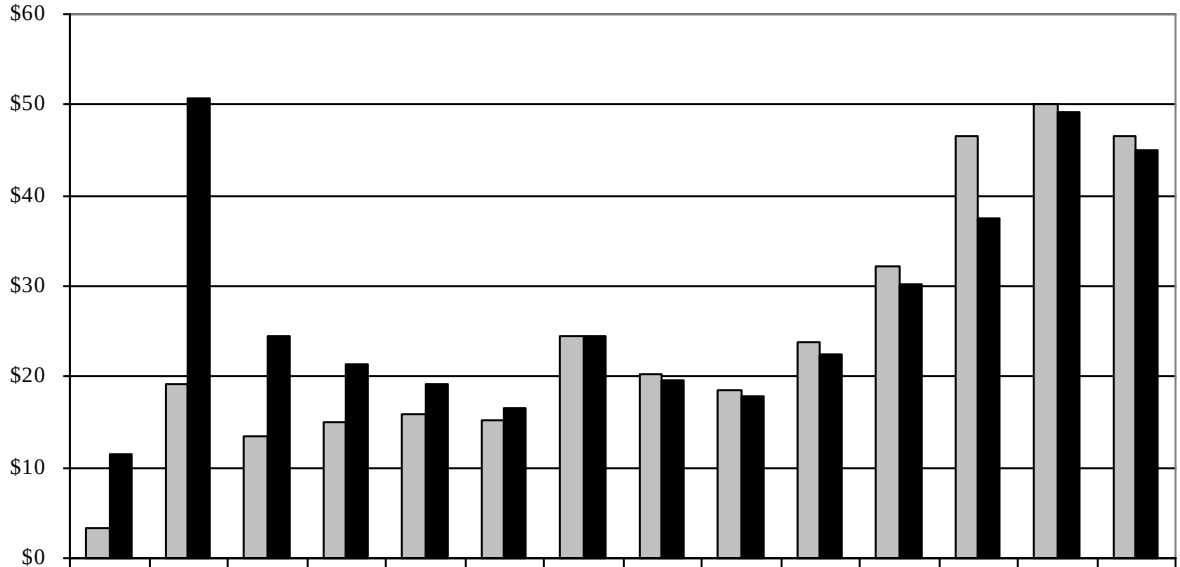
Iran may also be able to offer better deals in the future. The rise in global oil demand and the surge in the price of oil increased Iranian government oil revenues, as shown in **Figure 10.3**. For example, since 2002, Iran's oil revenues in constant dollars doubled. Extra revenues can be used to rebuild its energy infrastructure, but it can also be used to recapitalize its conventional military forces and even its WMD and missile programs. **Figure 10.3** also shows that Iran can sell its oil to willing buyers at market prices. Oil and gas are global commodities, and are bought at an open market. Sanctions by the US would have little impact on Iran's oil revenues or on Iran's overall production and export capacities.

In summary, past US sanctions against Iran have had some impact on the Iranian economy. It has certainly prevented US foreign direct investment from flowing into the Iranian energy sector and has contributed to a slow rate of expansion in its oil and gas production capacity. There are, however, other factors that contributed far more to the economic problems Iran is suffering.

- First, its command economy continues to prevent the rise of a vibrant private sector that can drive investment, employment, and stability of a middle class. The government continues to be the largest employer, investor, and consumer in Iran.
- Second, Iranian foreign investment laws are dated. They have many protectionist characteristics that have prevented many necessary investments from flowing into the Iranian economy, particularly its energy sector.
- Third, Iran's banking systems of lending mechanisms are rigid and are not able to keep up with the growth in the global economy and Iranian domestic investment needs.
- Finally, despite diversification and privatization efforts, Iran continues to heavily rely on oil exports. In 2005, oil accounted for 80-90% of Iran's exports earning and 40-50% of Iran's government budget.[40]

Figure 10.3: Trends in Iranian Net Oil Export Revenues: 1971-2007

(In $Billions)



	1971	1975	1980	1985	1990	1995	2000	2001	2002	2003	2004	2005*	2006*	2007*
Current	$3.33	$19.29	$13.41	$15.01	$15.78	$15.24	$24.47	$20.29	$18.61	$23.91	$32.24	$46.60	$50.10	$46.50
Constant	$11.50	$50.76	$24.38	$21.45	$19.25	$16.57	$24.47	$19.70	$17.89	$22.56	$30.13	$37.58	$49.20	$44.90

*Note: 2005 and 2006 are projected total oil revenues.
Source: EIA, "OPEC Revenues Fact Sheet," several editions.

The Problems of Oil Sanctions

For sanctions against Iran to be effective, they must target the most important export commodity—oil and gas. Although Iran is the second largest oil producer after Saudi Arabia, and holds the has world's fourth-largest pool of proven oil reserves (approximately 126 billion barrels or 10% of the world's total), its production has dropped by more than a third from a peak of over 6.0 MMBD in 1974 to about 4.1 MMBD in 2005.[41]

One implication of targeted economic sanctions against Iran's oil and gas sectors is a further diminution of its upstream and downstream infrastructure. Iran's domestic energy demands are growing at high rates. Between 2003 and 2010, the IAEA estimates that Iran's primary energy demand to grow by 3.4% per year, its demand for power generation and water desalination to increase by 4.1% per year, its demand for transport fuel to grow by 3.1% per year, and its electricity generation to grow by 4.9% per year.[42]

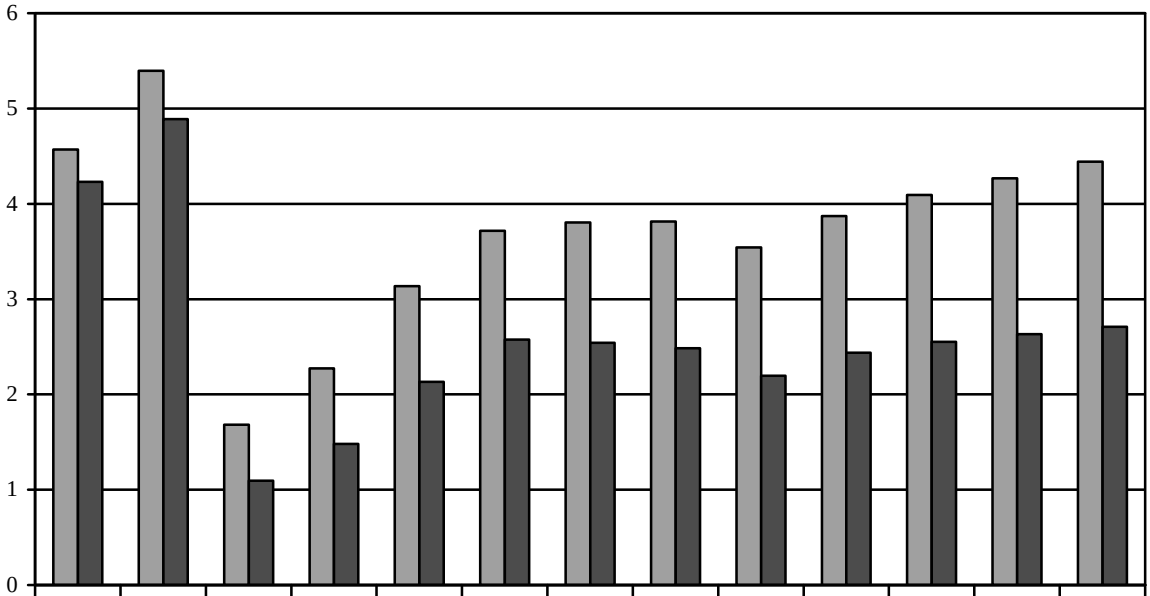
Figure 10.4 shows the trends in Iran's oil production and exports. Years of political isolation, recurring war and US sanctions have deprived the Iranian oil sector of needed investment. Iran's share of total world oil trade peaked at 17.2% in 1972, then declined to 2.6% in 1980, but has since recouped to roughly 5%. Iranian oil exports declined even further since the revolution. In 1975, Iran exported 4.88 MMBD and that declined to roughly 2.63 MMBD in 2005 (3% of total world exports). According to the International Energy Agency (IEA), Iran's net oil exports are estimated to reach 2.8 MMBD in 2010, 3.6 MMBD in 2020, and 4.4 MMBD in 2030. This would represent an average 1.9% per year increase from its 2.7 MMBD in 2004.[43]Cutting 5% of the world's oil supply might well increase the price per barrel by more that 5%, if one takes into account the

possibility of market panics, political or military miscalculations, and the fear of sustaining these sanctions.

Given the tightness in the global energy market, Iranian oil exports remain an important element in keeping oil prices at moderate levels. Total world oil supply is barely meeting total world oil demand. According to the US Energy Information Administration (EIA), on average, the world consumed 83.10 MMBD compared total world oil supply of 83.97 MMBD in 2005.

Figure 10.4: Iranian Oil Production and Exports: 1971-2006

(In MMBD)



	1971	1975	1980	1985	1990	1995	2000	2001	2002	2003	2004	2005*	2006*
Production	4.570	5.395	1.683	2.272	3.135	3.715	3.806	3.816	3.543	3.870	4.093	4.268	4.441
Exports	4.230	4.888	1.093	1.482	2.133	2.575	2.542	2.485	2.197	2.439	2.551	2.633	2.709

*Note: 2005 and 2006 are projected levels.
Source: EIA, "Oil Export Revenues Fact Sheet," 2005.

Some have argued that the US is not importing oil from Iran, and that the impact of disrupting Iran's oil supply will not impact US energy demands. These arguments are largely specious. First, even if the US is not directly importing oil supply from the Islamic Republic, the US economy is highly dependent on energy intensive imports that come from Asia. Cutting Iranian exports to Taiwan, South Korea, Japan, or China is likely to have indirect impact on the US and global economy. Second, temporary disruption or even worse sustained cut off of Iranian oil exports will increase the price per barrel of oil for everyone in the world, including the US. Third, high oil prices can have devastating impact on the global economy, and in turn the US economy.

It is equally important to note that the world oil market will have excess demand without a viable way to replace Iranian production. With the exception of Saudi Arabia, world oil producers do not have the surplus capacity. During past shortages, Saudi Arabia played the swing producer to replace Iraqi, Venezuelan, Nigerian, or US production decreases. The Kingdom, however, has a surplus production capacity of roughly 1.5 MMBD (with

plans to reach 2.5 by 2009), but this is simply not enough to replace 4.0 MMBD of production capacity.

Other experts have argued that industrialized countries can minimize the damage of any supply shortages by using crude reserves the US and other International Energy Agency (IEA) members have. It is estimated that the IEA hold 1.48 billion barrels of oil in their emergency stocks, which is equivalent to 2.4 MMBD for 600 days.[44] In addition, Saudi Arabia has an estimated 1.5 MMBD of surplus capacity. These additions (3.9 MMBD) can certainly compensate for disruptions of Iranian oil export, but the real question is how sustainable are those editions. The emergency stocks are limited and will run out in two years, and for Saudi Arabia to produce at capacity with no cushion can cause market unease.

