The Gulf and Transition

US Policy Ten Years After the Gulf War

Iranian and Iraqi Weapons of Mass Destruction and the US Response
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October 2000
Introduction

This transition study reflects the result of a long-standing project on Gulf net assessment, funded in part by the Smith Richardson Foundation. This project has already produced some eight books, including two major studies of Iranian and Iraqi military forces published in 1999 – *Iraq and the War of Sanctions* and *Iran’s Military Forces in Transition* (Praeger 1999). Additional detailed briefings and supporting data on the military balance in the Gulf, energy and economic trends, Iranian and Iraqi proliferation, and Gulf arms transfers can be found on the CSIS web page at [www.csis.org](http://www.csis.org) under the sections market as “Gulf in Transition” and “Strategic Assessment.

This volume is intended to support US policy making and the reader should be aware that the sources used are deliberately chosen to rely as heavily as possible on current official US government documents and reports, unclassified intelligence reporting and estimates, and official international institutions like the World Bank. The goal is to provide data that policy makers are familiar with and can trust. The author, however, is solely responsible for the conclusions and suggestions made in this analysis and no attempt was made to coordinate its content with either any officials or experts in the US government or other policy analysts in the CSIS.
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Proliferation is the Most Dangerous Military Threat

The threat of proliferation not only poses the greatest military challenge to the security of the region, it poses the greatest challenge to US military capabilities to deter and win a conflict in the region without unacceptable losses to our allies and damage to the global economy. As has been discussed earlier, both Iran and Iraq have actively sought and acquired biological, chemical, and nuclear weapons. Both have obtained long-range missiles, and Iran is developing a booster that could be used to launch a warhead against the US. Both used chemical weapons against each other in the Iran-Iraq War. While the UN victory in the Gulf War has severely limited Iraq’s biological and chemical warfare capabilities, it has not affected Iran’s programs. The US also faces the mid to long-term prospect that Iraq will recover its capability to use weapons of mass destruction in a post-sanctions environment. There is a significant risk that both Iran and Iraq will become nuclear powers and/or acquire biological weapons with the lethality of nuclear weapons.

The issues involved are not simple. The tables that describe Iran and Iraq’s efforts in the chapter show both the historical momentum behind each nation’s effort and its complexity. Both nations have simultaneously pursued chemical, biological, nuclear and possibly radiological weapons, for more than two decades. Both nations have extensive missile technology, but can also use aircraft cover delivery methods, or asymmetric warfare.

The analysis of Iranian and Iraqi contingency options has already shown that even if the current intentions of each leadership elite were known, they could change suddenly. A particular crisis could reshape Iran and Iraq’s perceptions with little or no warning and radically change the willingness to escalate. What may start out as an act of intimidation may suddenly escalate to full-scale war.

Both nations are developing extremely lethal weapons with little capability and opportunity to test their reliability, lethality and damage effects. Both have poor targeting capability and delivery systems that can be highly inaccurate and unreliable.
limited command and control and battle management capabilities and have badly miscalculated the intentions and capabilities of their neighbors and the US in the past. Both have little battle damage assessment capability, not only to measure the effects of their own strikes, but the exact nature of strikes against them. They may begin a war prudently and carefully, but the fog of war could make them blunder up the escalation ladder.

Proliferation is also a regional problem. Iran and Iraq may see each other as the primary threat and the US or their Southern Gulf neighbors as the nations they want most to intimidate. India and Pakistan are on their doorsteps, however, and Iran’s relations with Pakistan are poor.

Saudi Arabia has long range missiles of its own. They are obsolete Chinese-supplied weapons armed with a high explosive warhead. If Saudi Arabia is pushed too far, however, it may purchase much more advance long-ranged missiles and there are some reports it has already investigated the possibility of buying nuclear weapons from Pakistan.

Iraq has already launched missiles at Israel, and both Iran and Iraq have shown their interest in missiles with ranges that can reach targets anywhere in Israel, and have some capability to strike Israel today. In the future, longer range missiles might be used to intimidate or strike at Egypt, Turkey, or Western Europe. The only rules that matter are the ones history will make.

**Iranian Force Developments**

Experts differ over the seriousness of the Iranian threat. Most experts believe, however, that Iran continues to pursue the development of long-range missiles, and of nuclear and biological warheads, and has significant stocks of chemical weapons. The question is not whether Iran can proliferate, but rather at what rate and what intensity. The details of Iran’s effort to proliferate are described in detail in Table IX-1, and it is clear that Iran has a long history of efforts to acquire very long-range missile technology that can be used in designing ICBMs as well as efforts to acquire weapons of mass destruction. It is also clear that efforts to downplay or minimize the Iranian threat have to ignore a wide range of historical evidence that Iran has
evolved a sophisticated program involving major efforts at deception and using dual-use technology.

**The Problem of Iranian “Moderation” and Intentions**

Much will depend heavily on whether President Khatami and the more moderate elements in Iran’s leadership can consolidate power and rein in Iran’s hard-line extremists, as well as on Iran’s perception of the threat the US poses once it is ready to deploy and the cost of that deployment. This creates an extremely uncertain political climate. On the one hand, one must be careful about either assuming that Iran’s “moderates” will win, or that “moderation” will mean that Iran will not continue to proliferate.

On the other hand, one must be equally careful about assuming that Iran’s hostility to Iraq and Israel, and concern with Pakistan, will be translated into the deployment of ICBM forces capable of delivering nuclear or biological weapons against the American homeland. Most of Iran’s most visible missile and weapons of mass destruction programs are now directed at regional threats like Iraq, and at achieving regional influence. Iran cannot ignore the fact that India and Pakistan are becoming nuclear powers with missiles that can strike at any target in the region.

Status is also an issue. Even a “moderate” Iranian regime may conclude that proliferation is the only way to give Iran political and strategic credibility as a major power in the region and to offset US power projection capabilities and the strength of any US-Southern Gulf coalition. The more hostile elements in the Iranian regime may also have concluded that some kind of threat to the American Homeland will give it critical leverage in limiting US freedom of action in the region. Even a future neutral or “friendly” regime might conclude that the possession of strong regional strike capabilities with long-range missiles and weapons of mass destruction, could hold US power projection forces, bases, and allied territory as hostages in the region, and that developing a limit strike capability against the US would help deter any US strikes on such a regional capability.
The practical problem is that the US cannot possibly predict the character of an Iranian regime over the next 10-25 years, nor can it predict that Iranian regimes will share the risk perceptions of the US or act as “rational bargainers” from an American perspective. This means there is no way to predict what kind of threat Iran may or may not develop against the US homeland.

**Iranian Missile Developments**

What is clear from Table IX-1, is that Iran is currently developing the missile production capabilities and technology, and weapons of mass destruction, that could eventually allow it to deploy a threat to the US. In September 1999, National Intelligence Council summarized the potential Iranian ballistic missile threat to the US as follows:

“Iran is the next hostile country most capable of testing an ICBM capable of delivering a weapon to the United States during the next 15 years.  

- Iran could test an ICBM that could deliver a several-hundred kilogram payload to many parts of the United States in the latter half of the next decade, using Russian technology and assistance.

- Iran could pursue a Taepo Dong-type ICBM. Most analysts believe it could test a three-stage ICBM patterned after the Taepo Dong-1 SLV or a three-stage Taepo Dong-2-type ICBM, possibly with North Korean assistance, in the next few years.

- Iran is likely to test an SLV by 2010 that—once developed—could be converted into an ICBM capable of delivering a several-hundred kilogram payload to the United States.

- Analysts differ on the likely timing of Iran's first flight test of an ICBM that could threaten the United States. Assessments include:
  - likely before 2010 and very likely before 2015 (noting that an SLV with ICBM capabilities will probably be tested within the next few years);
  - no more than an even chance by 2010 and a better than even chance by 2015;
  - and less than an even chance by 2015.”
The NIC also estimated that Iran, as well as other advanced proliferators, will be able to deploy warheads with some degree of penetration aids by the time it can deploy missiles capable of reaching the US. 3

“We assess that countries developing ballistic missiles would also develop various responses to US theater and national defenses. Russia and China each have developed numerous countermeasures and probably are willing to sell the requisite technologies.

- Many countries, such as North Korea, Iran, and Iraq probably would rely initially on readily available technology—including separating RVs, spin-stabilized RVs, RV reorientation, radar absorbing material (RAM), booster fragmentation, low-power jammers, chaff, and simple (balloon) decoys—to develop penetration aids and countermeasures.

- These countries could develop countermeasures based on these technologies by the time they flight test their missiles.

Foreign espionage and other collection efforts are likely to increase. China, for example, has been able to obtain significant nuclear weapons information from espionage, contact with scientists from the United States and other countries, publications and conferences, unauthorized media disclosures, and declassified US weapons information. We assess that China, Iran, and others are targeting US missile information as well.”

These conclusions regarding penetration aids are not mentioned in many unclassified studies of the missile threat to the US, and the unclassified discussions of the nominal program architecture for the National Missile Defense system. They do, however, raise important questions about whether a single site with a limited number of interceptors and the current configuration can provide highly reliable coverage against the kind of Iranian threat that might develop by 2010-2020.

The US intelligence community is divided whether Iran will sustain its current programs, and actually deploy a system capable of striking the US. A number of US intelligence officials feel the NIC report was politicized by pressure from the policy level to support the NMD program, and to not disagree with the results of the Rumsfeld Commission. They feel that Iran still faces problems in its program to build the Shahab-3, which some feel is a missile with a range of only 780 miles. At least one official has been quoted on background as stating that, “There is an Iranian threat to U.S. forces in the region, not to the continental United States.”
Nevertheless, Iran announced on July 15, 2000 that it had successfully test-fired an upgraded version of its medium-range Shahab missile. An Iranian defence ministry source was quoted by state media as saying that the missile was test-fired to ensure it conforms to the latest technological standards. It was first tested in 1998. "This missile is part of our program for the defence industry and it would in no way threaten other countries." The Iranian announcement stated that that the Shahab-3 was a ballistic missile, with a range of 800 miles, and could travel at a speed of 4,320 mph with a 1-ton warhead.

US experts indicated that they estimated the missile had a range of 1,300 km (800 miles), making it capable of hitting Israel, and that the Shahab-3 was modeled mainly on North Korea's Nodong-1, but has been improved with Russian technology. Iran's Defence Minister Admiral Ali Shamkhani has said a larger missile, Shahab 4, was in production as a vehicle for launching satellites into space. US officials agree that Iran is considering developing a rocket that can put satellites in orbit, but note that the development of such a booster would give Iran significantly enhanced capabilities to develop an intercontinental ballistic missile. U.S. Defence Department spokesman Ken Bacon stated that, “From everything we can tell, it was a successful firing. It is another sign they are determined to build longer-range weapons of mass destruction.”

Secretary of Defense William Cohen stated that, "This does not come as a surprise...I have pointed to Iran and the testing of the Shahab-3 and what I assume will be the testing of the 4 in the future and beyond that, as one of the reasons why it is important for the United States to undertake to research, develop and potentially deploy an NMD (national missile defense) system that would provide protection against countries such as Iran posing a threat to the United States...This represents a continuation of their testing program, whether it was scheduled to coincide with the discussions in Washington is a matter only the Iranians can determine, we don't have any information pertaining to that... We accept it for what it is, we know that they will continue to test it, they will continue to develop a longer-range missile capability and that is one of the reasons why we believe it is important that the United States continue its research and testing and the development program for the NMD, precisely to deal with countries such as North Korea, Iran, Iraq and others. Anytime you have success in a particular missile system, that gives you confidence to move forward with more tests, with greater capability...So I think there is obviously a potential to accelerate development with each successful test...we have discussed this in the past, we believe that North Korea, Iran, potentially Iraq in the future and others will develop long-range missile capability. This is what we anticipate, this confirms our anticipation, and so this is a factor that will have to be taken into account in terms of what the time frame
will be when Iran will have the capability of striking U.S. territory or that of European nations. Only the president can decide whether we should go forward at this point,” Cohen said. “But I think this is an issue that is not going to go away with the elections, and if there is any delay in the program, that another president will have to face it at some point because the threat will continue to expand.”