There have been some studies of the impact of cutting Iranian oil exports. Virtually all predict that the price per barrel of oil might exceed $100, if Iran stopped its energy exports. One study predicted that the price per barrel could reach $131 if Iran stopped oil production.[45] Other energy experts estimated that even if Iran cut its production by a small amount, given the tightness of the oil market, the price per barrel of oil could exceed $100.[46]

The importance of reaching or exceeding the $100 per barrel price mark--even for very short periods--could also play a major psychological role in driving the energy market even further towards panic and further increases in energy prices. However, these attempts are more "guesstimates" than hard perfect foresight projections. Energy analyses and projections about the impact of supply shortages are uncertain at best. It is even more unpredictable when one tries to judge the impact of hypothetical sanctions without knowing the reaction of the Iranian government, the global energy market response, or the response of other oil and gas exporters.

Some Israeli experts have argued that the only effective sanctioning regime is a total oil embargo on Iranian oil trades. The author of the proposal, Aluf Benn, was quoted as saying "No country is dependent in its energy requests, its energy demands, upon Iran. [But] the Iranian oil industry, for instance, they need to export oil not only for the cash, but also to get back refined oil products like gasoline and other products because they don't have enough refinery capacity."[47]

It is one thing to impose an oil embargo; it is, however, another thing to enforce it. As noted earlier, the damage to Iran may not be high enough to impact a change of heart with regard to its nuclear research. The government in Tehran can violate sanctions with smuggling, use the money to advance its military and nuclear programs, and blame the world for economic suffering of its population.

Iran can also carry out its own "sanctions" by launching an oil embargo. While an oil embargo seems to be an unlikely choice for the UNSC, given the consequences and the national interest of key member states, Iran might choose to cut off its oil supply in response to other types of sanctions. Iranian officials have argued that they did not need the West, but that the West needed their energy exports. Iran can also shoot itself in the foot by cutting off 80-90% of its exports revenues, but in such uncharted territories all options are on the table. The intricate nature of diplomacy at the UNSC and the fragile internal political dynamics in Iran, even non-desirable options may become viable—including acting irrationally.

Iranian officials have left potential oil embargos on the table. A member of Iran's parliament, Mohammad Nabi Rudaki, a member of the National Security and Foreign policy committee in the Iranian parliament, was quoted as saying "Oil is exported from Iran and the Persian Gulf territorial states to Europe and America, and East Asia; the Strait of Hormuz, the Persian Gulf and, in case of a referral or an air or economic embargo, not even one drop of oil will be exported from this region…the Islamic Republic of Iran is able to hinder oil exportation from the coast of the Persian Gulf and our own oil if Europe fails to handle the nuclear case wisely and imposes unfair economic sanctions on Iran."[48]

Refined Products Sanctions

The traditional economy of Iran (carpets, caviars, pistachio, etc.) is another unlikely area for sanctions, since the impact would largely affect farmers and small business without major implications on the Iranian government. Such sectors are also self-sustained, since they are not dependent on imports.

Other sectors, however, are highly dependent on imports and would be more impacted by economic sanctions. Sectors such as industry, for example, play a major role in Iran's economy. It is estimated that Iran's GDP is 11.8% dependent on agriculture, 43.3% on industry, and 44.9% on services.[49] UNSC members would find it hard to justify the use of sanctions against agricultural products--except for dual use technologies and fertilizers that can be used in the production of WMD--but industrial sanctions might be a different story.

Iran's heavier industries that rely on refined products imports would suffer from economic sanctions. Iran is an importer of refined products. Since 1982, Iran's dependence on imports of gasoline surged due the fact the refineries were damaged by the Iran-Iraq War, the mismanagement of these refineries, and the lack of foreign investment in its refinery sector. According to the IEA, Iran's refining sector is inefficient. For example, only 13% of the refinery output is gasoline—which is estimated to be half of what European refineries produce.[50]

In 2004, Iran imported an estimated 0.160 million barrels a day of oil equivalent (MMBD) of gasoline (40% of its domestic consumption). Iran's dependence on gasoline import steadily increased in 2005 and 2006. Iran imported an estimate 0.170 MMBD of gasoline (41% of its domestic consumption) in 2005, and 0.196 MMBD (43% of its domestic consumption) in 2006. It is equally noteworthy that 60% of Iran's gasoline is imported from Europe, 15% from India, and the rest from elsewhere (Middle East and Asia).[51]

These trends are likely to continue. Iran's domestic demand for gasoline is estimated to increase at approximately 9% per year, and the costs of gasoline imports are also steadily increasing. For example, Iran paid an estimated $2.5-$3.0 billion for its gas imports in 2004 and is estimated to pay $4.5 billion in 2005.[52] Other experts, however, estimate that the cost of importing refined products was as high a $10 billion in 2005.[53] This is likely to include jet fuels, diesel, residual oil, kerosene, and other products.

Iran's dependence on gasoline imports are unlikely to change in the near future. It is estimated that Iran is planning to spend $16 billion between 2003 and 2030 to expand its refinery capacity from 1.5 MMBD in 2004 to 1.7 MMBD in 2010, 2.2 MMBD in 2020,

and 2.6 MMBD in 2030. However, its total energy demand and consumption of refined products are also estimated to increase at higher rates.[54]

Sanctioning refined products exports to Iran would certainly have an impact on the Iranian economy, but the effectiveness of such a sanctions regime would be uncertain. Iran can get around the imposed sanctions through unofficial deals and smuggling. In addition, Iran is enjoying high oil revenues, and may well use them to fast track its plans to expand refining capacity. Tehran might use such deals to attract foreign companies, and to further complicate a UNSC resolution, since some of these contracts might go to Chinese, Russian, French, German, and British firms.

Travel Restrictions

Some have argued that the first round of sanctions against Iran should target Iranian officials directly. This would include restricting Iranian officials including the President, Mahmoud Ahmadinejad, from traveling outside Iran as well as other top officials and clerics.

These sanctions would have little impact on the general population. They might affect the mobility of Iranian officials, but their impact would be limited. They are hard to enforce outside the EU and the US. This may be further complicated by stopping Iranian officials from attending UN meetings in the US or the EU. Middle Eastern and Asian countries might find it hard to comply with these travel restrictions—given the fragile strategic situation in the region.

If the goal is to send a message to the Iranian government and the world that the world does not approve of Iran's nuclear weapons, then such sanctions might do that. It is questionable, however, whether travel restrictions would change the attitudes or actions of the Iranian government or Iranian public attitudes toward acquiring nuclear technology. The Iranian nuclear research program does not depend on the ability of the Iranian president to visit Paris, and the impact of such sanctions will symbolic in the case of Iran.

The historical precedents also are not reassuring. The EU has maintained travel restrictions and financial sanctions against Zimbabwe. The EU imposed targeted sanctions that included travel bans, oil embargo, and freezing of financial assets of President Robert Mugabe and 100 other senior Zimbabwean officials. The ban has been extended several times since its inception in February 2002, and is expected to run out in February 2007. These extensions make either the point that these travel restrictions did not work or that they need a long time to work.

Financial Sanctions

Travel restrictions and financial sanctions combined are also an option that might have more impact. This may, in fact, be the set of sanctions that would arouse the least amount of resistance by UNSC members. Most the financial assets held in the West belong to the government or the ruling elite of Iran. The combination of freezing assets held in Westerns banks and travel restrictions can have the least impact on the general population and the maximum amount of pressure on the ruling elites.

While US capital markets have been closed to the Iranian government since the revolution, Iran had alternative sources. Iran relies on loans particularly from European

and Asian banks to finance domestic projects in its energy sector.[55] For examples, Iran's shipbuilding and car making sectors are growing faster than Iranian domestic financial institutions. These industries have relied on European banks for investment loans. Other European banks stopped doing business with Tehran, but many other banks continue to finance projects in Iran including major European banks such as HSBC, BNP Paribas, Deutsche Bank, Commerzbank, Standard Chartered, and Royal Bank of Scotland. Observers have argued that targeting loans from European Banks can have major impact on the Iranian economy, particularly since the Iranian capital market is in still small and key industries in Iran cannot survive without investment loans from the outside.[56]

Another option to target Iranian finances is to freeze Iranian assets in European and Asian banks. Iran's financial assets in the US have been frozen since the revolution, but Tehran has significant amount of financial assets in European financial institutions. There are no reliable estimates for how much Iran's hard currency deposits are. It is, however, safe to assume that it is a large amount given recent surge in oil. Some estimates put it at $36 billion in 2005.

The significance of this can be seen through the reaction of the Iranian government following the IAEA referral of Iran's case to the UNSC. In January 2006, the governor of Iran's Central Bank announced that Iran had started transferring its assets out of European banks. It is unclear where the funds have been moved, but there are indications and initial admission that they may have been transferred to Southeast Asia.[57]

It has also been reported that Iranian government figures have started to move their money from European financial institutions to Dubai, Hong Kong, Malaysia, Beirut, and Singapore. Iranian officials were quoted as saying that as high as $8 billion were moved out of Europe.[58]

Sanctions can reach beyond European financial institutions to include Asian banks and international NGOs such as the World Bank and the International Monetary Fund. This will drain another key source of financial support to the Iranian government. For example, in May 2005, the World Bank approved $344 million loan to Iran to support Caspian Provinces in managing scare water resources, $200 million for rebuilding following the Bam earthquake in October 2004, and $359 million in loans to the Government of Iran in order to improve housing, sanitation, and access to clean water in Ahwaz and Shiraz.[59] These loans, however, are focused toward humanitarian projects, but that does not mean that they can be delayed to force Iran back to the bargaining table.

It is important, however, to keep it in mind that the global economy offers many options to Iran, and enforcing such sanctions is not perfect. Iran is not confined to European private and central banks or international organizations to finance its domestic projects. If Iran does build enough incentives for direct foreign investment, no amount of sanctions can stop the flow of money into the country, particularly in its energy sector.

All of these scenarios are hypothetical at this point. It is unclear if the UNSC actually agrees to impose financial restrictions on Iran. In addition, no one can fully predict the response of the Iranian government, the ruling elite in Iran, or the Iranian general population. It is all too clear that freezing the money and restricting the travel of key regime figures is far less disagreeable than preventing investment in Iran's energy sector and causing further tightness in the global energy market. It is also clear that the regime

might be more impacted with these restrictions than any broad economic sanctions that have direct implications on the Iranian population.

Arms Embargo

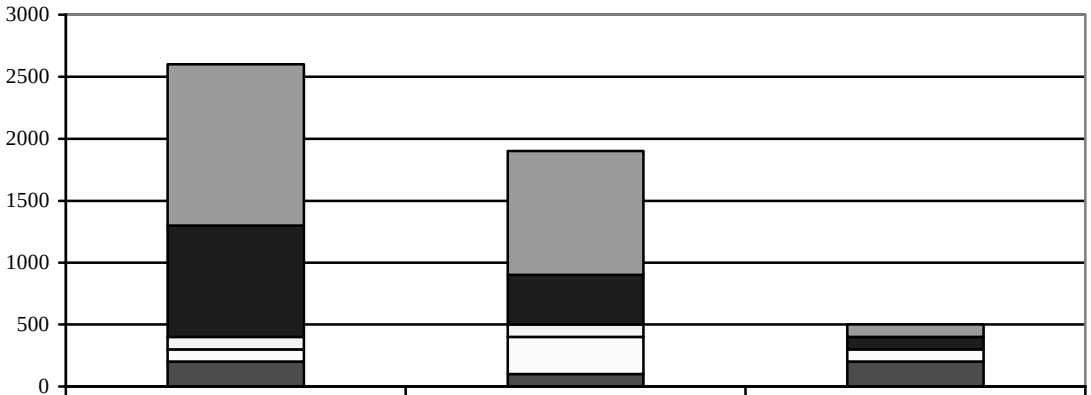
Another type of sanctions would be an embargo on conventional arms imports. While Iran does produce some small arms and even missiles, its indigenous military industrial complex is not yet able to produce most heavy arms at industrial levels. Iran imports most of its conventional military weapons, and much of its present weaponry is worn or obsolete.

Iran has not had significant amounts of US or Western European arms since 1980, or obtained significant amounts of modern arms from any of its other suppliers at the time of the Shah. Most of its deliveries during 1988-1992 were relatively low grade weapons, although Russia did supply some modern armor and aircraft. Iran then faced major financial problems until the mid-1990s and could not obtain resupply or new weapons from most Western states.

Iran was a major importer of other Western systems during the Iran-Iraq War. However, Iran did not carry out a major arms import effort once the Iran-Iraq War was over and it received the backlog of arms imports from the orders it placed during the war. **Figure 10.5** shows the drastic decline in Iranian arms deliveries. According to unclassified US intelligence estimates, Iran received roughly $2.6 billion worth of new arms deliveries between 1993 and 1996, $1.9 billion between 1997 and 2000, and only $500 between 2001 and 2004. This represents an 81% decline in Iran's overall arms deliveries.

The trends in Iran's new arms agreements are similar to those in its arms deliveries. As **Figure 10.6** shows, Iran's *new* arms agreements have been on the decline. Between 1993 and 1996, Iran signed $1.2 billion worth of new agreements; this was slightly increased to $1.5 billion between 1997 and 2000, and declined to $800 million between 2001 and 2004.

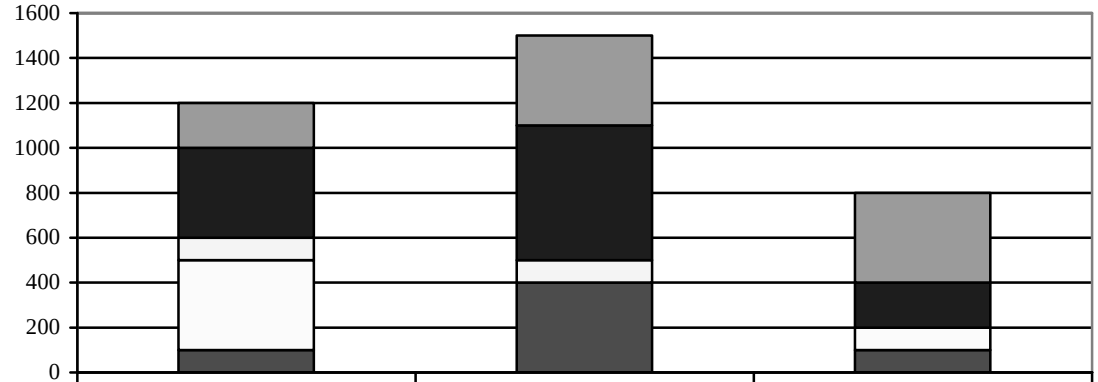
Figure 10.5: New Iranian Arms Deliveries by Supplier: 1993-2004
(In Current Million $US)



	1993-1996	1997-2000	2001-2004
US	0	0	0
Russia	1,300	1,000	100
China	900	400	100
Major W. European	100	100	0
Other European	100	300	100
Alll Others	200	100	200
Total	2,600	1,900	500

Figure 10.6: New Iranian *New* Arms Agreements by Supplier: 1993-2004

(In Current Million $US)



	1993-1996	1997-2000	2001-2004
US	0	0	0
Russia	200	400	400
China	400	600	200
Major W. European	100	100	0
Other European	400	0	100
Alll Others	100	400	100
Total	1,200	1,500	800

Source: Richard F. Grimmett, Conventional Arms Transfers To Developing Nations, 1997-2004, CRS, August 29, 2005; and Richard F. Grimmett, Conventional Arms Transfers To Developing Nations, 1993-2000, CRS, August 16, 2001.

It is equally important, however, to understand where Iranian arms are coming from and how this might affect the behavior of China and Russia. As **Figures 10.5 and 10.6** have shown, Iran has received arms from a variety of sources including China, Russia, and "other" Europeans. The US and Western Europeans have not been active in selling Iran new weapons, but Western European nations delivered $100 million worth of arms transfers to Iran between 1997 and 2000, and signed an additional $100 million new arms deals between 1997 and 2000. It is unclear if the latter has been transferred to Iran, yet. If not, these weapon deliveries can be held back and used as leverage against Iran.

China has been the second largest supplier of arms to Iran. During the 1990s, China delivered approximately $1.3 billion worth of arms to Iran, and signed an additional $800 million worth of agreements during the same period. Since 2001, China transferred $100 million worth of new weapons to the Iranians. In addition, China still is estimated to hold $200 million worth of new agreements, and can be used to pressure Iran on the nuclear issue, but it does remain uncertain as to what type of leverage China will use against Iran.

Russia, however, remains the largest exporter of arms to Iran. During the 1990s, Russia transferred $2.3 billion worth of new arms and signed $800 millions of new arms deals with Iran. Since 2001, Russia delivered $100 millions and signed an estimated $400 million worth of new arms agreements. As is the case with China, it remains unclear how Russia will deal with Iran and how much of if it will use these close ties and deals to influence Iran's decision makers to comply with UNSC demands.

The Iranian-Russian relationship is deep, and may not change even if Iran is proven to develop nuclear weapons. In addition to Russian help in Iran's nuclear program and energy investment, Russia is a major exporter of conventional weapons to Iran. This was true during the era of the USSR, and continued after the collapse of the Soviet Union. In 1999, Viktor Mizin, an official in the Russian Ministry of Foreign Affairs, described the importance of Iran as an arms importer:[60]

> Iran is also a very important market for Russian conventional armaments, and as it is well known, this issue slowed Russian adherence to the Wassenaar Arrangement. Many arms experts in Russia believe that Iran is another untapped market for Russian weapons, and therefore there is no rational basis for ending arms sales to this country, even after fulfillment of current contracts as was agreed in bilateral U.S.-Russian talks. These experts now consider Iran, since the death of Ayatollah Khomeini, just another country that actually has ceased supporting terrorist activity and is no less democratic than some U.S. allies in the Middle East. These feelings are quite widely shared by the Russian political elite.

During 2005, Russia exported more than $6.1 billion worth of new arms and had a total of $23 billion worth of new orders. This accounted for a large portion of the Russian economy. Iran's exact share of these arms exports is not known, but Iran signed a deal with Russia to by Tor-M1 surface-to-air missile at an estimated cost of $700 million. The decision to sell these anti-aircraft missiles was criticized by the US, Israel, and the EU. Moscow, however, argued that there was no reason not to fulfill the contract is signed with Tehran in December 2005.[61]

Whether Russia and China agree to sanctions are important uncertainties. It is also important to remember that it is one thing to recommend a conventional arms embargo; it is another thing to enforce it. On the one hand, Iran does need these imports to upgrade its aging military weapons. On the other hand, given Iran's missiles and asymmetric capabilities, Tehran is not as reliant on arms imports for its "strategic" and security goals.

Finally, the US has imposed an arms embargo against Iran since the revolution. The above data also showed that Western European nations have contributed little to Iran's arms recapitalization. Nevertheless, Iran found alternatives to its military needs. The effectiveness of their procurement and their importance to Iran's overall strategic posture and military needs, however, are not as important as the fact that these exporting economies would find it hard to give up such a customer. For many of these exporting countries, the decision will be as much economic as it is strategic.

Uncertain Effect of Economic Sanctions

There is no point in paying the cost of sanctions against Iran unless their value outweighs that cost, and they achieve their strategic objectives. Sanctions may become self inflicted wounds to the powers imposing them far more than stop Iran's from achieving nuclear capabilities. As noted earlier, there have been countless examples where broad economic sanctions defeated their purposes.

Sanctions can fail either through a lack of collation to enforce them, Iranian smuggling of sanctioned goods, or through Iranian defiance in spite of the impact of such sanctions on the Iranian economy. Iran can ride out the sanctions and still develop its nuclear capabilities in which case even a military option might become useless in stopping Iran from obtaining an atom bomb.

Even if the sanctions are enforced without smuggling and do cause major impact on the Iranian economy, Iran is not without options. While Iran has certainly received help from the outside, as previous chapters have shown, the nature of Iran's nuclear research program is still too uncertain and it is unclear how much Iran has already gained in terms of importing CBRN technology. It is equally important to note that no one fully knows how advanced Iran's "indigenous" nuclear research program is. Iranian nuclear experts may be at a "point of no return," in which case there is little that outside help can offer.

Another important element in judging the effectiveness of the sanctions is not who would abide by them, but who would not. Rogue states, namely North Korea, are unlikely to be deterred by any sanctions. If sanctions are imposed against Iran, new help might come from the North Korean regime to develop Iran's nuclear program, sell Tehran a nuclear bomb, and/or sell Iran more advanced missiles.

The nature of the regime in Iran is very unlikely to be changed by sanctions, and economic restrictions may in fact help the regime consolidate its power. The general Iranian population seem to support Iran's bid for nuclear power, civilian and militarily. Despite conventional wisdom in the US, the Iranian public may not be as "anti-American" as others in the Middle East, but they are not "pro-American" either.

Iran's effort to achieve nuclear capabilities has become a matter of national pride. The idea that Iran has a special place on the world stage is supported by the majority of Iranians. Economic sanctions that are imposed by the UNSC are unlikely to change this popular view about the hope of Iran becoming a regional superpower. Iranians see the Islamic Republic, despite their disagreement with some current domestic policies, as the legacy of the Persian civilization that must become a regional superpower.