Israel expressed its concerns as well. Amos Yaron, director-general of the Defence Ministry, told Israel Radio that, “We are looking at this matter for the moment with some concern because in any event they have the ability. We don't believe they have any intention whatsoever to attack the state of Israel for the moment… It must be remembered that Iran developed these capabilities as a result of the lessons they had from the wars of the past, which is to say from its big war against Iraq. Iran didn't develop this missile against the state of Israel…Now the Iranians have this ability. Between the ability and the intention, there is a great distance.” A senior Israeli military source did predict, however, that by 2005, Iran would, with Russian help, achieve a military nuclear capability. Israel's army chief, Lieutenant-General Shaul Mofaz, told Israel Radio that the combined development of the missile and a non-conventional capacity posed a threat not only to Israel, but also to any country within range of the missile.

Iran’s foreign minister Kamal Kharraz responded by stating that, “as it was announced before, the test was done to boost the country's defensive capability and as a deterring force. It looks like America and Israel are using Iran's efforts to boost its defensive capability, which are its natural and legitimate right, as a scapegoat to secure the budget to race for arms…Who says Israel has the right to be equipped with all kinds of offensive arms, including weapons of mass destruction, but other countries in the region should not even have defensive weapons? The propaganda against Iran is aimed at deflecting world concerns over the U.S. missile shield.”

**Iran and Weapons of Mass Destruction**

The chain of evidence surrounding Iran’s overall efforts to acquire weapons of mass destruction is both uncertain and complex. It too is summarized in Table IX-2, however, and there is substantial evidence that Iran could be acquiring a nuclear and that it is also making substantial progress in deploying highly lethal biological weapons.
A CIA report, issued in August 2000, summarized the state of proliferation in Iran as follows,10

Iran remains one of the most active countries seeking to acquire WMD and ACW technology from abroad. In doing so, Tehran is attempting to develop an indigenous capability to produce various types of weapons—nuclear, chemical, and biological—and their delivery systems. During the reporting period, the evidence indicates increased reflections of Iranian efforts to acquire WMD- and ACW-related equipment, materials, and technology primarily on entities in Russia, China, North Korea and Western Europe.

For the second half of 1999, entities in Russia, North Korea, and China continued to supply the largest amount of ballistic missile-related goods, technology, and expertise to Iran. Tehran is using this assistance to support current production programs and to achieve its goal of becoming self-sufficient in the production of ballistic missiles. Iran already is producing Scud short-range ballistic missiles (SRBMs) and has built and publicly displayed prototypes for the Shahab-3 medium-range ballistic missile (MRBM), which had its initial flight test in July 1998. In addition, Iran’s Defense Minister last year publicly acknowledged the development of the Shahab-4, originally calling it a more capable ballistic missile than the Shahab-3, but later categorizing it as solely a space launch vehicle with no military applications. Iran’s Defense Minister also has publicly mentioned plans for a “Shahab 5.” Such statements, made against the backdrop of sustained cooperation with Russian, North Korean, and Chinese entities, strongly suggest that Tehran intends to develop a longer-range ballistic missile capability in the near future.

For the reporting period, Tehran expanded its efforts to seek considerable dual-use biotechnical materials, equipment, and expertise from abroad—primarily from entities in Russia and Western Europe—ostensibly for civilian uses. Iran began a biological warfare (BW) program during the Iran-Iraq war, and it may have some limited capability for BW deployment. Outside assistance is both important and difficult to prevent, given the dual-use nature of the materials, the equipment being sought, and the many legitimate end uses for these items.

Iran, a Chemical Weapons Convention (CWC) party, already has manufactured and stockpiled chemical weapons, including blister, blood, and choking agents and the bombs and artillery shells for delivering them. During the second half of 1999, Tehran continued to seek production technology, training, expertise, and chemicals that could be used as precursor agents in its chemical warfare (CW) program from entities in Russia and China. It also acquired or attempted to acquire indirectly through intermediaries in other countries equipment and material that could be used to create a more advanced and self-sufficient CW infrastructure.

Iran sought nuclear-related equipment, material, and technical expertise from a variety of sources, especially in Russia, during the second half of 1999. Work continues on the construction of a 1,000-megawatt nuclear power reactor in Bushehr, Iran, that will be subject to International Atomic Energy Agency (IAEA) safeguards. In addition, Russian entities continued to interact with Iranian research centers on various activities. These projects will help Iran augment its nuclear technology infrastructure, which in turn would be useful in supporting nuclear weapons research and development. The expertise and technology gained, along with the commercial channels and contacts established—even from cooperation that appears strictly civilian in nature—could be used to advance Iran’s nuclear weapons research and developmental program.

Beginning in January 1998, the Russian Government took a number of steps to increase its oversight of entities involved in dealings with Iran and other states of proliferation concern. In 1999, it pushed a new export control law through the Duma. Russian firms, however, faced economic pressures to circumvent these
controls and did so in some cases. The Russian Government, moreover, failed in some cases regarding Iran to enforce its export controls. Following repeated warnings, the US Government in January 1998 and January 1999 imposed administrative measures against Russian entities that had engaged in nuclear- and missile-related cooperation with Iran. The measures imposed on these and other Russian entities (which were penalized in 1998) remain in effect, although sanctions against two entities—Polyus and Inor—are being lifted.

China pledged in October 1997 not to engage in any new nuclear cooperation with Iran but said it would complete cooperation on two ongoing nuclear projects, a small research reactor and a zirconium production facility at Esfahan that Iran will use to produce cladding for reactor fuel. The pledge appears to be holding. As a party to the Nuclear Nonproliferation Treaty (NPT), Iran is required to apply IAEA safeguards to nuclear fuel, but safeguards are not required for the zirconium plant or its products.

Iran claims that it is attempting to establish a complete nuclear fuel cycle for its civilian energy program. In that guise, it seeks to obtain whole facilities, such as a uranium conversion facility, that, in fact, could be used in any number of ways in support of efforts to produce fissile material needed for a nuclear weapon. Despite international efforts to curtail the flow of critical technologies and equipment, Tehran continues to seek fissile material and technology for weapons development and has set up an elaborate system of military and civilian organizations to support its effort.

On the ACW side, Iran (which has acknowledged a need for Western military equipment and spare parts) continues to acquire Western equipment, such as attack helicopters, but also is developing indigenous production capabilities with assistance from countries such as Russia, China, and North Korea. Indigenous efforts involve such systems as tanks, TOW missiles, fighter aircraft, Chinese-designed SAMs and anti-ship missiles, and attack helicopters.

…Russian entities (have) continued to supply a variety of ballistic missile-related goods and technical know-how to countries such as Iran, India, and Libya. Iran’s earlier success in gaining technology and materials from Russian entities accelerated Iranian development of the Shahab-3 MRBM, which was first flight-tested in July 1998. Russian entities during the second six months of 1999 have provided substantial missile-related technology, training, and expertise to Iran that almost certainly will continue to accelerate Iranian efforts to develop new ballistic missile systems.

During the second half of 1999, Russia also remained a key supplier for civilian nuclear programs in Iran, primarily focused on the Bushehr Nuclear Power Plant project. With respect to Iran’s nuclear infrastructure, Russian assistance enhances Iran’s ability to support a nuclear weapons development effort. By its very nature, even the transfer of civilian technology may be of use in Iran’s nuclear weapons program. We remain concerned that Tehran is seeking more than a buildup of its civilian infrastructure, and the IC will be closely monitoring the relationship with Moscow for any direct assistance in support of a military program. In addition, Russia supplied India with material for its civilian nuclear program during this reporting period.

Russian entities remain a significant source of biotechnology and chemicals for Iran. Russia’s world-leading expertise in biological and chemical weapons would make it an attractive target for Iranians seeking technical information and training on BW and CW agent production processes. Russia (along with its sister republics in the FSU) also remains an important source of conventional weapons and spare parts for Iran, which is seeking to upgrade and replace its existing conventional weapons inventories.

Following intense and continuing engagement with the US, Russian officials took some positive steps to strengthen the legal basis of export controls. President Yeltsin in July 1999 signed a federal export control law,
which formally makes WMD-related transfers a violation of law and codifies several existing decrees—including catch-all controls—yet may lessen punishment for violators. Russian export enforcement and prosecution still remains weak, however. The export law is still awaiting completion of implementing decrees and its legal status is unclear. Public comments by the head of Russia’s security council indicate that Russia obtained only three convictions for export control violations involving WMD and missile technology during 1998-99.

Nonetheless, the Russian government’s commitment, willingness, and ability to curb proliferation-related transfers remain uncertain. Moreover, economic conditions in Russia continued to deteriorate, putting more pressure on Russian entities to circumvent export controls. Despite some examples of restraint, Russian businesses continue to be major suppliers of WMD equipment, materials, and technology to Iran. Specifically, Russia continues to provide Iran with nuclear technology that could be applied to Iran’s weapons program. Monitoring Russian proliferation behavior, therefore, will remain a very high priority.

Throughout the second half of 1999, North Korea continued to export significant ballistic missile-related equipment and missile components, materials, and technical expertise to countries in the Middle East, South Asia, and North Africa. Pyongyang attaches a high priority to the development and sale of ballistic missiles, equipment, and related technology. Exports of ballistic missiles and related technology are one of the North’s major sources of hard currency, which fuel continued missile development and production.

…Chinese missile-related technical assistance to Pakistan increased during this reporting period. In addition, firms in China provided missile-related items, raw materials, and/or assistance to several countries of proliferation concern—such as Iran, North Korea, and Libya….China’s 1997 pledge not to engage in any new nuclear cooperation with Iran has apparently held, but work associated with two remaining nuclear projects—a small research reactor and a zirconium production facility—continues. The Intelligence Community will continue to monitor carefully Chinese nuclear cooperation with Iran.

Prior to the reporting period, Chinese firms had supplied CW-related production equipment and technology to Iran. The US sanctions imposed in May 1997 on seven Chinese entities for knowingly and materially contributing to Iran’s CW program remain in effect. Evidence during the current reporting period suggests Iran continues to seek such assistance from Chinese entities, but it is unclear to what extent these efforts have succeeded. In June 1998, China announced that it had expanded its chemical export controls to include 10 of the 20 Australia Group chemicals not listed on the CWC schedules.