All that said, sanctions may become the only short-term option, and could still have an impact—if their objective is practical and they are targeted well enough to persuade Iran

to bargain. In summary, the UNSC has the following options, which can be exercised individually or in combinations:

- Impose financial sanctions against official Iranian assets, freezing government officials' capital, and restrict Iranian government officials' travels. Stop all loans from European, Asian, and Middle Eastern banks.
- Target certain trading partners particularly stop all trade between Iran and North Korea to stop the transfer of weapons, missile, or nuclear technology.
- Continue the US arms embargo and strengthen it to include Russian, Chinese, and European sanctions against any export of conventional military imports.
- Strengthen inspections of Iranian imports to stop the importation of any sensitive dual use technologies or devices. This would mean intrusive inspections at the source and would require robust intelligence.
- Impose total embargo on Iranian imports of refined products. This would mean cutting off all European and Indian exports of gasoline, jet fuels, and other refined products to Iran. Smuggling will take place, but
- Stop all the shipment of machineries from Germany, Italy, Russia, and France to Iran's heavy industry.

None of these options are perfect, and none is guaranteed to successes or achieve its goal, but the combination of these can enhance the pressure against the Iranian government. The previous sections have outlined the consequences of each of these options in details. They could be defied by the Iranians. They could also cause further escalation to a conventional, asymmetric attacks, or WMD conflict.

It must also be understood that sanctions can also be combined with military force. The US can choose to carry surgical air and missile strikes against known or new Iranian nuclear and missile sites, and hope that it can delay Iranian nuclear program. Military strikes are unlikely to be supported by the UNSC and may break the "coalition" including the EU3, Russia, and China. If Iran does, however, decides to defy UN imposed sanction and move toward further development in its nuclear program, then the outlook of the UNSC may change. As the following section will show, however, there are several military options, but Iran is not without retaliatory options either.

Possible Military Options

Official US policy is to leave all options on the table, and emphasize diplomatic activity through the EU3 and the UN. Vice President Richard Cheney reiterated the United States policy on March 7, 2006:[62]

> The Iranian regime needs to know that if it stays on its present course, the international community is prepared to impose meaningful consequences. For our part, the United States is keeping all options on the table in addressing the irresponsible conduct of the regime…And we join other nations in sending that regime a clear message: We will not allow Iran to have nuclear weapons.

Other United States officials also reiterated that preventive military options are still on the table. The national security advisor, Stephen J. Hadley, reiterated that Iran poses a grave threat to the United States national security. During a presentation of the United States national security strategy in March 2006, he said, "We face no greater challenge

from a single country than from Iran." Mr. Hadley added "The doctrine of preemption remains sound…We do not rule out the use of force before an attack occurs."[63]

The US estimates of timelines for Iran's nuclear and missile efforts also leave at least several years in which to build an international consensus behind sanctions and diplomatic pressure, and a consensus behind military options if diplomacy fails.

The US would also have the potential advantage of finding any Iranian "smoking gun," improving its targeting and strike options, and being able to strike targets in which Iran had invested much larger assets. The fact Iran can exploit time as a weapon in which to proliferate, does not mean that the US cannot exploit time as a weapon with which to strike Iran.

The Problem of Targeting

There are no risk-free military options for the US or neighboring states. Tehran's known nuclear research facilities are dispersed around the country, generally large, and have constant new construction. Many key sites are underground and many others may be unknown or are not identifiable. IAEA inspections have identified at least 18 sites, but others argue that there might be more than 70.[64]

There is a range of views regarding what can be achieved by targeting Iranian nuclear sites. For example, former Pentagon advisor, Richard Perle, argued that a one-night strike with B-2 bombers by United States c devastate Iran's nuclear program. Gary Bernsten, former CIA operative, however, argued that "This is a huge system of facilities they have. This is not going to be a small sort of engagement. We are probably going to have to destroy 30 facilities in 30 locations. Or at least 15." However, Bersten added that "We can take care of it in a couple of days with air strikes and they wouldn't be able to stop us."[65]

Tehran, however, has had a quarter of a century to learn from the experience of Iraq in 1981. Iran may have built redundant sites, underground facilities, and constructed high level of protection around its known nuclear research centers. Others have argued that Iranian nuclear sites may have been deliberately built near populated areas or in facilities with many other "legitimate" purposes so the US would be confronted with the problem of collateral damage or being charged with having hit an "innocent target." The previous chapters have also strongly suggested that many of Iran's research, development, and production activities are almost certainly modular and can be rapidly moved to new sites, including tunnels, caves, and other hardened facilities.

US officials have publicly identified key nuclear research sites that may have been placed underground to shield them again airborne assaults. For example, the US identified the Parchin military complex, located south of Tehran, as a "probable" location for nuclear weaponization research.[66] This site alone has many sections, hundreds of bunkers, and several tunnels. It is also a site that is being used to manufacture conventional armaments and Iranian missiles.[67] This is one possible site that could be attacked, but even the evidence linking this to military nuclear weapons manufacturing were ambiguous. The site has civilian and conventional military use. The IAEA initial assessment was that the site was not linked to nuclear weapons manufacturing, but most agree that there was not definitive proof.

It is equally important to note that Iran had increased its protection of sites against possible US or Israel air strikes. It has been reported that the Islamic Revolutionary Guards Corps (IRGC) launched a program to protect major nuclear facilities. The program was recommended by the Nuclear Control Center of Iran and endorsed by Iran's Supreme Leader, Ali Khamenei. The program's mission was to build a defense infrastructure for Iran's nuclear research facilities.[68]

This program, reportedly coordinated with North Korea, is to build underground halls and tunnels at the cost of "hundreds of millions of dollars." Some key sites such as Esfahan and Natanz are high on the list of the program to protect. The logistic defense infrastructure would include natural barriers (tunnels into mountains and cliffs), and manufactured barricades (concrete ceilings and multiple floors), and camouflage activities around key sites. The construction, a joint venture between Iranian and North Korean companies, was estimated to finish by June 1, 2006.[69]

All that said, this does not mean the US cannot target much or most of Iran's capabilities or does not have much better targeting intelligence than outsiders can estimate One great danger in open-sourced analysis is that cannot be upon anything other than guesses about the quality targeting intelligence and cannot provide a meaningful picture of what the US or other potential attackers know at the classified level. It is also dangerous, if not irresponsible, for analysts with no empirical training and experience in targeting and modern weapons effects to make sweeping judgments about strike options. They simply lack basic professional competence and even minimal credibility.

Options also do not need to be limited to known targets or nuclear targets. A power as large as the US could strike at possible targets as well. The problem with a shell gamer is that it virtually provokes strikes at all the shells.

The US also could strike at a wide range of critical Iranian military facilities, including its missile production facilities. Most are soft targets, and would be extremely costly to Iran. Even if many of Iran's nuclear facilities did survive US strikes, Iran would be faced with either complying with the EU3 and UN terms or taking much broader military losses -- losses its aging and limited forces can ill afford.

More generally, the US could cripple Iran's economy by striking at major domestic gas production and distribution facilities, refineries, and electric power generators. Iran may have a lever in terms of suspending its oil exports, but the Iranian economy has a highly fragile infrastructure and selective strikes could paralyze a great deal of Iran's economic activity outside the oil sector in ways that would put intense pressure on Iran to both suspend its nuclear activity and export at maximum rates to fund its economic recovery. There are no rules that would preclude the US from immediate restrikes or restrikes over time. If the US chose to strike at the necessary level of intensity, it could use conventional weapons to cripple Iran's ability to function as a nation in a matter of days with attacks limited to several hundred aim points.

Iranian Defense Against US Strikes

Iran would find it difficult to defend against US forces using cruise missiles, stealth aircraft, stand-off precision weapons, and equipped with a mix of vastly superior air combat assets and the IS&R assets necessary to strike and restrike Iranian targets in near real time. For example, each US B-2A Spirit stealth bomber could carry eight 4,500lb enhanced BLU-28 satellite-guided bunker-busting bombs – potentially enough to take out

one hardened Iranian site per sortie. Such bombers could operate from flying from Diego Garcia in the Indian Ocean, RAF Fairford in Gloucestershire and Whiteman USAF base in Missouri.[70]

The US also has a wide range of other hard target killers, many of which are in development or classified. Systems that are known to be deployed include the BLU-109 Have Void "bunker busters." a "dumb bomb" with a maximum penetration capability of 4 to 6 feet of reinforced concrete. An aircraft must overfly the target and launch the weapon with great precision to achieve serious penetration capability.[71] It can be fitted with precision guidance and converted to a guided glide bomb. The Joint Direct Attack Munition (JDAM) GBU-31 version a nominal range of 15 kilometers with a Circular Error Probable (CEP) of 13 meters in the GPS-aided INS modes of operation and 30 meters in the INS-only modes of operation.[72]

More advanced systems include the BLU-116 Advanced Unitary Penetrator [AUP],GBU-24 C/B (USAF), or GBU-24 D/B (Navy) which has about three times the penetration capability of the BLU-109.[73] It is not clear whether the US has deployed the AGM-130C with an advanced earth penetrating/hard target kill system. The AGM-130 Surface Attack Guided Munition was developed to be integrated into the F-15E, so it could two such missiles, one on each inboard store station. It is retargetable, precision guided standoff weapon using inertial navigation aided by Global Positioning System (GPS) satellites and has a 15 - 40 NM range.[74]

It is not clear such weapons could destroy all of Iran's most hardened underground sites, although it seems likely that the BLU-28 could do serious damage at a minimum. Much depends on the accuracy of reports that Iran has undertaken a massive tunneling project with some 10,000 square meters of underground halls and tunnels branching off for hundreds of meters from each hall. Iran is reported to be drawing on North Korean expertise, and to have created a separate corporation (Shahid Rajaei Company) for such tunneling and hardening efforts under the IRGC, with extensive activity already underway in Natanz and Isfahan. The facilities are said to make extensive use of blast-proof doors, extensive divider walls, hardened ceilings, 20 cm-thick concrete walls, and to use double concrete ceilings with earth fill between layers to defeat earth penetrators.[75] Such passive defenses could have a major impact, but reports of such activity are often premature, exaggerated, or report far higher construction standards than are actually executed.

At the same time, the B-2A could be used to deliver large numbers of precision-guided 500-lb bombs against dispersed surface targets or a mix of light and heavy precision guided weapons. Submarines and surface ships could deliver cruise missiles for such strikes, and conventional strike aircraft and bombers could deliver stand-off weapons against most suspect Iranian facilities without suffering a high risk of serious attrition. The challenge would be to properly determine what targets and aim points were actually valuable, not to inflict high levels of damage.

Iran has "quantity," but its air defenses have little "quality." It has assigned some 12,000-15,000 men in its air force to land-based air defense functions, including at least 8,000 regulars and 4,000 IRGC personnel. It is not possible to distinguish clearly between the major air defense weapons holdings of the regular air force and IRGC, but the air force appeared to operate most major surface-to-air missile systems.

Total holdings seem to include 30 Improved Hawk fire units (12 battalions/150+ launchers), 45-55 SA-2 and HQ-2J/23 (CSA-1) launchers (Chinese-made equivalents of the SA-2), and possibly 25 SA-6 launchers. The air force also had three Soviet-made long-range SA-5 units with a total of 10-15 launchers—enough for six sites. Iran has developed and deployed its own domestically manufactured SAM dubbed the Shahab Thaqeb. The SAM requires a four-wheeled trailer for deployment and closely resembles the R440 SAM.[76]

Iran's holdings of lighter air defense weapons include five Rapier squadrons with 30 Rapier fire units, 5-10 Chinese FM-80 launchers, 10-15 Tigercat fire units, and a few RBS-70s. Iran also holds large numbers of man-portable SA-7s, HN-5s, and SA-14s, plus about 2,000 anti-aircraft guns -- including some Vulcans and 50-60 radar-guided and self propelled ZSU-23-4 weapons.[77] It is not clear which of these lighter air defense weapons were operated by the army, the IRGC, or the air force. The IRGC clearly had larger numbers of manportable surface-to-air launchers, including some Stingers that it had obtained from Afghanistan. It almost certainly had a number of other light air defense guns as well.

There are no authoritative data on how Iran now deploys its land-based air defenses, but Iran seems to have deployed its new SA-5s to cover its major ports, oil facilities, and Tehran. It seems to have concentrated its Improved Hawks and Soviet and Chinese-made SA-2s around Tehran, Isfahan, Shiraz, Bandar Abbas, Kharg Island, Bushehr, Bandar Khomeini, Ahwaz, Dezful, Kermanshah, Hamadan, and Tabriz.

Although Iran has made some progress in improving and updating its weapons, sensors, and electronic warfare capability, and has learned much from Iraq's efforts to defeat US enforcement of the "no-fly zones" from 1992-2003, its current defenses are outdated and poorly integrated. All of its major systems are based on technology that is now more than 35 years old, and all are vulnerable to US use of active and passive countermeasures.

Iran’s air defense forces are too widely spaced to provide more than limited air defense for key bases and facilities, and many lack the missile launcher strength to be fully effective. This is particularly true of Iran’s SA-5 sites, which provide long-range, medium-to-high altitude coverage of key coastal installations. Too few launchers are scattered over too wide an area to prevent relatively rapid suppression. Iran also lacks the low altitude radar coverage, overall radar net, command and control assets, sensors, resistance to sophisticated jamming and electronic countermeasures, and systems integration capability necessary to create an effective air defense net.

Its land-based air defenses must operate largely in the point defense mode, and Iran lacks the battle management systems and data links are not fast and effective enough to allow it to take maximum advantage of the overlapping coverage of some of its missile systems—a problem further complicated by the problems in trying to net different systems supplied by Britain, China, Russia, and the US. Iran’s missiles and sensors are most effective at high-to-medium altitudes against aircraft with limited penetrating and jamming capability.

This situation may, however, change in the future, and improvements in Iran’s land-based air defenses could be a factor in the timing of any US or Israeli strikes. Iran purchased 20 Russian 9K331 Tor-M-1 (SA-15 Gauntlet) self-propelled surface-to-air missiles in December 2005.[78] Global Security indicates that this is a modern short-range missile that

has the capability to simultaneously attack two targets using a relatively high powered and jam-resistant radar, and has "electronic beam control and vertically launched missiles. able to maintain high speed and maneuverability inside an entire engagement envelope; the high degree of automation of combat operation provided by the electronic equipment suite." It is said to be capable of detecting targets at a distance of 25 kilometers and attack them at a maximum distance of 12 kilometers. For what it is worth, Russian sources claim that Tor is much more efficient than similar systems like France's Crotale and Britain's Rapier.

The basic combat formation is a firing battery consisting of four TLARs and the Rangir battery command post. The TLAR carries eight ready missiles stored in two containers holding four missiles each. It is claimed to have an effective range of 1,500 to 12,000 meters against targets flying at altitudes between 10 and 6,000 meters. The maximum maneuvering load factor limit on the weapon is said to be 30 "Gs".[79] It should be noted that Russian manufacturer claims are no less exaggerated than those of European and US manufacturers.

Delivery dates ranging from 2006-2009 have been reported, but the Tor is too range limited to have a major impact on US stealth attack capability, although its real-world performance against cruise missiles still has to be determined. It might have more point defense lethality against regular Israeli and US strike fighters like the F-15 and F-16 using precision guided-bombs, but would only be lethal against such aircraft with stand-off air-to-surface missiles if it could be deployed in the flight path in ways that were not detected before the attack profile was determined.

Iran also announced in February 2006 (along with several other weapons and military exercise announcements that seemed timed to try to deter US or Israeli military action) that it was mass producing a new man-portable, low altitude, short-range air defense missile called the Mithaq-2.[80] It was said to be electronic warfare and IR-flare resistant, and seemed to be based on the Chinese QW-1 Vanguard. If it is the QW-1, it is an IR-homing missile introduced in the mid-1990s. It may, however, be a variant of the QW-2 with an improved IR seeker. China claims it has an effective range of 500-5,000 meters at target altitudes of 30-4,000 meters. The maximum maneuvering load factor limit on the weapon is said to be 30 "Gs." In spite of Iranian claims, it does not seem superior to the Russian SA-14s already in Iranian inventory, and is too short-ranged to have more than a minimal deterrent effect.[81]

Some reports indicate that Iran is seeking more modern Soviet SA-300 missiles, and to use Russian systems to modernize its entire air defense system. If Iran could acquire, deploy, and bring such systems to a high degree of readiness, they would substantially improve Iranian capabilities. A report in Jane's claims that Iran is building surface-to-air missile defense zones around its nuclear facilities that will use a single battery of S-300PMU (SA-10) missiles to defend Bushehr reactor and will deploy the S-300V (SA-12b) to provide wide area defense coverage of other targets which it will mix with the TOR-M1 to provide low altitude point defense.

This is a logical Iranian approach to improving its defenses, and Iran has sought to purchase the S-300 in the past. It seems to have advanced electronic warfare capabilities, sensors, computer systems and software. The SA-10 is reported to be able to intercept aircraft at a maximum slant range of 32,000 to 43,200 meters, and a maximum effective defense perimeter of 150 km (90 miles). The minimum effective interception altitude is

claimed to be 10 meters. One variant of the missile is reported to have some BMD capability and be able to engage ballistic missile targets at ranges of up to 40 km (25 miles). Each battery is said to have a load of 32 missile rounds on its launchers, a battery deployment time as low as five minutes, and the ability to fire three missiles per second. A standard battery consists of an 83M6E2 command post (CP), up to six 90Zh6E2 air defence missile complexes, 48N6E2 air defence missiles, and technical support facilities. [82]

If Iran were to get the SV-300 (SA-12a and SA-12b), it would get a system with far more advanced sensors, electronic warfare capabilities, and significant point defense capabilities against ballistic missiles. A Russian S-300V brigade has the following components: 9M82 SA-12b Giant missiles (2 per launcher) and TELAR, 9M83 SA-12a Gladiator missiles (4 per launcher), and TELAR, Giant and Gladiator launcher/loader vehicles, 9S15 Bill Board Surveillance Radar system, 9S19 High Screen Sector Radar system, 9S32 Grill Pan Guidance Radar system, and 9S457 Command Station. The SA-12a is a dual-role anti-missile and anti-aircraft missile with a maximum range between 75 and 90 km. The SA-12b GIANT missile is configured as an ATBM role with a longer maximum range of between 100 and 200 kilometers. Each unit can detect up to 200 targets, track as many as 70 targets and designate 24 of the targets to the brigade's four GRILL PAN radar systems for engagement.[83]

It seems doubtful, however, that Iran has operational S-300PMU systems, has taken delivery on such units, or has even been able to buy them from Russia. It is also unclear that Russia has sold Iran SV-300 systems or plans to. The Russian minister of defense flatly denied any such sales had taken place in February 2006.[84] Even if such systems are delivered, their real-world performance will be uncertain. In the past, Russia has also been careful to control some critical aspects of its weapons exports, and sell degraded export versions.

Iran's air forces are only marginally better able to survive in air-to-air combat than Iraq's were before 2003. Iran’s command and control system has serious limitations in terms of secure communications, vulnerability to advanced electronic warfare, netting, and digital data transfer. According to the IISS, Iran does still have 5 operational P-3MP Orion and may have made its captured Iraqi IL-76 Candid AEW aircraft operational. These assets would give it airborne warning and command and control capability, but these are obsolescent to obsolete systems and are likely to be highly vulnerable to electronic warfare and countermeasures, and long-range attack, even with Iranian modifications and updates. There are some reports Iran may be seeking make a version of the Russian AN-140 AEW aircraft but these could not be deployed much before 2015.[85]

Iran’s air defense aircraft consist of a maximum operational strength of two squadrons of 25 export versions of the MiG-29A and two squadrons of 25-30 F-14As. The export version of the MiG-29A has significant avionics limitations and vulnerability to countermeasures, and it is not clear Iran has any operation Phoenix air-to-air missiles for its F-14As or has successfully modified its IHawk missiles for air-to-air combat. The AWG-9 radar on the F-14 has significant long distance sensor capability in a permissive environment, but is a US-made system in a nearly 30-year old configuration that is now vulnerable to countermeasures.

Iran might risk using its fighters and AEW aircraft against an Israeli strike. It seems doubtful that Israel could support a long-range attack unit with the air defense and electronic assets necessary to provide anything like the air defense and air defense suppression assets that would support a US strike. A US strike could almost certainly destroy any Iranian effort to use fighters, however, and destroy enough Iranian surface-to-air missile defenses to create a secure corridor for penetrating into Iran and against key Iranian installations. The US could then maintain such a corridor indefinitely with restrikes.

Iranian Retaliation Against US Strikes

This does not mean it would be easy or desirable for the US to exercise its military options. US forces are preoccupied in Iraq, and the lack of security in Iraq makes a full military attack against Iran all too unlikely. US military options are not risk-free, and the consequences of US strikes are enormous. Tehran has several retaliatory options:

- Retaliate against US forces in Iraq and Afghanistan overtly using Shahab-3 missiles armed with CBR warheads
- Use proxy groups including al-Zarqawi and Sadr in Iraq to intensify the insurgency and escalate the attacks against US forces and Iraqi Security Forces
- Turn the Shi'ite majority in Iraq against the US presence and demand US forces to leave
- Attack the US homeland with suicide bombs by proxy groups or deliver CBR weapons to al-Qa'ida to use against the US
- Use its asymmetric capabilities to attacks US interests in the region including soft targets: e.g. embassies, commercial centers, and American citizens
- Attack US naval forces stationed in the Gulf with anti-ship missiles, asymmetric warfare, and mines
- Attack Israel with missile attacks possibly with CBR warheads
- Retaliate against energy targets in the Gulf and temporarily shut off the flow of oil from the Strait of Hormuz
- Stop all of its oil and gas shipments to increase the price of oil, inflict damage on the global and US economies

Iran has close relations with many Iraqi Shi'ites, particularly Shi'ite political parties and militias. Some Iraqi groups have warned against US military strikes against their neighbors. For example, Moqtada Sadr pledged that he would come to the aid of Iran in the case of a military strike by the US against Tehran. Sadr pledged that his militia, the Mahdi army, would come to the aid of Iran. According to Sadr, Iran asked him about what his position would be if Iraq was attacked by the US and he pledged that the Mahdi army would help any Arab or neighboring country if it was attacked.[86]

Both the US and British ministers of defense have complained that Iran is actively supporting various militias in Iraq, has supplied advanced triggering and motion detector systems for IEDS, and is using elements of the al-Quds force to train death squads and militias.[87] Work by Nawaf Obaid, a visiting fellow at CSIS, indicates that,

> Iran is insinuating itself into Iraq. The first is through the activities of the al-Quds Forces, the special command division of the Iranian Revolutionary Guard (IRGC). The second approach is by funding and arming Shi'ite militias, the most prominent of which is the SCIRI's 25,000-strong

armed wing, the Badr Organization of Reconstruction and Development. Senior members of the Badr Organization and the al-Quds Forces have a closely coordinated relationship. Intelligence reports have indicated that Iranian officers are directing operations under cover in units of the Badr Organization. The Mahdi Army also receives important Iranian assistance, but on a much smaller scale.