These comments broaden proliferation in the Gulf into a regional problem. They show that existing international arms control efforts are not adequate and that US and other attempts to control the sale of military and dual-USC technology have severe limits. Once again, these points are reinforced by the details shown in Table IX-1.
Table IX-1

Iranian Missile Threats and Proliferation

Delivery Systems

- Air delivery systems include:
  - Su-24 long-range strike fighters with range-payloads roughly equivalent to US F-111 and superior to older Soviet medium bombers.
  - F-4D/E fighter bombers with capability to carry extensive payloads to ranges of 450 miles.
  - Can modify HY-2 Silkworm missiles and SA-2 surface-to-air missiles to deliver weapons of mass destruction.
- Iran has made several indigenous-long range rockets.
  - The Iran-130, or Nazeat, since the end of the Iran-Iraq War. The full details of this system remain unclear, but it seems to use commercially available components, a solid fuel rocket, and a simple inertial guidance system to reach ranges of about 90-120 kilometers. It is 355-mm in diameter, 5.9 meters long, weighs 950 kilograms, and has a 150 kilogram warhead. It seems to have poor reliability and accuracy, and its payload only seems to be several hundred kilograms.
  - The Shahin 2. It too has a 355-mm diameter, but is only 3.87 meters long, and weighs only 580 kilograms. It evidently can be equipped with three types of warheads: A 180 kilogram high explosive warhead, another warhead using high explosive submunitions, and a warhead that uses chemical weapons.
  - Iranian Oghab (Eagle) rocket with 40+ kilometers range.
  - New SSM with 125 mile range may be in production, but could be modified FROG.
- Large numbers of multiple rocket launchers and tube artillery for short range delivery of chemical weapons.
- Iran has shorter missile range systems:
  - In 1990, Iran bought CSS-8 surface-to-surface missiles (converted SA-2s) from China with ranges of 130-150 kilometers.
  - Has Chinese sea and land-based anti-ship cruise missiles. Iran fired 10 such missiles at Kuwait during Iran-Iraq War, hitting one US-flagged tanker.
  - The Soviet-designed Scud B (17E) guided missile currently forms the core of Iran’s ballistic missile forces.
  - Iran acquired its Scuds in response to Iraq’s invasion. It obtained a limited number from Libya and then obtained larger numbers from North Korea. It deployed these units with a special Khatam ol-Anbya force attached to the air element of the Pasdaran. Iran fired its first Scuds in March, 1985. It fired as many as 14 Scuds in 1985, 18 in 1986, 18 in 1987, and 77 in 1988. Iran fired 77 Scud missiles during a 52 day period in 1988, during what came to be known as the “war of the cities.” Sixty-one were fired at Baghdad, nine at Mosul, five at Kirkuk, one at Takrit, and one at Kuwait. Iran fired as many as five missiles on a single day, and once fired three missiles within 30 minutes. This still, however, worked out to an average of only about one missile a day, and Iran was down to only 10-20 Scuds when the war of the cities ended.
  - Iran's missile attacks were initially more effective than Iraq’s attacks. This was largely a matter of geography. Many of Iraq's major cities were comparatively close to its border with Iran, but Tehran and most of Iran's major cities that had not already been targets in the war were outside the range of Iraqi Scud attacks. Iran's missiles, in contrast, could hit key Iraqi cities like Baghdad. This advantage ended when Iraq deployed extended range Scuds.
  - The Scud B is a relatively old Soviet design which first became operational in 1967, designated as the R-17E or R-300E. The Scud B has a range of 290-300 kilometers with its normal conventional payload. The export version of the missile is about 11 meters long, 85-90 centimeters in diameter, and weighs 6,300 kilograms. It has a nominal CEP of...
1,000 meters. The Russian versions can be equipped with conventional high explosive, fuel air explosive, runway penetrator, submunition, chemical, and nuclear warheads.

- The export version of the Scud B comes with a conventional high explosive warhead weighing about 1,000 kilograms, of which 800 kilograms are the high explosive payload and 200 are the warhead structure and fusing system. It has a single stage storable liquid rocket engine and is usually deployed on the MAZ-543 eight wheel transporter-erector-launcher (TEL). It has a strap-down inertial guidance, using three gyros to correct its ballistic trajectory, and uses internal graphite jet vane steering. The warhead hits at a velocity above Mach 1.5.

- Most estimates indicate that Iran now has 6-12 Scud launchers and up to 200 Scud B (R-17E) missiles with 230-310 KM range.

- Some estimates give higher figures. They estimate Iran bought 200-300 Scud Bs from North Korea between 1987 and 1992, and may have continued to buy such missiles after that time. Israeli experts estimate that Iran had at least 250-300 Scud B missiles, and at least 8-15 launchers on hand in 1997.

- US experts also believe that Iran can now manufacture virtually all of the Scud B, with the possible exception of the most sophisticated components of its guidance system and rocket motors. This makes it difficult to estimate how many missiles Iran has in inventory and can acquire over time, as well as to estimate the precise performance characteristics of Iran’s missiles, since it can alter the weight of the warhead and adjust the burn time and improve the efficiency of the rocket motors.

- Iran has new long range North Korean Scuds - with ranges near 500 kilometers.

- The North Korean missile system is often referred to as a “Scud C.” Typically, Iran formally denied the fact it had such systems long after the transfer of these missiles became a reality. Hassan Taherian, an Iranian foreign ministry official, stated in February, 1995, “There is no missile cooperation between Iran and North Korea whatsoever. We deny this.”

- In fact, a senior North Korean delegation traveled to Tehran to close the deal on November 29, 1990, and met with Mohsen Rezaei, the former commander of the IRGC. Iran either bought the missile then, or placed its order shortly thereafter. North Korea then exported the missile through its Lyongaksan Import Corporation. Iran imported some of these North Korean missile assemblies using its B-747s, and seems to have used ships to import others.

- Iran probably had more than 60 of the longer range North Korean missiles by 1998, although other sources report 100, and one source reports 170.

- Iran may have 5-10 Scud C launchers, each with several missiles. This total seems likely to include four new North Korean TELs received in 1995.

- Iran seems to want enough missiles and launchers to make its missile force highly dispersible.

- Iran has begun to test its new North Korean missiles. There are reports it has fired them from mobile launchers at a test site near Qom about 310 miles (500 kilometers) to a target area south of Shahroud. There are also reports that units equipped with such missiles have been deployed as part of Iranian exercises like the Saeqer-3 (Thunderbolt 3) exercise in late October, 1993.

- The missile is more advanced than the Scud B, although many aspects of its performance are unclear. North Korea seems to have completed development of the missile in 1987, after obtaining technical support from the People's Republic of China. While it is often called a “Scud C,” it seems to differ substantially in detail from the original Soviet Scud B. It seems to be based more on the Chinese-made DF-61 than on a direct copy of the Soviet weapon.

- Experts estimate that the North Korean missiles have a range of around 310 miles (500 kilometers), a warhead with a high explosive payload of 700 kilograms, and relatively good accuracy and reliability. While this payload is a bit limited for the effective delivery of chemical agents, Iran might modify the warhead to increase payload at the expense of range and restrict the use of chemical munitions to the most lethal agents such as persistent nerve gas. It might also concentrate its development efforts on arming its Scud C forces with more lethal biological agents. In any case, such missiles are likely to have enough range-payload to give Iran the ability to strike all targets on the southern coast of the Gulf and all of the populated areas in Iraq, although not the West. Iran could also reach targets in part of
eastern Syria, the eastern third of Turkey, and cover targets in the border area of the former Soviet Union, western Afghanistan, and western Pakistan.

- Accuracy and reliability remain major uncertainties, as does operational CEP. Much would also depend on the precise level of technology Iran deployed in the warhead. Neither Russia nor the People's Republic of China seem to have transferred the warhead technology for biological and chemical weapons to Iran or Iraq when they sold them the Scud B missile and CSS-8. However, North Korea may have sold Iran such technology as part of the Scud C sale. If it did so, such a technology transfer would save Iran years of development and testing in obtaining highly lethal biological and chemical warheads. In fact, Iran would probably be able to deploy far more effective biological and chemical warheads than Iraq had at the time of the Gulf War.

- Iran may be working with Syria in such development efforts, although Middle Eastern nations rarely cooperate in such sensitive areas. Iran served as a transshipment point for North Korean missile deliveries during 1992 and 1993. Some of this transshipment took place using the same Iranian B-747s that brought missile parts to Iran. Others moved by sea. For example, a North Korean vessel called the Des Hung Ho, bringing missile parts for Syria, docked at Bandar Abbas in May, 1992. Iran then flew these parts to Syria. An Iranian ship coming from North Korea and a second North Korean ship followed, carrying missiles and machine tools for both Syria and Iran. At least 20 of the North Korean missiles have gone to Syria from Iran, and production equipment seems to have been transferred to Iran and to Syrian plants near Hama and Aleppo.

- Iran has created shelters and tunnels in its coastal areas which it could use to store Scud and other missiles in hardened sites and reduce their vulnerability to air attack.

- Iran can now assemble Scud and Scud C missiles using foreign-made components. It may soon be able to make entire missile systems and warhead packages in Iran.

- A US examination of Iran’s dispersal, sheltering, and hardening programs for its anti-ship missiles and other missile systems indicate that Iran has developed effective programs to ensure that they would survive a limited number of air strikes and that Iran had reason to believe that the limited number of preemptive strikes Israel could conduct against targets in the lower Gulf could not be effective in denying Iran the capability to deploy its missiles.

- Iran is developing an indigenous missile production capability with both solid and liquid fueled missiles.

  - The present scale of Iran’s production and assembly efforts is unclear. Iran seems to have a design center, at least two rocket and missile assembly plants, a missile test range and monitoring complex, and a wide range of smaller design and refit facilities.

  - The design center is said to located at the Defense Technology and Science Research Center, which is a branch of Iran’s Defense Industry Organization, and located outside Karaj -- near Tehran. This center directs a number of other research efforts. Some experts believe it has support from Russian and Chinese scientists.

  - Iran’s largest missile assembly and production plant is said to be a North Korean-built facility near Isfahan, although this plant may use Chinese equipment and technology. There are no confirmations of these reports, but this region is the center of much of Iran’s advanced defense industry, including plants for munitions, tank overhaul, and helicopter and fixed wing aircraft maintenance. Some reports say the local industrial complex can produce liquid fuels and missile parts from a local steel mill.

  - A second missile plant is said to be located 175 kilometers east of Tehran, near Semnan. Some sources indicate this plant is Chinese-built and began rocket production as early as 1987. It is supposed to be able to build 600-1,000 Oghab rockets per year, if Iran can import key ingredients for solid fuel motors like ammonium perchlorate. The plant is also supposed to produce the Iran-130.

  - Another facility may exist near Bandar Abbas for the assembly of the Seersucker. China is said to have built this facility in 1987, and is believed to be helping the naval branch of the Guards to modify the Seersucker to extend its range to 400 kilometers. It is possible that China is also helping Iran develop solid fuel rocket motors and produce orassemble missiles like the CS-801 and CS-802. There have, however, been reports that Iran is developing extended range Scuds with the support of Russian experts, and of a missile called the Tondar 68, with a range of 700 kilometers.
• Still other reports claim that Iran has split its manufacturing facilities into plants near Pairzan, Seman, Shiraz, Maghdad, and Islake. These reports indicate that the companies involved in building the Scuds are also involved in Iran’s production of poison gas and include Defense Industries, Shahid, Baghri Industrial Group, and Shahid Hemat Industrial Group.

• Iran’s main missile test range is said to be further east, near Shahroud, along the Tehran-Mashhad railway. A telemetry station is supposed to be 350 kilometers to the south at Taba, along the Mashhad-Isfahan road. All of these facilities are reportedly under the control of the Islamic Revolutionary Guards Corps.

• There were many reports during the late 1980s and early 1990s that Iran had ordered the North Korean No Dong missile, which was planned to have the capability to carry nuclear and biological missile ranges of up to 900 kilometers. This range would allow the missile could reach virtually any target in Gulf, Turkey, and Israel. The status of the No Dong program has since become increasingly uncertain, although North Korea deployed some developmental types at test facilities in 1997.

• The No-Dong underwent flight tests at ranges of 310 miles (500 kilometers) on May 29, 1993. Some sources indicate that Iranians were present at these tests. Extensive further propulsion tests began in August 1994, and some reports indicate operational training began for test crews in May 1995. Missile storage facilities began to be built in July 1995, and four launch sites were completed in October 1995.

• The progress of the program has been slow since that time, and may reflect development problems. However, mobile launchers were seen deployed in northeast North Korea on March 24, 1997. According to some reports, a further seven launcher units were seen at a facility about 100 kilometers from Pyongyang.

• The No-Dong 1 is a single-stage liquid-fueled missile, with a range of up to 1,000 to 1,300 kilometers (810 miles), although longer ranges may be possible with a reduced warhead and maximum burn. There are also indications that there may be a No-Dong 2, using the same rocket motor, but with an improved fuel supply system that allows the fuel to burn for a longer period.

• The missile is about 15.2 meters long -- four meters longer than the Scud B -- and 1.2 meters in diameter. The warhead is estimated to weigh 770 kilograms (1,200-1,750 pounds) and a warhead manufacturing facility exists near Pyongyang. The No-Dong has an estimated theoretical CEP of 700 meters at maximum range, versus 900 meters for the Scud B, although its practical accuracy could be as wide as 3,000-4,000 meters. It has an estimated terminal velocity of Mach 3.5, versus 2.5 for the Scud B, which presents added problems for tactical missile defense. The missile is be transportable on a modified copy of the MAZ-543P TEL that has been lengthened with a fifth axle and which is roughly 40 meters long. The added support stand for the vertical launch modes brings the overall length to 60 meters, and some experts questioned whether a unit this big is practical.

• Reports during the late 1980s and early 1990s indicated that Iran was also interested in two developmental North Korean IRBMs called the Tapeo Dong 1 and Tapeo Dong 2

• The Tapeo Dong 1 missile has an estimated maximum range of 2,000 kilometers, and the Tapeo Dong 2 may have a range up to 3,500 kilometers.

• Both Tapeo Dongs are liquid fueled missiles which seem to have two stages.

• Unlike the No-Dong, the Tapeo Dongs must be carried to a site in stages and then assembled at a fixed site. The No-Dong transporter may be able to carry both stages of the Tapeo Dong 1, but some experts believe that a special transporter is needed for the first stage of the Tapeo Dong 1, and for both stages of the Tapeo Dong 2.

• Since the early 1990s, however, the focus of reports on Iran’s missile efforts have shifted, and it has since become clear that Iran is developing its own longer-range variants of the No Dong for indigenous production with substantial Russian and some Chinese aid:

• As early as 1992, one such missile was reported to have a range of 800-930 miles and a 1,650 pound warhead. Reports differ sharply on its size. Jane’s estimates a launch weight up to 16,000 kilograms, provided the system is derived from the No Dong. It could have a launch weight of 15,000 kilograms, a payload of 600 kilograms, and a
range of 1,700-1,800 kilometers if it is based on a system similar to the Chinese CSS-5 (DF-21) and CSS-N3 ((JL-1). These systems entered service in 1983 and 1987.

- A longer-range missile was said to have improved guidance components, a range of up to 1,240 miles and a warhead of up to 2,200 pounds.
- IOC dates were then estimated to be 1999-2001.

- These developments may help explain the background to Iran’s new Shahab system:
  - Some US experts believe that Iran tested booster engines in 1997 capable of driving a missile ranges of 1,500 kilometers. Virtually all US experts believe that Iran is rapidly approaching the point where it will be able to manufacture missiles with much longer ranges than the Scud B.
  - Eitan Ben Eliyahu -- the commander of the Israeli Air Force -- reported on April 14, 1997 that Iran had tested a missile capable of reaching Israel. The background briefings to his statement implied that Russia was assisting Iran in developing two missiles -- with ranges of 620 and 780 miles. Follow-on intelligence briefings that Israel provided in September, 1997, indicated that Russia was helping Iran develop four missiles. US intelligence reports indicate that China has also been helping Iran with some aspects of these missile efforts.
  - These missiles included the Shahab (“meteor”) missiles, with performance similar to those previously identified with Iranian missiles adapted from North Korean designs.
  - The Israeli reports indicated that the Shahab 3 was a liquid-fueled missile with a range of 810 miles (1,200-1,500 kilometers) and a payload of 1,550 pounds (700 kilometers).
  - Israel claimed the Shahab might be ready for deployment as early as 1999.
    - Iran tested the Shahab 3 on July, 21 1998, claiming that it was a defensive action to deal with potential threats from Israel.
      - The missile flew for a distance of up to 620 miles, before it exploded about 100 seconds after launch. US intelligence sources could not confirm whether the explosion was deliberate, but indicated that the final system might have a range of 800-940 miles (a maximum of 1,240 kilometers), depending on its payload. The test confirmed the fact the missile was a liquid fueled system.
      - Gen. Mohammad Bagher Qalibaf, head of the Islamic Revolutionary Guards Corps' air wing publicly reported on August 2, 1998 that the Shahab-3 is 53-foot-long ballistic missile that can travel at 4,300 mph and carry a one-ton warhead at an altitude of nearly 82,000 feet. He claimed that the weapon was guided by an Iranian-made system that gives it great accuracy: “The final test of every weapon is in a real war situation but, given its warhead and size, the Shahab-3 is a very accurate weapon.”
      - Other Iranian sources reported that the missile had a range of 800 miles. President Mohammad Khatami on August 1, 1998 stated that Iran was determined to continue to strengthen its armed forces, regardless of international concerns: “Iran will not seek permission from anyone for strengthening its defense capability.”
      - Martin Indyck, the US Assistant Secretary for Near East Affairs testified on July 28, that the US estimated that the system needed further refinement but might be deployed in its initial operational form between September, 1998 and March, 1999.
      - Iran publicly displayed the Shahab 3 on its launcher during a parade on September 25, 1998. The missile carrier bore signs saying, “The US can do nothing” and “Israel would be wiped from the map.”
      - There are some reports of a Shahab-3B missile with extended range and a larger booster.
      - The resulting system seems to be close to both the No-Dong and Pakistani Ghauri or Haff-5 missile, first tested in April 1998, raising questions about Iranian-North Korean-Pakistani cooperation.
      - North Korean parades exhibiting the Tapeo Dong in September 1999 exhibited a missile with rocket motor and nozzle characteristics similar to those of the Sahab 3.
• The Shahab 3 was tested in a launch from a transporter-erector-launcher (TEL) from a new air base of the Islamic Revolutionary Guards at Mashad on February 20, 2000, and successfully demonstrated the integration of the engine and missile subsystems. It tested the system again in July 2000, with a nominal range of 810 miles.\(^\text{11}\)

• Iran tested a solid state missile it called the Shahab D on September 20, 2000. The Iranian Deputy Defense Minister, Vice admiral Ali Shamkani, claimed that it was part of a peaceful program for launching satellites. \(^\text{12}\)

• Iranian sources indicate that the missile has an inertial navigation system with a CEP of 3 kilometers, making it so inaccurate that it can only be lethal against area targets using a weapon of mass destruction.

• Jane's Defense Weekly claimed on March 22, 2000 that US and Israeli intelligence officials felt the Shahab 3 was now ready for deployment.

• Iran announced on July 15, 2000 that it had successfully test-fired an upgraded version of its medium-range Shahab missile. An Iranian defense ministry source was quoted by state media as saying that the missile was test-fired to ensure it conforms to the latest technological standards. It was first tested in 1998. "This missile is part of our program for the defense industry and it would in no way threaten other countries." Iran announced that the Shahab-3 is a ballistic missile, with a range of 800 miles, and could travel at a speed of 4,320 mph with a 1-ton warhead.

• Iran's Defense Minister Admiral Ali Shamkhani has said a larger missile, Shahab 4, was in production as a vehicle for launching satellites into space.\(^\text{13}\)

• US experts indicated that they estimated the missile had a range of 1,300 km (800 miles), making it capable of hitting Israel, and that the Shahab-3 was modeled mainly on North Korea's Nodong-1, but has been improved with Russian technology. The US intelligence community is divided whether Iran will sustain its current programs, and actually deploy a system capable of striking the US. US experts indicated that they estimated the missile had a range of 1,300 km (800 miles), making it capable of hitting Israel, and that the Shahab-3 was modeled mainly on North Korea's Nodong-1, but has been improved with Russian technology.\(^\text{14}\)

• Secretary of Defense William Cohen stated that, \(^\text{15}\) "This does not come as a surprise…I have pointed to Iran and the testing of the Shahab-3 and what I assume will be the testing of the 4 in the future and beyond that, as one of the reasons why it is important for the United States to undertake to research, develop and potentially deploy an NMD (national missile defense) system that would provide protection against countries such as Iran posing a threat to the United States…This represents a continuation of their testing program, whether it was scheduled to coincide with the discussions in Washington is a matter only the Iranians can determine, we don't have any information pertaining to that. We accept it for what it is, we know that they will continue to test it, they will continue to develop a longer-range missile capability and that is one of the reasons why we believe it is important that the United States continue its research and testing and the development program for the NMD, precisely to deal with countries such as North Korea, Iran, Iraq and others. Anytime you have success in a particular missile system, that gives you confidence to move forward with more tests, with greater capability…So I think there is obviously a potential to accelerate development with each successful test…we have discussed this in the past, we believe that North Korea, Iran, potentially Iraq in the future and others will develop long-range missile capability. This is what we anticipate, this confirms our anticipation, and so this is a factor that will have to be taken into account in terms of what the time frame will be when Iran will have the capability of striking U.S. territory or that of European nations….Only the president can decide whether we should go forward at this point," Cohen said. "But I think this is an issue that is not going to go away with the elections, and if there is any delay in the program, that another president will have to face it at some point because the threat will continue to expand."

• Israeli expressed its own concerns. Amos Yaron, director-general of the Defence Ministry, told Israel Radio that, "We are looking at this matter for the moment with some concern because in any event they have the
ability. We don’t believe they have any intention whatsoever to attack the state of Israel for the moment… It must be remembered that Iran developed these capabilities as a result of the lessons they had from the wars of the past, which is to say from its big war against Iraq. Iran didn’t develop this missile against the state of Israel… Now the Iranians have this ability. Between the ability and the intention, there is a great distance.”

A senior Israeli military source did predict, however, that by 2005, Iran would, with Russian help, achieve a military nuclear capability by 2005 with Russian help. Israel’s army chief, Lieutenant-General Shaul Mofaz, told Israel Radio that the combined development of the missile and a non-conventional capacity posed a threat not only to Israel, but also to any country within range of the missile.16

- In spite of these developments, a number of US intelligence officials feel the NIC report was politicized by pressure from the policy level to support the NMD program, and to not disagree with the results of the Rumsfeld Commission. They feel that Iran still faces problems in its program to build the Shahab-3, which some feel is a missile with a range of only 780 miles. At least one official has been quoted on background as stating that, “There is an Iranian threat to U.S. forces in the region, not to the continental United States.”

- US officials agree that Iran is considering developing a rocket that can put satellites in orbit, but note that the development of such a booster would give Iran significantly enhanced capabilities to develop an intercontinental ballistic missile.17 U.S. Defence Department spokesman Ken Bacon stated that, “From everything we can tell, it was a successful firing. It is another sign they are determined to build longer-range weapons of mass destruction.”

- In short, it is impossible to dismiss the possibility that Iran might continue to develop nuclear weapons and long-range missiles in spite of its agreements not to do so. At the same time, there is no way to predict that Iran will definitely pose such a threat, or the size, timing, and effectiveness, of any forces it may deploy. The justification for an NMD system can be built around the possibility of an Iranian threat but – as is the case with North Korea – there is no way that the justification for an NMD system can be based on the certainty of an Iranian missile threat or that the US can now tailor the architecture of its NMD system to a clear concept of what that threat will be. There equally is no way that the need for an NMD system can be dismissed because of the lack of a valid potential threat.