The IRGC Commander is General Yahya Rahim-Safavi and the Deputy Commander is General Mohammad Bager Zulgadr. The al-Quds Forces Commander is General Qassem Soleimani. Generals Zulgadr and Soleimani are two most senior officers responsible for Iran's large covert program in Iraq and have a direct link to the Office of the Leader. Additionally, intelligence estimates have identified four other IRGC generals and nine IRGC colonels that are directly responsible for covert operations in Iraq.

The al-Quds Forces mainly functions as a large intelligence operation skilled in the art of unconventional warfare. Current intelligence estimates puts the strength of the force at 5,000. Most of these are highly trained officers. Within the al-Quds Forces, there is a small unit usually referred to as the "Special Quds Force" which consists of the finest case officers and operatives.

The senior officers attached to this unit conduct foreign covert unconventional operations using various foreign national movements as proxies. The forces operate mainly outside Iranian territory, but maintain numerous training bases inside Iran as well. Al-Quds international operations are divided into geographic areas of influence and various corps. The most important and largest cover Iraq, Saudi Arabia (and the Arabian Peninsula), and Syria / Lebanon. The smaller corps cover Afghanistan, Pakistan/India, Turkey, the Muslim Republics of the former Soviet Union, Europe / North America, and North Africa (Egypt, Tunisia, Algeria, Sudan, and Morocco).

The goal of Iran is to infiltrate all Iraq-based militias by providing training and support to their members. For example, al-Sadr's estimated 10,000-strong Mahdi Army, which gets logistical and financial support from al-Quds, also receives training in IRCG camps in Iran. Moreover, nearly all of the troops in the Badr Organization were trained in these camps as well. In addition, most senior officers acquired their skills in specialized camps under the control of the al-Quds Forces. Intelligence estimates that al-Quds currently operates six major training facilities in Iran, with the main facility located adjacent to Imam Ali University in Northern Tehran. The other most important training camps are located in the Qom, Tabriz, and Mashhad governorates. There are also two similar facilities operating on the Syrian-Lebanese border.

According to a senior general in the Iraqi Defense Ministry and a critic of Iran, the Iranians have set up the most sophisticated intelligence-gathering network in the country, to the extent that they have infiltrated "every major Iraqi ministry and security service." There is also an intelligence directorate that has been set up within the Revolutionary Guard that is under the command of the al-Quds Forces devoted exclusively to monitoring the movements of US and Allied forces in Iraq.

Many members of the newly created police and Iraqi forces are controlled by Shi'ite officers who, in some form or another, previously belonged to SCIRI or other groups affiliated with Iran. Recent intelligence indicates that IRGC officers are currently operating in Iraq in certain Shi'ite militias and actual army and police units. The degree of penetration of these organizations is difficult to assess, and it is virtually impossible to distinguish between Iraqi Shi'ite militias and police units, both of which are profoundly influenced by Iran, and in some cases are under Iranian control.

Iranian manipulation has filtered down to street level as well. Ordinary police and military officers now have a stronger allegiance to the Badr Organization or the Mahdi Army than to their own units. And of course, these organizations are deeply connected to Iran. According to the head of intelligence of an allied country that borders Iraq, "the Iranians have not just pulled off an infiltration, in certain regions in Baghdad and Basra, it's been a complete takeover."[1]

[1] Confidential interviews conducted by the SNSAP.

Many observers argue that a military strike against Iran can add to the chaos in Iraq and may further complicate the US position in Iraq. While the consequences of US military attacks against Iran remain unclear; the Shi'ite majority in Iraq can: 1) as the US to leave Iraq, 2) Shi'ite militia groups directly attack US forces, and/or 3) turn the new Iraqi security and military forces against US forces in Iraq.[88]

As has been discussed earlier, Iran has extensive forces suited to asymmetric warfare. These not only include the Revolutionary Guards and elements of the al-Quds force under the Directorate of the Islamic Revolutionary Guards Corps, but elements of the foreign intelligence directorate in the Ministry of Intelligence and Security (Vezarat-e-Ettela'at va Amniat-e Keshvar or VEVAK).[89]

The Iranian surface navy is highly vulnerable, but Iran could position land-based anti-ship missile where it could strike at tanker traffic, and mobile firing elements using systems like the HY-2/C-201 Silkworm or Seerseeker (Raad) have ranges of 90 to 100-kilometers and have proved difficult to detect and kill in the past.[90] Iran is reported to have the capability to make or assemble such missiles, modify and upgrade them, have roughly 100 systems in stock, and have 8-10 mobile missile launchers. These are reported to be deployed near the Strait of Hormuz, but may actually be in a number of different locations.[91]

Iran also has three relatively effective Kilo-class submarines, which can use long-range wire guided torpedoes or release mines. (Reports Iran has advanced "bottom" mines with sensors that release and activate them as they sense ships passing overhead are uncertain.)

The naval branch of the IRGC is reported to have up to 20,000 men. They operate 10 Hudong missile patrol boats with C-801K (42-120 kilometers) and C-802 (42-120 kilometers) sea-skimming anti-ship missiles.[92] The Iranian air force has airborne variants of these systems.

They have additional C-14 high speed catamarans which each have C-701 anti-ship missiles, and additional North Korean missile boats. They operate some 50 additional patrol boats, including 40 Bohammar Marine boats. Many are so small they are difficult to detect with ship-borne radars. These can be armed with recoilless rifles, RPGs and small arms to attack or harass ships in are near the Gulf and raid or attack offshore facilities. They can conduct suicide attacks, or release floating mines covertly in shipping lanes or near key facilities. Iran can use any commercial ship to release free-floating mines for the same purpose.[93]

Iran made claims in the spring of 2006 that it was testing more advanced weapons for such forces. These included a sonar-evading underwater missile (torpedo?) that IRGC Rear Admiral Ali Fadavi claimed no enemy warship could detect, and "no warship could escape because of its high velocity." Iran also claimed to be testing a new missile called the Kowsar with a very large warhead and extremely high speed to attack "big ships and submarines" that it claimed could evade radar and anti-missile missiles. While such tests may have been real, Iran has made so many grossly exaggerated claims about its weapons developments in the past, that it seems they were designed more to try to deter US military action and/or reassure the Iranian public than serious real-world capabilities.[94]

In any case, Iran could not close the Strait of Hormuz, or halt tanker traffic, and its submarines and much of its IRGC forces would probably be destroyed in a matter of days

if they become operational. It could, however, conduct a series of raids to threaten and disrupt Gulf traffic, and/or strike at offshore and shore facilities in the Southern Gulf, or at Iraqi oil facilities in the Gulf. Even sporadic random strikes would create a high risk premium and potential panic in oil markets. Iran could potentially destabilize part of Afghanistan, and use Hezbollah and Syria to threaten Israel.

Iran can also use its IRGC asymmetric warfare assets to attack US interests in the region. Iranian officials do not hide the fact that they would use asymmetric attacks against US interests. For example, a Brigadier General in the IRGC and the commander of the "Lovers of Martyrdom Garrison," Mohammad-Reza Jaafari, threatened US interest with suicide operations if the US were to attack Iran:[95]

> Now that America is after gaining allies against the righteous Islamic Republic and wants to attack our sanctities, members of the martyrdom-seeking garrisons across the world have been put on alert so that if the Islamic Republic of Iran receives the smallest threat, the American and Israeli strategic interests will be burnt down everywhere.
>
> The only tool against the enemy that we have with which we can become victorious are martyrdom-seeking operations and, God willing, our possession of faithful, brave, trained and zealous persons will give us the upper hand in the battlefield...
>
> Upon receiving their orders, our martyrdom-seeking forces will be uncontrollable and a guerrilla war may go on in various places for years to come…
>
> America and any other power cannot win in the unbalanced war against us.

Iran could seek to create an alliance with extremist movements like al-Qa'ida in spite of their hostility to Shi'ites. It can seek to exploit Arab and Muslim anger against US ties to Israel and the invasion of Iraq on a global level, and European and other concerns that the US might be repeating its miscalculation of the threat posed by Iraq and striking without adequate cause. Unless Iran is far more egregious in its non-compliance, or the US can find a definitive smoking gun to prove Iran is proliferating, Iran would be certain to have some success in such efforts.

Iran's energy resources are another potential weapon. Shutting off exports would deeply hurt Iran but would have an impact on global markets. As Iraq found, energy deals can also sharply weaken support for even diplomatic options, and Russia and China might well oppose any kind of US military strike, regardless of the level of justification the US could advance at the time.

US Military Options

If the US does choose to respond militarily, it has several major types of military and strategic options. Each of these options might have many of the following broad characteristics, although it should be stressed that these are only rough outlines of US options and are purely speculative and illustrative points. They are more *warnings* than recommendations and they are not based on any inside knowledge of actual US war plans, and calculations. Those who argue strongly for and against such options should note, however, that there are many different ways in which the US could act. There are no rules or certainties that either say such attacks could not succeed or that they would.

- **Demonstrative, Coercive, or Deterrent Strikes**
  - Conduct a few cruise missile or stealth strikes simply as a demonstration or warning of the seriousness of US intentions if Iran does not comply with the terms of the EU3 or UN.

- Hit at least one high value target recognized by IAEA and EU3 to show credibility to Iran, minimize international criticism.
- Might strike at new sites and activities to show Iran cannot secretly proceed with, or expand its efforts, by ignoring the UN or EU3.
- Could carrier base; would not need territory of Gulf ally.
- International reaction would be a problem regardless of the level of US action.
- Might trigger Iranian counteraction in Iraq, Afghanistan, and dealing with Hezbollah.