- It is still unclear when Iran will be able to bring such programs to the final development stage, carry out a full range of suitable test firings, develop highly lethal warheads, and deploy actual units. Much may still depend on the level of foreign assistance.

- In September 1999, the Revolutionary Guard exhibited another missile called the Zelzal, which it stated was “now in mass production.” The missile was said to have taken four and one-half years to develop and to be derived from the Zelzal 2, which the IRGC had exhibited earlier. Some estimates indicate that it can carry a warhead of 500 kilograms for up to 900 kilometers. However, the missile exhibited in Tehran was a rocket on a truck-mounted launch rail that seemed more likely to have a range of 150-200 kilometers.

- Iranian Defense Minister Shamkhani has confirmed the development of a “more capable” missile called the Shahab 4. Although he later called it a space booster. He has also mentioned a Shahab 5.

- Israeli and US intelligence sources have reported that that Iran is developing the Shahab 4, with a range of 2,000 kilometers (1,250 miles), a payload of around 2,000 pounds, and a CEP of around 2,400 meters. Some estimates indicate that this system could be operational in 2-5 years.

- US Assistant Secretary for Near East Affairs testified on July 28, 1998, that the US estimated that the system still needed added foreign assistance to improve its motors and guidance system.

- Some reports indicate that the Shahab 4 is based on the Soviet SS-4 missile. Others that there is a longer range Shahab 5, based on the SS-4 or Tapeo Dong missile. Reports saying the Shahab is based on the SS-4 say it has a range of up to 4,000 kilometers and a payload in excess of one ton.)

- Iran may have two other missile programs include longer-range systems, variously reported as having maximum ranges of 3,650, 4,500-5,000, 6,250, or 10,000 kilometers.
There have been reports that Iran might be using Russian technology to develop long-range missiles with ranges from 2,000 to 6,250 kilometers.

It seems clear that Iran has obtained some of the technology and design details of the Russian SS-4. The SS-4 (also known as the R-12 or “Sandal”) is an aging Russian liquid fuel designed that first went into service in 1959, and which was supposedly destroyed as part of the IRBM Treaty. It is a very large missile, with technology dating back to the early 1950s, although it was evidently updated at least twice during the period between 1959 and 1980. It has a CEP of 2-4 kilometers and a maximum range 2,000 kilometers, which means it can only be lethal with a nuclear warhead or a biological weapon with near-nuclear lethality.

At the same time, the SS-4’s overall technology is relatively simple and it has a throwweight of nearly 1,400 kilograms (3,000 pounds). It is one of the few missile designs that a nation with a limited technology base could hope to manufacture or adapt, and its throwweight and range would allow Iran to use a relatively unsophisticated nuclear device or biological warhead. As a result, an updated version of the SS-4 might be a suitable design for a developing country.

Iran is reported to have carried out the test of a sea-launched ballistic missile in 1998.

Russia has been a key supplier of missile technology.

Russia agreed in 1994 that it would adhere to the terms of the Missile Technology Control Regime and would place suitable limits on the sale or transfer of rocket engines and technology. Nevertheless, the CIA has identified Russia as a leading source of Iranian missile technology, and the State Department has indicated that President Clinton expressed US concerns over this cooperation to President Yeltsin. This transfer is one reason the President appointed former Ambassador Frank Wisner, and then Robert Gallucci, as his special representatives to try to persuade Russia to put a firm halt to aid support of the Iran.

These programs are reported to have continuing support from North Korea, and from Russian and Chinese firms and technicians. One such Chinese firm is Great Wall Industries. The Russian firms include the Russian Central Aerohydrodynamic Institute, which has provided Iran’s Shahid Hemmat Industrial Group (SHIG) with wind tunnels for missile design, equipment for manufacturing missile models, and the software for testing launch and reentry performance. They may also include Rosvoorouzhenie, a major Russian arms-export agency; NPO Trud, a rocket motor manufacturer; a leading research center called the Bauman Institute, and Polyus (Northstar), a major laser test and manufacturing equipment firm.

Some sources have indicated that Russian military industries have signed contracts with Iran to help produce liquid fueled missiles and provide specialized wind tunnels, manufacture model missiles, and develop specialized computer software. For example, these reports indicate that the Russian Central Aerohydrodynamic Institute is cooperating with Iran’s Defense Industries Organization (DIO) and the DIO’s Shahid Hemmat Industrial Group (SHIG). The Russian State Corporation for Export and Import or Armament and Military Equipment (Rosvoorouzhenie) and Infor are also reported to be involved in deals with the SHIG. These deals are also said to include specialized laser equipment, mirrors, tungsten-coast graphite material, and maraging steel for missile development and production. They could play a major role in help Iran develop long range versions of the Scud B and C, and more accurate variations of a missile similar to the No Dong.

The Israeli press reported in August, 1997 that Israeli had evidence that Iran was receiving Russian support. In September, 1997, Israel urged the US to step up its pressure on Iran, and leaked reported indicating that private and state-owned Russian firms had provided gyroscopes, electronic components, wind tunnels, guidance and propulsion systems, and the components needed to build such systems to Iran.

President Yeltsin and the Russian Foreign Ministry initially categorically denied that such charges were true. Following a meeting with Vice President Gore, President Yeltsin stated on September 26, 1997 that, “We are being accused of supplying Iran with nuclear or ballistic missile technologies. There is nothing further from the truth. I again and again categorically deny such rumors.”

Russia agreed, however, that Ambassador Wisner and Yuri Koptyev, the head of the Russian space program, should jointly examine the US intelligence and draft a report on Russian transfers to Iran. This report reached a very different conclusion from President Yeltsin and concluded that Russia had provided such aid to Iran. Further, on
October 1, 1997 -- roughly a week after Yeltsin issued his denial -- the Russian security service issued a statement that it had “thwarted” an Iranian attempt to have parts for liquid fuel rocket motors manufactured in Russia, disguised as gas compressors and pumps.

- Russian firms said to be helping Iran included the Russian Central Aerohydrodynamic Institute which developed a special wind tunnel; Rosvoorouzhenie, a major Russian arms-export agency; Kutznetsov (formerly NPO Trud) a rocket motor manufacturer in Samara; a leading research center called the Bauman National Technical University in Moscow, involved in developing rocket propulsion systems; the Tsagi Research Institute for rocket propulsion development; and the Polyus (Northstar) Research Institute in Moscow, a major laser test and manufacturing equipment firm. Iranians were also found to be studying rocket engineering at the Baltic State University in St. Petersburg and the Bauman State University.

- Russia was also found to have sold Iran high strength steel and special foil for its long-range missile program. The Russian Scientific and Production Center Inor concluded an agreement as late as September, 1997 to sell Iran a factory to produce four special metal alloys used in long-range missiles. Inor’s director, L. P Chromova worked out a deal with A. Asgharzadeh, the director of an Iranian factory, to sell 620 kilograms of special alloy called 21HKMT, and provide Iran with the capability to thermally treat the alloy for missile bodies. Iran had previously bought 240 kilograms of the alloy. Inor was also selling alloy foils called 49K2F, CUBE2, and 50N in sheets 0.2-0.4 millimeters thick for the outer body of missiles. The alloy 21HKMT was particularly interesting because North Korea also uses it in missile designs. Inor had previously brokered deals with the Shahid Hemat Industrial Group in Iran to supply maraging steel for missile cases, composite graphite-tungsten material, laser equipment, and special mirrors used in missile tests.

- The result was a new and often tense set of conversations between the US and Russia in January, 1998. The US again sent Ambassador Frank Wisner to Moscow, Vice President Gore called Prime Minster Viktor Chernomyrdin, and Secretary of State Madeline Albright made an indirect threat that the Congress might apply sanctions. Sergi Yastrzhembsky, a Kremlin spokesman, initially responded by denying that any transfer of technology had taken place.

- This Russian denial was too categorical to have much credibility. Russia had previously announced the arrest of an Iranian diplomat on November 14, 1997, that it caught attempting to buy missile technology. The Iranian was seeking to buy blueprints and recruit Russian scientists to go to Iran. Yuri Koptev, the head of the Russian Space Agency, explained this, however, by stating that that, “There have been several cases where some Russian organizations, desperately struggling to make ends meet and lacking responsibility, have embarked on some ambiguous projects...they were stopped long before they got to the point where any technology got out.”

- The end result of these talks was an agreement by Gore and Chernomyrdin to strengthen controls over transfer technology, but it was scarcely clear that it put an end to the problem. As Koptev has said, “There have been several cases where some Russian organizations, desperately struggling to make ends meet and lacking responsibility, have embarked on some ambiguous projects.” Conditions in Russia are getting worse, not better, and the desperation that drives sales has scarcely diminished.

- Prime Minister Chernomyrdin again promised to strengthen his efforts to restrict technology transfer to Iran in a meeting with Gore on March 12, 1998. The US informed Russia of 13 cases of possible Russian aid to Iran at the meeting and offered to increase the number of Russian commercial satellite launches it would license for US firms as an incentive.

- New arrests of smugglers took place on April 9, 1998. The smugglers had attempted to ship 22 tons of specialized steel to Iran via Azerbaijan, using several Russia shell corporations as a cover.

- On April 16, 1998, the State Department declared 20 Russian agencies and research facilities were ineligible to receive US aid because of their role in transferring missile technology to Iran.

- The CIA reported in June 1997 that Iran obtained major new transfers of new long-range missile technology from Russian and Chinese firms during 1996. Since that time, there have been many additional reports of technology transfer from Russia.

- The Rumsfeld Commission heard evidence that Iran had obtained engines or designs for the RD-214 rocket engine used in the SS-4 and SL-7 space launch vehicle.

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Reports on Chinese transfers of ballistic missile technology provide less detail:

- There have been past reports that Iran placed orders for PRC-made M-9 (CSS-6/DF-15) missile (280-620 kilometers range, launch weight of 6,000 kilograms).
- It is more likely, however, that PRC firms are giving assistance in developing indigenous missile R&D and production facilities for the production of an Iranian solid fueled missile.
- The US offered to provide China with added missile technology if it would agree to fully implement an end of technology transfer to Iran and Pakistan during meetings in Beijing on March 25-26, 1998.

Iran has, however, acquired much of the technology necessary build long-range cruise missile systems from China:

- Such missiles would cost only 10% to 25% as much as ballistic missiles of similar range, and both the HY-2 Seersucker and CS-802 could be modified relatively quickly for land attacks against area targets.
- Iran reported in December, 1995 that it had already fired a domestically built anti-ship missile called the Saeqe-4 (Thunderbolt) during exercises in the Strait of Hormuz and Gulf of Oman. Other reports indicate that China is helping Iran build copies of the Chinese CS-801/CS-802 and the Chinese FL-2 or F-7 anti-ship cruise missiles. These missiles have relatively limited range. The range of the CS-801 is 8-40 kilometers, the range of the CS-802 is 15-120 kilometers, the maximum range of the F-7 is 30 kilometers, and the maximum range of the FL-10 is 50 kilometers. Even a range of 120 kilometers would barely cover targets in the Southern Gulf from launch points on Iran’s Gulf coast. These missiles also have relatively small high explosive warheads. As a result, Iran may well be seeking anti-ship capabilities, rather than platforms for delivering weapons of mass destruction.
- A platform like the CS-802 might, however, provide enough design data to develop a scaled-up, longer-range cruise missile for other purposes, and the Gulf is a relatively small area where most urban areas and critical facilities are near the coast. Aircraft or ships could launch cruise missiles with chemical or biological warheads from outside the normal defense perimeter of the Southern Gulf states, and it is at least possible that Iran might modify anti-ship missiles with chemical weapons to attack tankers -- ships which are too large for most regular anti-ship missiles to be highly lethal.
- Building an entire cruise missile would be more difficult. The technology for fusing CBW and cluster warheads would be within Iran's grasp. Navigation systems and jet engines, however, would still be a major potential problem. Current inertial navigation systems (INS) would introduce errors of at least several kilometers at ranges of 1,000 kilometers and would carry a severe risk of total guidance failure -- probably exceeding two-thirds of the missiles fired. A differential global positioning system (GPS) integrated with the inertial navigation system (INS) and a radar altimeter, however, might produce an accuracy of 15 meters. Some existing remotely piloted vehicles (RPVs), such as the South African Skua claim such performance. Commercial technology is becoming available for differential global positioning system (GPS) guidance with accuracies of 2 to 5 meters.
- There are commercially available reciprocating and gas turbine engines that Iran could adapt for use in a cruise missile, although finding a reliable and efficient turbofan engine for a specific design application might be difficult. An extremely efficient engine would have to be matched to a specific airframe. It is doubtful that Iran could design and build such an engine, but there are over 20 other countries with the necessary design and manufacturing skills.
- While airframe-engine-warhead integration and testing would present a challenge and might be beyond Iran's manufacturing skills, it is inherently easier to integrate and test a cruise missile than a long-range ballistic missile. Further, such developments would be far less detectable than developing a ballistic system if the program used coded or low altitude directional telemetry.
- Iran could bypass much of the problems inherent in developing its own cruise missile by modifying the HY-2 Seersucker for use as a land attack weapon and extending its range beyond 80 kilometers, or by modifying and improving the CS-801 (Ying Jai-1) anti-ship missile. There are reports that the Revolutionary Guards are working on such developments at a facility near Bandar Abbas.

The CIA reported in January 1999 that entities in Russia and China continue to supply missile-related goods and technology to Iran. Tehran is using these goods and technologies to achieve its goal of becoming self-sufficient in the
production of MRBMs. The July flight test of the Shahab-3 MRBM demonstrates the success Iran has achieved in realizing that goal. Iran already is producing Scud SRBMs with North Korean help and has begun production of the Shahab-3. In addition, Iran’s Defense Minister has publicly acknowledged the development of the Shahab-4 ballistic missile, with a “longer range and heavier payload than the 1,300-km Shahab-3.”

- Iran’s earlier success in gaining technology and materials from Russian companies accelerated Iranian development of the Shahab-3 MRBM, which was first flight tested in July 1998.
- The CIA report on missile proliferation in September 1999 estimated that Iran is the next hostile country most capable of testing an ICBM capable of delivering a weapon to the United States during the next 15 years.
- Iran could test an ICBM that could deliver a several-hundred kilogram payload to many parts of the United States in the latter half of the next decade, using Russian technology and assistance.
- Iran could pursue a Taepo Dong-type ICBM. Most analysts believe it could test a three-stage ICBM patterned after the Taepo Dong-1 SLV or a three-stage Taepo Dong-2-type ICBM, possibly with North Korean assistance, in the next few years.
- Iran is likely to test an SLV by 2010 that—once developed—could be converted into an ICBM capable of delivering a several-hundred kilogram payload to the United States.
- Analysts differ on the likely timing of Iran’s first flight test of an ICBM that could threaten the United States. Assessments include:
  - likely before 2010 and very likely before 2015 (noting that an SLV with ICBM capabilities will probably be tested within the next few years);
  - no more than an even chance by 2010 and a better than even chance by 2015;
  - and less than an even chance by 2015.
- The DCI Nonproliferation Center (NPC) reported in February 2000 that entities in Russia and China continued to supply a considerable amount and a wide variety of ballistic missile-related goods and technology to Iran. Tehran is using these goods and technologies to support current production programs and to achieve its goal of becoming self-sufficient in the production of ballistic missiles. Iran already is producing Scud short-range ballistic missiles (SRBMs) and has built and publicly displayed prototypes for the Shahab-3 medium-range ballistic missile (MRBM), which had its initial flight test in July 1998 and probably has achieved “emergency operational capability”—i.e., Tehran could deploy a limited number of the Shahab-3 prototype missiles in an operational mode during a perceived crisis situation. In addition, Iran’s Defense Minister last year publicly acknowledged the development of the Shahab-4, originally calling it a more capable ballistic missile than the Shahab-3, but later categorizing it as solely a space launch vehicle with no military applications. Iran’s Defense Minister also has publicly mentioned plans for a “Shahab 5.” It also stated that,
- Firms in China provided missile-related items, raw materials, and/or assistance to several countries of proliferation concern such as Iran.
- Russian entities continued to supply a variety of ballistic missile-related goods and technical know-how to Iran and were expanding missile-related assistance to Syria and India. For example, Iran’s earlier success in gaining technology and materials from Russian companies accelerated Iranian development of the Shahab-3 MRBM, which was first flight-tested in July 1998. Russian entities during the first six months of 1999 have provided substantial missile-related technology, training, and expertise to Iran that almost certainly will continue to accelerate Iranian efforts to build new indigenous ballistic missile systems . . . the government’s commitment, willingness, and ability to curb proliferation-related transfers remain uncertain. Moreover, economic conditions in Russia continued to deteriorate, putting more pressure on Russian entities to circumvent export controls. Despite some examples of restraint, Russian businesses continue to be major suppliers of WMD equipment, materials, and technology to Iran. Monitoring Russian proliferation behavior, therefore, will remain a very high priority.
• Iranian Foreign Ministry spokesman Hamid Reza stated on February 3, 2000 that Iran had no intention of seeking missiles with the range to reach the US, and that the CIA was only making such charges to distract the world for Israel’s nuclear weapons program.

• A CIA report in August 2000 summarized the state of missile proliferation in Iran as follows:

• For the second half of 1999, entities in Russia, North Korea, and China continued to supply the largest amount of ballistic missile-related goods, technology, and expertise to Iran. Tehran is using this assistance to support current production programs and to achieve its goal of becoming self-sufficient in the production of ballistic missiles. Iran already is producing Scud short-range ballistic missiles (SRBMs) and has built and publicly displayed prototypes for the Shahab-3 medium-range ballistic missile (MRBM), which had its initial flight test in July 1998. In addition, Iran’s Defense Minister last year publicly acknowledged the development of the Shahab-4, originally calling it a more capable ballistic missile than the Shahab-3, but later categorizing it as solely a space launch vehicle with no military applications. Iran’s Defense Minister also has publicly mentioned plans for a “Shahab 5.” Such statements, made against the backdrop of sustained cooperation with Russian, North Korean, and Chinese entities, strongly suggest that Tehran intends to develop a longer-range ballistic missile capability in the near future.

• Beginning in January 1998, the Russian Government took a number of steps to increase its oversight of entities involved in dealings with Iran and other states of proliferation concern. In 1999, it pushed a new export control law through the Duma. Russian firms, however, faced economic pressures to circumvent these controls and did so in some cases. The Russian Government, moreover, failed in some cases regarding Iran to enforce its export controls. Following repeated warnings, the US Government in January 1998 and January 1999 imposed administrative measures against Russian entities that had engaged in nuclear- and missile-related cooperation with Iran. The measures imposed on these and other Russian entities (which were penalized in 1998) remain in effect, although sanctions against two entities—Polyus and Inor—are being lifted.

• On the ACW side, Iran (which has acknowledged a need for Western military equipment and spare parts) continues to acquire Western equipment, such as attack helicopters, but also is developing indigenous production capabilities with assistance from countries such as Russia, China, and North Korea. Indigenous efforts involve such systems as tanks, TOW missiles, fighter aircraft, Chinese-designed SAMs and anti-ship missiles, and attack helicopters.

• …Russian entities (have) continued to supply a variety of ballistic missile-related goods and technical know-how to countries such as Iran, India, and Libya. Iran’s earlier success in gaining technology and materials from Russian entities accelerated Iranian development of the Shahab-3 MRBM, which was first flight-tested in July 1998. Russian entities during the second six months of 1999 have provided substantial missile-related technology, training, and expertise to Iran that almost certainly will continue to accelerate Iranian efforts to develop new ballistic missile systems.

• Throughout the second half of 1999, North Korea continued to export significant ballistic missile-related equipment and missile components, materials, and technical expertise to countries in the Middle East, South Asia, and North Africa. P’yongyang attaches a high priority to the development and sale of ballistic missiles, equipment, and related technology. Exports of ballistic missiles and related technology are one of the North’s major sources of hard currency, which fuel continued missile development and production.

• …Chinese missile-related technical assistance to Pakistan increased during this reporting period. In addition, firms in China provided missile-related items, raw materials, and/or assistance to several countries of proliferation concern—such as Iran, North Korea, and Libya. …China’s 1997 pledge not to engage in any new nuclear cooperation with Iran has apparently held, but work associated with two remaining nuclear projects—a small research reactor and a zirconium production facility—continues. The Intelligence Community will continue to monitor carefully Chinese nuclear cooperation with Iran.

Chemical Weapons

• Iran purchased large amounts of chemical defense gear from the mid-1980s onwards. Iran also obtained stocks of non-lethal CS gas, although it quickly found such agents had very limited military impact since they could only be used effectively in closed areas or very small open areas.

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• Acquiring poisonous chemical agents was more difficult. Iran did not have any internal capacity to manufacture poisonous chemical agents when Iraq first launched its attacks with such weapons. While Iran seems to have made limited use of chemical mortar and artillery rounds as early as 1985 -- and possibly as early as 1984 -- these rounds were almost certainly captured from Iraq.

• Iran had to covertly import the necessary equipment and supplies, and it took several years to get substantial amounts of production equipment, and the necessary feedstocks. Iran sought aid from European firms like Lurgi to produce large “pesticide” plants, and began to try to obtain the needed feedstock from a wide range of sources, relying heavily on its Embassy in Bonn to manage the necessary deals. While Lurgi did not provide the pesticide plant Iran sought, Iran did obtain substantial support from other European firms and feedstocks from many other Western sources.

• By 1986-1987, Iran developed the capability to produce enough lethal agents to load its own weapons. The Director of the CIA, and informed observers in the Gulf, made it clear that Iran could produce blood agents like hydrogen cyanide, phosgene gas, and/or chlorine gas. Iran was also able to weaponize limited quantities of blister (sulfur mustard) and blood (cyanide) agents beginning in 1987, and had some capability to weaponize phosgene gas, and/or chlorine gas. These chemical agents were produced in small batches, and evidently under laboratory scale conditions, which enabled Iran to load small numbers of weapons before any of its new major production plants went into full operation.

• These gas agents were loaded into bombs and artillery shells, and were used sporadically against Iraq in 1987 and 1988.