○ **Limited US attacks:**

- Limited strike would probably take 16-20 Cruise missile and strike sorties. (Total sorties in Gulf and area would probably have to total 100 or more including escorts, enablers, and refuelers.
- Might be able to combine B-2s and carrier-based aircraft and sea-launched cruise missiles. Might well need land base(s) in Gulf for staging, refueling, and recovery.
- Goal would be at least 2-3 of most costly and major facilities critically damaged or destroyed.
- Hit at high value targets recognized by IAEA and EU3 to show credibility to Iran, minimize international criticism.
- Might strike at new sites and activities to show Iran cannot secretly proceed with, or expand its efforts, by ignoring the UN or EU3.
- Might slow down Iran if used stealth aircraft to strike at hard and underground targets, —but impact over time would probably still be more demonstrative than crippling.
- Hitting hard and underground targets could easily require multiple strikes during mission, and follow-on restrikes to be effective.
- Battle damage would be a significant problem, particularly for large buildings and underground facilities.
- Size and effectiveness would depend very heavily on the quality of US intelligence, and suitability of given ordnance, as well as the time the US sought to inflict a given effect.
- Iran's technology base would survive; the same would be true of much of equipment even in facilities hit with strikes. Little impact, if any, on pool of scientists and experts.
- Iranian response in terms of proliferation could vary sharply and unpredictably: Deter and delay vs. mobilize and provoke.
- Likely to produce cosmetic Iranian change in behavior at best. Would probably make Iran disperse program even more, and drive it to deep underground facilities. Might provoke to implement (more) active biological warfare program.
- Any oil embargo likely to be demonstrative.
- Would probably trigger Iranian counteraction in Iraq, Afghanistan, and dealing with Hezbollah.
- International reaction could be a serious problem; US might well face same level of political problems as if it had launched a comprehensive strike on Iranian facilities.

○ **Major US attacks on Iranian CBRN and major missile targets:**

- 200-600 cruise missiles and strike sorties; would have to be at least a matching number of escorts, enablers, and refuelers. Period of attacks could extend from 3 to 10 days.

- Hit all suspect facilities for nuclear, missile, BW, and related C^4IBM.
- Knock out key surface-to-air missile sites and radars for future freedom of action
- Would need to combine B-2s, carrier-based aircraft and sea-launched cruise missiles, and used of land base(s) in Gulf for staging, refueling, and recovery.
- Threaten to strike extensively at Iranian capabilities for asymmetric warfare and to threaten tanker traffic, facilities in the Gulf, and neighboring states.
- At least 7-10 days to fully execute and validate.
- Goal would be at least 70-80% of most costly and major facilities critically damaged or destroyed.
- Hit at all high value targets recognized by IAEA and EU3 to show credibility to Iran, minimize international criticism, but also possible sites as well.
- Strike at all known new sites and activities to show Iran cannot secretly proceed with, or expand its efforts, unless hold back some targets as hostages to the future.
- Impact over time would probably be crippling, but Iran might still covertly assemble some nuclear device and could not halt Iranian biological weapons effort.
- Hitting hard and underground targets could easily require multiple strikes during mission, and follow-on restrikes to be effective.
- Battle damage would be a significant problem, particularly for large buildings and underground facilities.
- Size and effectiveness would depend very heavily on the quality of US intelligence and suitability of given ordnance, as well as the time the US sought to inflict a given effect.
- Much of Iran's technology base would still survive; the same would be true of many equipment items, even in facilities hit with strikes. Some impact, if any, on pool of scientists and experts.
- Iranian response in terms of proliferation could vary sharply and unpredictably: Deter and delay vs. mobilize and provoke.
- A truly serious strike may be enough of a deterrent to change Iranian behavior, particularly if coupled to the threat of follow on strikes in the future. It still, however, could as easily produce only a cosmetic Iranian change in behavior at best. Iran might still disperse its program even more, and shift to multiple, small, deep underground facilities.
- Might well provoke Iran to implement (more) active biological warfare program.
- An oil embargo might be serious.
- Iranian government could probably not prevent some elements in Iranian forces and intelligence from seeking to use Iraq, Afghanistan, support of terrorism, and Hezbollah to hit back at the US and its allies if it tried; it probably would not try.
- International reaction would be a serious problem, but the US might well face same level of political problems as if it had launched a small strike on Iranian facilities.

- **Major US attacks on military and related civilian targets:**
  - 1000-2,500 cruise missiles and strike sorties
  - Hit all suspect facilities for nuclear, missile, BW, and C^4IBM, and potentially "technology base" targets including universities, dual use facilities.
  - Either strike extensively at Iranian capabilities for asymmetric warfare and to threaten tanker traffic, facilities in the Gulf, and neighboring states or threaten to do so if Iran should deploy for such action.
  - Would require a major portion of total US global assets. Need to combine B-2s, other bombers, and carrier-based aircraft and sea-launched cruise missiles. Would need land base(s) in Gulf for staging, refueling, and recovery. Staging out of Diego Garcia would be highly desirable.
  - Would probably take several weeks to two months to fully execute and validate.
  - Goal would be 70-80%-plus of most costly and major CBRN, missile and other delivery systems, key conventional air and naval strike assets, and major military production facilities critically damaged or destroyed.
  - Hit at all high value targets recognized by IAEA and EU3 to show credibility to Iran, minimize international criticism, but also possible sites as well.
  - Strike at all known new sites and activities to show Iran cannot secretly proceed with, or expand its efforts, unless hold back some targets as hostages to the future.
  - Hitting hard and underground targets could easily require multiple strikes during mission, and follow-on restrikes to be effective.
  - Impact over time would probably be crippling, but Iran might still covertly assemble some nuclear device and could not halt Iranian biological weapons effort.
  - Battle damage would be a significant problem, particularly for large buildings and underground facilities.
  - Size and effectiveness would depend very heavily on the quality of US intelligence and suitability of given ordnance, as well as the time the US sought to inflict a given effect.
  - Much of Iran's technology base would still survive; the same would be true of many equipment items, even in facilities hit with strikes. Some impact, if any, on pool of scientists and experts.
  - Iranian response in terms of proliferation could vary sharply and unpredictably: Deter and delay vs. mobilize and provoke.
  - Such a series of strikes might be enough of a deterrent to change Iranian behavior, particularly if coupled to the threat of follow on strikes in the future. It still, however, could as easily produce only a cosmetic Iranian change in behavior at best. Iran might still disperse its program even more, and shift to multiple, small, deep underground facilities.
  - Might well provoke Iran to implement (more) active biological warfare program.
  - An oil embargo might be serious.
  - Iranian government could probably not prevent some elements in Iranian forces and intelligence from seeking to use Iraq, Afghanistan, support of terrorism, and Hezbollah to hit back at the US and its allies if it tried; it probably would not try.
  - International reaction would be a serious problem, and far greater than strikes that could be clearly associated with Iran's efforts to proliferate.

- **Delay and then strike:**
  - The US could execute any of the above options, and wait until after Iran provided proof was proliferating. Such a "smoking gun" would create a much higher chance of allied support, and international tolerance or consensus
  - Iran will have committed major resources, and created much higher value targets
  - The counter-risk is an unanticipated Iranian break out; some form of Iranian launch on warning (LOW), launch under attack (LUA), or survivable "ride out" capability.
  - Iranian dispersal and sheltering may be much better.
  - Iran might have biological weapons as a counter
  - Allied and regional reactions would be uncertain. Time tends to breed tolerance of proliferation.
- **Ride out Iranian Proliferation:**
  - Announce or quietly demonstrate US nuclear targeting of Iran's military and CBRN facilities and cities.
  - Deploy anti-ballistic and cruise missile defenses, and sell to Gulf and neighboring states.
  - Signal US conventional option to cripple Iran by destroying its power generation, gas, and refinery facilities.
  - Provide US guarantees of extended deterrence to Gulf States.
  - Tacitly accept Saudi acquisition of nuclear weapons and long-range strike capabilities.
  - Maintain preventive/preemptive option at constant combat readiness. Act without warning.
  - Encourage Israel to openly declare its strike options as a deterrent.
  - Announce doctrine that any Iranian use of biological weapons will lead to nuclear retaliation against Iran.

The "ride out" option is one that many commentators need to consider in more depth. Unless the US does find evidence of an imminent Iranian threat -- which at this point might well require Iran to find some outside source of nuclear weapons or weapons-grade material -- the US may well simply choose to wait. Patience is not always a virtue, but it has never been labeled a mortal sin.

The Consequences of an Israeli Strike

Some military experts in Israel have said that Iranian rhetoric calling for the destruction of Israel is more a smokescreen and excuse for creating an Iran nuclear monopoly in the Gulf than a sign of any serious willingness or desired to engage Israel. Others have said the opposite. Even if Iran's nuclear ambitions are mainly centered on the US presence in the Gulf and other Muslim and Arab states, however, this may not deter Israel from preventive or preemptive action in dealing with an existential threat, where one or two nuclear ground bursts centered on Tel Aviv and Haifa could virtually destroy Israel as a state.

A number of Israeli officers, officials and experts have said that Israel must not permit the Iranians acquire nuclear capabilities, regardless of Tehran's motivations. Some have

called for preemptive strikes by Israel. Ephraim Inbar, the President of the Jaffee Center for Strategic Studies, said, "For self-defense, we must act in a pre-emptive mode."[96]

Israeli military officials were quoted in press reports in January 2006, as saying that the IDF got the order to get ready for a military strike against Iranian nuclear sites by March 2006.[97] It is unclear what type of military strikes Israel may chose, if it decides to respond preemptively. Some have argued that Israel may declare its nuclear weapons and establish a mutually assured destruction: deterrence. While the impact of an Israeli declaration remains uncertain, it is likely to have little impact on Israel's strategic posture in the region, since most states factor Israel's nuclear weapons into their strategic thinking.

Some experts argued that Israel does not have viable military options. They argue it does not have US targeting capability and simply cannot generate and sustain the necessary number of attack sorties. Some argue that Israel might do little more than drive Iranian activity further underground, provoke even more Iranian activity, make it impossible for diplomatic and UN pressure to work, and make Israel into a real, rather than proxy or secondary target.

There is no doubt that such a strike would face problems. The Israelis do not have conventional ballistic missiles or land/sea-based cruise missiles suited for such a mission. The shortest flight routes would be around 1,500-1,700 kilometers through Jordan and Iraq, 1,900-2,100 kilometers through Saudi Arabia, and 2,600-2,800 kilometers in a loop through Turkey.[98]

All such missions would probably be detected relatively quickly by the radars in the countries involved, and very low-altitude penetration profiles would lead to serious range-payload problems. The countries overflown would be confronted with the need to either react or have limited credibility in claiming surprise. An over flight of Iraq would be seen in the region as having to have had a US "green light." Iran would almost certainly see Jordanian, Turkish, and/or Saudi tolerance of such an IAF strike as a hostile act. It might well claim a US "green light" in any case in an effort to mobilize hostile Arab and Muslim (and possibly world) reactions.