• Reports regarding Iran’s production and research facilities are highly uncertain:
  • Iran seems to have completed completion of a major poison gas plant at Qazvin, about 150 kilometers west of Tehran. This plant is reported to have been completed between November, 1987 and January, 1988. While supposedly a pesticide plant, the facility’s true purpose seems to have been poison gas production using organophosphorous compounds.
  • It is impossible to trace all the sources of the major components and technology Iran used in its chemical weapons program during this period. Mujahideen sources claim Iran also set up a chemical bomb and warhead plant operated by the Zakaria Al-Razi chemical company near Mahshar in southern Iran, but it is unclear whether these reports are true.
  • Reports that Iran had chemical weapons plants at Damghan and Parchin that began operation as early as March, 1988, and may have begun to test fire Scuds with chemical warheads as early as 1988-1989, are equally uncertain.
  • Iran established at least one large research and development center under the control of the Engineering Research Centre of the Construction Crusade (Jahad e-Sazandegi), had established a significant chemical weapons production capability by mid-1989,
  • Debates took place in the Iranian parliament or Majlis in late 1988 over the safety of Pasdaran gas plants located near Iranian towns, and that Rafsanjani described chemical weapons as follows: "Chemical and biological weapons are poor man's atomic bombs and can easily be produced. We should at least consider them for our defense. Although the use of such weapons is inhuman, the war taught us that international laws are only scraps of paper."
  • Post Iran-Iraq War estimates of Iran chemical weapons production are extremely uncertain:
    • US experts believe Iran was beginning to produce significant mustard gas and nerve gas by the time of the August, 1988 cease-fire in the Iran-Iraq War, although its use of chemical weapons remained limited and had little impact on the fighting
    • Iran’s efforts to equip plants to produce V-agent nerve gases seem to have been delayed by US, British, and German efforts to limit technology transfers to Iran, but Iran may have acquired the capability to produce persistent nerve gas during the mid 1990s.
    • Production of nerve gas weapons started no later than 1994.
    • Began to stockpile of cyanide (cyanogen chloride), phosgene, and mustard gas weapons after 1985. Recent CIA testimony indicates that production capacity may approach 1,000 tons annually.
• Weapons include bombs and artillery. Shells include 155 mm artillery and mortar rounds. Iran also has chemical bombs and mines. It may have developmental chemical warheads for its Scuds, and may have a chemical package for its 22006 RPV (doubtful).

• There are reports that Iran has deployed chemical weapons on some of its ships.

• Iran has increased chemical defensive and offensive warfare training since 1993.

• Iran is seeking to buy more advanced chemical defense equipment, and has sought to buy specialized equipment on world market to develop indigenous capability to produce advanced feedstocks for nerve weapons.
  
  • CIA sources indicated in late 1996, that China might have supplied Iran with up to 400 tons of chemicals for the production of nerve gas.
  
  • One report indicated in 1996, that Iran obtained 400 metric tons of chemical for use in nerve gas weapons from China -- including carbon sulfide.
  
  • Another report indicated that China supplied Iran with roughly two tons of calcium-hypochlorate in 1996, and loaded another 40,000 barrels in January or February of 1997. Calcium-hypochlorate is used for decontamination in chemical warfare.
  
  • Iran placed several significant orders from China that were not delivered. Razak Industries in Tehran, and Chemical and Pharmaceutical Industries in Tabriz ordered 49 metric tons of alkyl dimethylamine, a chemical used in making detergents, and 17 tons of sodium sulfide, a chemical used in making mustard gas. The orders were never delivered, but they were brokered by Iran's International Movable Industries Corporation (Imaco) and China's North Chemical Industries Co. (Nocinco). Both brokers have been linked to other transactions affecting Iran's chemical weapons program since early 1995, and Nocinco has supplied Iran with several hundred tons of carbon disulfide, a chemical uses in nerve gas.
  
  • Another Chinese firm, only publicly identified as Q. Chen, seems to have supplied glass vessels for chemical weapons.
  
  • The US imposed sanctions on seven Chinese firms in May, 1997, for selling precursors for nerve gas and equipment for making nerve gas -- although the US made it clear that it had, “no evidence that the Chinese government was involved.” The Chinese firms were the Nanjing Chemical Industries Group and Jiangsu Yongli Chemical Engineering and Import/Export Corporation. Cheong Yee Ltd., a Hong Kong firm, was also involved. The precursors included tioxyl chloride, dimethylamine, and ethylene chlorohydril. The equipment included special glass lined vessels, and Nanjing Chemical and Industrial Group completed construction of a production plant to manufacture such vessels in Iran in June, 1997.
  
  • Iran sought to obtain impregnated Alumina, which is used to make phosphorous-oxychloride -- a major component of VX and GB -- from the US.
  
  • It has obtained some equipment from Israelis. Nahum Manbar, an Israeli national living in France, was convicted in an Israeli court in May 1997 for providing Iran with $16 million worth of production equipment for mustard and nerve gas during the period from 1990 to 1995.
  
  • CIA reported in June 1997 that Iran had obtained new chemical weapons equipment technology from China and India in 1996.
  
  • India is assisting in the construction of a major new plant at Qazvim, near Tehran, to manufacture phosphorous pentasulfide, a major precursor for nerve gas. The plant is fronted by Meli Agrochemicals, and the program was negotiated by Dr. Mejid Tehrani Abbaspour, a chief security advisor to Rafsanjani.
  
  • A recent report by German intelligence indicates that Iran has made major efforts to acquire the equipment necessary to produce Sarin and Tabun, using the same cover of purchasing equipment for pesticide plants that Iraq used for its Sa’ad 16 plant in the 1980s. German sources note that three Indian companies -- Tata Consulting Engineering, Transpek, and Rallis India -- have approached German pharmaceutical and engineering concerns for such equipment and technology under conditions where German intelligence was able to trace the end user to Iran.
• Iran ratified the Chemical Weapons Convention in June 1997.
  • It submitted a statement in Farsi to the CWC secretariat in 1998, but this consisted only of questions in Farsi as to the nature of the required compliance.
  • It has not provided the CWC with any data on its chemical weapons program.
• The CIA estimated in January 1999 that Iran obtained material related to chemical warfare (CW) from various sources during the first half of 1998. It already has manufactured and stockpiled chemical weapons, including blister, blood, and choking agents and the bombs and artillery shells for delivering them. However, Tehran is seeking foreign equipment and expertise to create a more advanced and self-sufficient CW infrastructure.
• The CIA stated that Chinese entities sought to supply Iran with CW-related chemicals during 1997-1998 period. The US sanctions imposed in May 1997 on seven Chinese entities for knowingly and materially contributing to Iran’s CW program remain in effect.
• The DCI Nonproliferation Center (NPC) reported in February 2000 that Iran, a Chemical Weapons Convention (CWC) party, already has manufactured and stockpiled chemical weapons, including blister, blood, and choking agents and the bombs and artillery shells for delivering them. During the first half of 1999, Tehran continued to seek production technology, expertise, and chemicals that could be used as precursor agents in its chemical warfare (CW) program from entities in Russia and China. It also acquired or attempted to acquire indirectly through intermediaries in other countries equipment and material that could be used to create a more advanced and self-sufficient CW infrastructure. It also stated that,
  • Russian entities remain a significant source of biotechnology and chemicals for Iran. Russia’s world-leading expertise in biological and chemical weapons would make it an attractive target for Iranians seeking technical information and training on BW and CW agent production processes.
  • Chinese firms had supplied CW-related production equipment and technology to Iran. The US sanctions imposed in May 1997 on seven Chinese entities for knowingly and materially contributing to Iran’s CW program remain in effect. In June 1998, China announced that it had expanded its chemical export controls to include 10 of the 20 Australia Group chemicals not listed on the CWC schedules.
  • A CIA report in August 2000 summarized the state of chemical weapons proliferation in Iran as follows,20
  • Iran remains one of the most active countries seeking to acquire WMD and ACW technology from abroad. In doing so, Tehran is attempting to develop an indigenous capability to produce various types of weapons—nuclear, chemical, and biological—and their delivery systems. During the reporting period, the evidence indicates increased reflections of Iranian efforts to acquire WMD- and ACW- related equipment, materials, and technology primarily on entities in Russia, China, North Korea and Western Europe.
  • Iran, a Chemical Weapons Convention (CWC) party, already has manufactured and stockpiled chemical weapons, including blister, blood, and choking agents and the bombs and artillery shells for delivering them. During the second half of 1999, Tehran continued to seek production technology, training, expertise, and chemicals that could be used as precursor agents in its chemical warfare (CW) program from entities in Russia and China. It also acquired or attempted to acquire indirectly through intermediaries in other countries equipment and material that could be used to create a more advanced and self-sufficient CW infrastructure.
  • Russian entities remain a significant source of biotechnology and chemicals for Iran. Russia’s world-leading expertise in biological and chemical weapons would make it an attractive target for Iranians seeking technical information and training on BW and CW agent production processes. Russia (along with its sister republics in the FSU) also remains an important source of conventional weapons and spare parts for Iran, which is seeking to upgrade and replace its existing conventional weapons inventories.
  • Throughout the second half of 1999, North Korea continued to export significant ballistic missile-related equipment and missile components, materials, and technical expertise to countries in the Middle East, South Asia, and North Africa. P’yongyang attaches a high priority to the development and sale of ballistic missiles, equipment, and related technology.
Exports of ballistic missiles and related technology are one of the North’s major sources of hard currency, which fuel continued missile development and production.

- Prior to the reporting period, Chinese firms had supplied CW-related production equipment and technology to Iran. The US sanctions imposed in May 1997 on seven Chinese entities for knowingly and materially contributing to Iran’s CW program remain in effect. Evidence during the current reporting period suggests Iran continues to seek such assistance from Chinese entities, but it is unclear to what extent these efforts have succeeded. In June 1998, China announced that it had expanded its chemical export controls to include 10 of the 20 Australia Group chemicals not listed on the CWC schedules.

**Biological Weapons**

- Extensive laboratory and research capability.
- Weapons effort documented as early as 1982. Reports surfaced that Iran had imported suitable type cultures from Europe and was working on the production of Mycotoxins -- a relatively simple family of biological agents that require only limited laboratory facilities for small scale production.
- US intelligence sources reported in August, 1989, that Iran was trying to buy two new strains of fungus from Canada and the Netherlands that can be used to produce Mycotoxins. German sources indicated that Iran had successfully purchased such cultures several years earlier.
- The Imam Reza Medical Center at Mashhad Medical Sciences University and the Iranian Research Organization for Science and Technology were identified as the end users for this purchasing effort, but it is likely that the true end user was an Iranian government agency specializing in biological warfare.
- Many experts believe that the Iranian biological weapons effort was placed under the control of the Islamic Revolutionary Guards Corps, which is known to have tried to purchase suitable production equipment for such weapons.
- Since the Iran-Iraq War, Iran has conducted research on more lethal active agents like Anthrax, hoof and mouth disease, and biotoxins. In addition, Iranian groups have repeatedly approached various European firms for the equipment and technology necessary to work with these diseases and toxins.
  - Unclassified sources of uncertain reliability have identified a facility at Damghan as working on both biological and chemical weapons research and production, and believe that Iran may be producing biological weapons at a pesticide facility near Tehran.
  - Some universities and research centers may be linked to biological weapons program.
  - Reports surfaced in the spring of 1993 that Iran had succeeded in obtaining advanced biological weapons technology in Switzerland and containment equipment and technology from Germany. According to these reports, this led to serious damage to computer facilities in a Swiss biological research facility by unidentified agents. Similar reports indicated that agents had destroyed German bio-containment equipment destined for Iran.
  - More credible reports by US experts indicate that Iran has begun to stockpile anthrax and Botulinum in a facility near Tabriz, can now mass manufacture such agents, and has them in an aerosol form. None of these reports, however, can be verified.
  - The CIA has reported that Iran has, “sought dual-use biotech equipment from Europe and Asia, ostensibly for civilian use.” It also reported in 1996 that Iran might be ready to deploy biological weapons. Beyond this point, little unclassified information exists regarding the details of Iran’s effort to “weaponize” and produce biological weapons.
  - Iran may have the production technology to make dry storable and aerosol weapons. This would allow it to develop suitable missile warheads and bombs and covert devices.
  - Iran may have begun active weapons production in 1996, but probably only at limited scale suitable for advanced testing and development.
  - CIA testimony indicates that Iran is believed to have weaponized both live agents and toxins for artillery and bombs and may be pursuing biological warheads for its missiles. The CIA reported in 1996 that, “We believe that Iran holds some
stocks of biological agents and weapons. Tehran probably has investigated both toxins and live organisms as biological warfare agents. Iran has the technical infrastructure to support a significant biological weapons program with little foreign assistance.