Israel has configured its F-15s and F-16s for long-range strikes, and has refueling capability. It is doubtful, however, that it has enough refueling capability to do more than send a strike force that would have to defend itself without a significant fighter escort or support from electronic warfare aircraft. Its strike aircraft would probably need close to maximum payloads to achieve the necessary level of damage against most targets suspected of WMD activity, although any given structure could be destroyed with 1-3 weapons. (This would include the main Bushehr reactor enclosure, but is real-world potential value to an Iranian nuclear program is limited compared to more dispersed and/or hardened targets).

The IAF's mix of stand-off precision-guided missiles -- such as Harpoon or Popeye – might not have the required lethality with conventional warheads. (Wildly differing reports exist about the range of the Popeye, which is deployed in the US as the Have Nap missile, The base system has a range of around 60-70 kilometers. Popeye II has a range of 150 kilometers. Reports have been made about improved "turbo" versions with ranges of 200-350 kilometers.) [99] There have even been reports of air or submarine launched versions with ranges of 1,500 kilometers. (One report notes that, "Israel is reported to

possess a 200kg nuclear warhead, containing 6kg of plutonium, that could be mounted on cruise missiles." [100]

This would greatly increase Israeli survivability and penetration capability, However, multiple strikes on the dispersed buildings and entries in a number of facilities would be necessary to ensure adequate damage without restrikes. Restrikes would require repeated penetration into Arab air space and do not seem to feasible planning criteria for Israeli commanders to use.

Much has been made of Israel's purchase of 500 BLU-109 Have Void "bunker busters," but considerable caution is needed about such reports. These are 2,000-pound weapons that are far less effective against deeply buried targets than the much larger US weapons described earlier. The standard version is a "dumb bomb" with a maximum penetration capability of 4 to 6 feet of reinforced concrete. An aircraft must overfly the target and launch the weapon with great precision to achieve serious penetration capability.[101]

It is possible to fit the weapon with precision guidance and convert it to a guided glide bomb and the US may have sold such a version or Israel may have modified them. The Joint Direct Attack Munition (JDAM) GBU-31 can be fitted to the bomb to give it a nominal range of 15 kilometers with a Circular Error Probable (CEP) of 13 meters in the GPS-aided INS modes of operation and 30 meters in the INS-only modes of operation.[102]Open source reporting, however, does not provide any data on such capabilities.

It is also possible that Israel actually purchased the BLU-116 Advanced Unitary Penetrator [AUP], GBU-24 C/B (USAF), or GBU-24 D/B (Navy) which has about three times the penetration capability of the BLU-109.[103]

At least limited refueling would be required, and back-up refueling and recovery would be an issue.

Many have compared current Israeli military options with Iran to that of the 1981 attack against Iraq's Osiraq reactor, and have noted the conditions are very different. For example, Peter Brookes, a military expert, argued that have argued that Israel has several options including satellite-guided JDAM bombs, cruise missiles on submarines, and Special Operation Forces. He, however, argued that attacking Iranian nuclear facilities are "much tougher" to target given the nature of the Iranian nuclear facilities and the strategic balance in the region.[104]

Yet, these are problems to be solved, not insuperable barriers. Israel has the capabilities to carry out at last one set of air strikes, and senior US officials have warned about this capability. Vice President Richard Cheney suggested on January 20, 2005 that, "Given the fact that Iran has a stated policy that their objective is the destruction of Israel, the Israelis might well decide to act first, and let the rest of the world worry about cleaning up the diplomatic mess afterwards."[105]

General Moshe Ya'alon, the Israeli Chief of Staff, was quoted as saying in August 2004 that Iran must not be permitted to acquire nuclear weapons. He added that Israel must not rely on the rest of the world to stop Iran from going nuclear because he said a nuclear Iran would change the Middle East where "Moderate States would become more extreme."[106] General Ya'alon also indicated that Israel might conduct such attacks without

using its aircraft, triggering a wide range of speculation about Israeli and US covert operatives and special forces conducting such strikes.

Israel may have specially designed or adapted weapons for such strikes, and bought 500 bunker busters from the United States in February 2005. Experts speculated whether the purchase was a power projection move or whether Israel was in fact planning to use these conventional bombs against Iranian nuclear sites. These speculations were further exacerbated with the Israeli Chief of Staff, Lt. General Dan Halutz, was asked how far Israel would go to stop Iran's nuclear program, he said "2,000 kilometers."[107]

Brig. General, Shlomo Brom, however, has argued that Israel's capabilities may not be enough to inflict enough damage on Iran's nuclear program:[108]

> …any Israeli attack on an Iranian nuclear target would be a very complex operation in which a relatively large number of attack aircraft and support aircraft (interceptors, ECM aircraft, refuelers, and rescue aircraft) would participate. The conclusion is that Israel could attack only a few Iranian targets and not as part of a sustainable operation over time, but as a one time surprise operation.
>
> Even if Israel had the attack capabilities needed for the destruction of the all elements of the Iranian nuclear program, it is doubtful whether Israel has the kind of intelligence needed to be certain that all the necessary elements of the program were traced and destroyed fully. Israel has good photographic coverage of Iran with the Ofeq series of reconnaissance satellites, but being so distant from Iran, one can assume that other kinds of intelligence coverage are rather partial and weak.
>
> Covert action demands different kinds of operational capabilities and intelligence. There is no indication that Israel has capabilities of covert operations in Iran. The recent information about the development of the Iranian program indicated that it reached a status of being independent of external assistance. Moreover, the assistance Iran got was mostly from Pakistan, another place which is not a traditional area of operations for the Israeli secret services, like Europe or South America. It seems that there is no real potential for covert Israeli operations against the Iranian Nuclear program.

As is the case with a US strike, Iran has the capabilities to strike back. In fact, it has threatened retaliation if attacked by Israel. The Iranian Foreign Minister, Manouchehr Mottaki, was quoted as saying that an attack by Israel or the US would have "severe consequence," and threatened that Iran would retaliate "by all means" at its disposal. Mottaki added: "Iran does not think that the Zionist regime is in a condition to engage in such a dangerous venture and they know how severe the possible Iranian response will be to its possible audacity…Suffice to say that the Zionist regime, if they attack, will regret it."[109]

Iran has several options to respond to an Israeli attack:

- Multiple launches of Shahab-3 including the possibility of CBR warheads against Tel Aviv, Israeli military and civilian centers, and Israeli suspected nuclear weapons sites.
- Escalate the conflict using proxy groups such Hezbollah or Hamas to attack Israel proper with suicide bombings, covert CBR attacks, and missile attacks from southern Lebanon and Syria.
- Covert attacks against Israeli interests by its intelligence and IRGC assets. This could include low-level bombings against Israeli embassies, Jewish centers, and other Israeli assets outside and inside Israel.

In addition, any Israeli military option would have to include an air strike and would seriously complicate Israel's fragile relations with Jordan and may provoke Saudi Arabia to respond. An Israeli strike against Iranian nuclear facilities may also strengthen the

Iranian regime's stance to move toward nuclear capabilities, and drive many neighboring states to support Iran's bid for nuclear weapons. The US will be seen as having given the "green light" for such Israeli strikes, which could lead to further escalation of the Iraqi insurgency, increase the threat of asymmetric attacks against America interests and allies in the region, or even worse used as a justification cry for attacks against the US homeland with CBR weapons by proxy groups or through an alliance with groups such as al-Qa'ida.

On the other hand, Israeli officials have expressed the concern that if Iran acquires nuclear weapons and the means to deliver them, this may spark further proliferation in the region. This would spread WMD capabilities around the Middle East, and greatly increase the threat of CBRN attacks against Israel and the entire region.[110] Waiting also has its penalties.

Strategic Implications

It may be years, or as much as a decade, before all of the implications surrounding Iran's possible efforts to acquire nuclear weapons become clear. As the previous chapters have shown, the strategic implications of whether Iran has any nuclear device are only part of the story. There are many different ways in which Iran can proliferate, deploy nuclear-armed or other CBRN weapons, and use them to deter, intimidate, and strike against other nations. All have only one thing in common: *they are all provocative and dangerous to both any nation Iran may chose to try to influence and target, and to Iran.*

Iran's options for warfighting, and the possible response, have already been described in detail. One final point does, however, need to be raised. Even Iranian ambiguity will probably lead Israel and the US -- and possibly India, Pakistan, and Russia -- to develop nuclear options to deter or retaliate against Iran. Restraint does not have to stop at the first convincing Iranian threat to use nuclear or highly lethal biological weapons, but it could do so. Any actual Iranian use of such weapons is likely to provoke a nuclear response and may well provoke one targeted on Iranian cities and its population. Iran's effort to limit or control the game will probably end at the first ground zero.

Iranian ambiguity also may trigger Saudi and Egyptian efforts to become nuclear powers. They might show restraint if the US could provide convincing ballistic and cruise missile defenses, and the same form of extended deterrence it once provided to Germany during the Cold War. But, these options are speculative and do not yet exist. Saudi Arabia has already said that it has examined nuclear options and rejected them, but this is no certainty and inevitably depends on Iranian action.

The end result is the prospect of a far more threatening mix of CBRN capabilities in the Gulf region, and the areas that most models project as the main source of continued world oil and gas exports beyond 2015. It is also the threat of more polarization between Sunni and Shi'ite, and broader regional tensions and actions that spillover out of the confrontation over Iran's nuclear activities. None of these prospects are pleasant.

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The fuzing of the weapon is believed to have been improved and possibly some aspects of its penetration capability. It has been tested against rock as well as soil. Global Security indicates that Guided Bomb Unit-28C/B, also known as BLU-122 or Enhanced Paveway III, provides with an improved aerial delivery capability for the BLU-113 P3I warhead, and possesses a Global Positioning System aided laser guidance capability with improved lethality, survivability, and penetration over the 28B/B weapons system, and is compatible with F-15E and B-2A aircraft platforms. http://www.globalsecurity.org/military/systems/munitions/gbu-28.htm. The B-2 Spirit bomber has also tested simulated nuclear earth penetrator modifications of the B61-11. http://www.globalsecurity.org/wmd/library/news/usa/1998/n19980326_980417.html.

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> HY-2A terminal guidance radar of the prototype missile was modified into a passive infrared target seeker which effectively raised the concealment and anti-jamming capabilities of the missile. The interception performance of this missile within guidance range can realize omnidirectional attacks on ship targets at sea.
>
> HY-2B the conical scanning terminal guidance radar of the prototype missile was modified to an advanced monopulse system radar which improved its resistance sea waves interference and various forms of electronic jamming.
>
> HY-2C terminal guidance radar of the prototype missile was modified into a television-equipped target seeker which was able to effectively raise the concealment and anti-jamming capabilities of the missile as well as increase its hit probability.
>
> HY-2G uses a high precision radio altimeter so that the level flight altitude of the missile can be lowered to 30-50 meters, raising penetration capabilities. The basic HY-2 uses active radar homing, while HY-2G adds a radio altimeter to permit a lower penetration altitude.

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