- CIA reported in June 1997 that Iran had obtained new dual use technology from China and India during 1996.
- Iran announced in June 1997 that it would not produce or employ chemical weapons including toxins.
- The CIA estimated in January 1999 that Iran continued to pursue purchasing dual-use biotechnical equipment from Russia and other countries, ostensibly for civilian uses. Its biological warfare (BW) program began during the Iran-Iraq war, and Iran may have some limited capability for BW deployment. Outside assistance is both important and difficult to prevent, given the dual-use nature of the materials and equipment being sought and the many legitimate end uses for these items.
- Russia remains a key source of biotechnology for Iran. Russia’s world-leading expertise in biological weapons makes it an attractive target for Iranians seeking technical information and training on BW agent production processes.
- The DCI Nonproliferation Center (NPC) reported in February 2000 that Tehran continued to seek considerable dual-use biotechnical equipment from entities in Russia and Western Europe, ostensibly for civilian uses. Iran began a biological warfare (BW) program during the Iran-Iraq war, and it may have some limited capability for BW deployment. Outside assistance is both important and difficult to prevent, given the dual-use nature of the materials, the equipment being sought, and the many legitimate end uses for these items.
- A CIA report in August 2000 summarized the state of biological weapons proliferation in Iran as follows,\textsuperscript{21}
- For the reporting period, Tehran expanded its efforts to seek considerable dual-use biotechnical materials, equipment, and expertise from abroad—primarily from entities in Russia and Western Europe—ostensibly for civilian uses. Iran began a biological warfare (BW) program during the Iran-Iraq war, and it may have some limited capability for BW deployment. Outside assistance is both important and difficult to prevent, given the dual-use nature of the materials, the equipment being sought, and the many legitimate end uses for these items.
- Russian entities remain a significant source of biotechnology and chemicals for Iran. Russia’s world-leading expertise in biological and chemical weapons would make it an attractive target for Iranians seeking technical information and training on BW and CW agent production processes. Russia (along with its sister republics in the FSU) also remains an important source of conventional weapons and spare parts for Iran, which is seeking to upgrade and replace its existing conventional weapons inventories.

**Nuclear Weapons**

- The Shah established the Atomic Energy Organization of Iran in 1974, and rapidly began to negotiate for nuclear power plants.
- In 1975, he purchased a 10% share in a Eurodif uranium enrichment plant being built at Tricastin in France that was part of a French, Belgian, Spanish, and Italian consortium. Under the agreement the Shah signed, Iran was to have full access to the enrichment technology Eurodif developed, and agreed to buy a quota of enriched uranium from the new plant.

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• He created an ambitious plan calling for a network of 23 power reactors throughout Iran that was to be operating by the mid-1990s, and sought to buy nuclear power plants from Germany and France.

• By the time the Shah fell in January, 1979, he had six reactors under contract, and was attempting to purchase a total of 12 nuclear power plants from Germany, France, and the US. Two 1,300 megawatt German nuclear power plants at Bushehr were already 60% and 75% completed, and site preparation work had begun on the first of two 935 megawatt French plants at Darkhouin that were to be supplied by Framatome.

• The Shah also started a nuclear weapons program in the early to mid-1970s, building upon his major reactor projects, investment in URENCO, and smuggling of nuclear enrichment and weapons related technology from US and Europe.

• 5 megawatt light-water research reactor operating in Tehran.

• 27 kilowatt neutron-source reactor operating in Isfahan.

• Started two massive 1300 megawatt reactor complexes.

• The Shah attempted to covertly import controlled technology from the US.

• US experts believe that Shah began a low-level nuclear weapons research program, centered at the Amirabad Nuclear Research Center. This research effort included studies of weapons designs and plutonium recovery from spent reactor fuel.

• It also involved a laser enrichment program which began in 1975, and led to a complex and highly illegal effort to obtain laser separation technology from the US. This latter effort, which does not seems to have had any success, continued from 1976 until the Shah's fall, and four lasers operating in the critical 16 micron band were shipped to Iran in October, 1978.

• At the same time, Iran worked on other ways to obtain plutonium, created a secret reprocessing research effort to use enriched uranium, and set up a small nuclear weapons design team.

• In 1976, Iran signed a secret contract to buy $700 million worth of yellow cake from South Africa, and appears to have reached an agreement to buy up to 1,000 metric tons a year. It is unclear how much of this ore South Africa shipped before it agreed to adopt IAEA export restrictions in 1984, and whether South Africa really honored such export restrictions. Some sources indicate that South Africa still made major deliveries as late as 1988-1989.

• Iran also tried to purchase 26.2 kilograms of highly enriched uranium; the application to the US for this purchase was pending when the Shah fell.

• The Shah did eventually accept full IAEA safeguards but there value is uncertain.

• In 1984, Khomeini revived nuclear weapons program begun under Shah.

• Received significant West German and Argentine corporate support in some aspects of nuclear technology during the Iran-Iraq War.

• Limited transfers of centrifuge and other weapons related technology from PRC, possibly Pakistan.

• It has a Chinese-supplied heavy-water, zero-power research reactor at Isfahan Nuclear Research Center, and two-Chinese supplied sub-critical assemblies -- a light water and graphite design.

• It has stockpiles of uranium and mines in Yazd area. It may have had a uranium-ore concentration facility at University of Tehran, but status unclear.

• Some experts feel that the IRGC moved experts and equipment from the Amirabad Nuclear Research Center to a new nuclear weapons research facility near Isfahan in the mid-1980s, and formed a new nuclear research center at the University of Isfahan in 1984 -- with French assistance. Unlike many Iranian facilities, the center at Isfahan was not declared to the IAEA until February 1992, when the IAEA was allowed to make a cursory inspection of six sites that various reports had claimed were the location of Iran’s nuclear weapons efforts.
• (Bushehr I & II), on the Gulf Coast just southwest of Isfahan, were partially completed at the time of the Shah’s fall. Iran attempted to revive the program and sought German and Argentine support, but the reactors were damaged by Iraqi air strikes in 1987 and 1988.

• Iran may also have opened a new uranium ore processing plant close to its Shagand uranium mine in March, 1990, and it seems to have extended its search for uranium ore into three additional areas. Iran may have also begun to exploit stocks of yellow cake that the Shah had obtained from South Africa in the late 1970s while obtaining uranium dioxide from Argentina by purchasing it through Algeria.

• Iran began to show a renewed interest in laser isotope separation (LIS) in the mid-1980s, and held a conference on LIS in September, 1987.

• Iran opened a new nuclear research center in Isfahan in 1984, located about four kilometers outside the city and between the villages of Shahrida and Fulashan. This facility was built at a scale far beyond the needs of peaceful research, and Iran sought French and Pakistani help for a new research reactor for this center.

• The Khomeini government may also have obtained several thousand pounds of uranium dioxide from Argentina by purchasing it through Algeria. Uranium dioxide is considerably more refined than yellow cake, and is easier to use in irradiating material in a reactor to produce plutonium.

• The status of Iran’s nuclear program since the Iran-Iraq War is highly controversial, and Iran has denied the existence of such a program.

• On February 7, 1990, the speaker of the Majlis publicly toured the Atomic Energy Organization of Iran and opened the new Jabir Ibn al Hayyan laboratory to train Iranian nuclear technicians. Reports then surfaced that Iran had at least 200 scientists and a work force of about 2,000 devoted to nuclear research.

• Iran’s Deputy President Ayatollah Mohajerani stated in October, 1991, that Iran should work with other Islamic states to create an “Islamic bomb.”

• The Iranian government has repeatedly made proposals to create a nuclear-free zone in the Middle East. For example, President Rafsanjani was asked if Iran had a nuclear weapons program in an interview in the CBS program 60 Minutes in February 1997. He replied, “Definitely not. I hate this weapon.”

• Other senior Iranian leaders, including President Khatami have made similar categorical denials. Iran’s new Foreign Minister, Kamal Kharrazi, stated on October 5, 1997, that, “We are certainly not developing an atomic bomb, because we do not believe in nuclear weapons... We believe in and promote the idea of the Middle East as a region free of nuclear weapons and other weapons of mass destruction. But why are we interested to develop nuclear technology? We need to diversify our energy sources. In a matter of a few decades, our oil and gas reserves would be finished and therefore, we need access to other sources of energy...Furthermore, nuclear technology has many other utilities in medicine and agriculture. The case of the United States in terms of oil reserve is not different from Iran’s The United States also has large oil resources, but at the same time they have nuclear power plants. So there is nothing wrong with having access to nuclear technology if it is for peaceful purposes...”

• The IAEA reports that Iran has fully complied with its present requirements, and that it has found no indications of nuclear weapons effort, but IAEA only inspects Iran’s small research reactors.

• The IAEA visits to other Iranian sites are not inspections, and do not use instruments, cameras, seals, etc. The are informal walk-throughs.

• The IAEA visited five suspect Iranian facilities in 1992 and 1993 in this manner, but did not conduct full inspections.

• Iran has not had any 93+2 inspections and its position on improved inspections is that it will not be either the first or the last to have them.

• Iranian officials have repeatedly complained that the West tolerated Iraqi use of chemical weapons and its nuclear and biological build-up during the Iran-Iraq War, and has a dual standard where it does not demand inspections of Israel or that Israel sign the NPT.

• These are reasons to assume that Iran still has a nuclear program:

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• Iran attempted to buy highly enriched fissile material from Kazakhstan. The US paid between $20 million and $30 million to buy 1,300 pounds of highly enriched uranium from the Ust-Kamenogorsk facility in Kazakhstan that Iran may have sought to acquire in 1992. A total of 120 pounds of the material -- enough for two bombs -- cannot be fully accounted for.

• Iran has imported maraging steel, sometimes used for centrifuges, by smuggling it in through dummy fronts. Britain intercepted 110 pound (50 kilo) shipment in August, 1996. Seems to have centrifuge research program at Sharif University of Technology in Tehran. IAEA “visit” did not confirm.

• Those aspects of Iran's program that are visible indicate that Iran has had only uncertain success. Argentina agreed to train Iranian technicians at its Jose Balaseiro Nuclear Institute, and sold Iran $5.5 million worth of uranium for its small Amirabad Nuclear Research Center reactor in May 1987. A CENA team visited Iran in late 1987 and early 1988, and seems to have discussed selling sell Iran the technology necessary to operate its reactor with 20% enriched uranium as a substitute for the highly enriched core provided by the US, and possibly uranium enrichment and plutonium reprocessing technology as well. Changes in Argentina's government, however, made it much less willing to support proliferation. The Argentine government announced in February, 1992, that it was canceling an $18 million nuclear technology sale to Iran because it had not signed a nuclear safeguards arrangement. Argentine press sources suggested, however, that Argentina was reacting to US pressure.

• In February, 1990 a Spanish paper reported that Associated Enterprises of Spain was negotiating the completion of the two nuclear power plants at Bushehr. Another Spanish firm called ENUSA (National Uranium Enterprises) was to provide the fuel, and Kraftwerke Union (KWU) would be involved. Later reports indicated that a 10 man delegation from Iran's Ministry of Industry was in Madrid negotiating with the Director of Associated Enterprises, Adolfo Garcia Rodriguez.

• Iran negotiated with Kraftwerke Union and CENA of Germany in the late 1980s and early 1990s. Iran attempted to import reactor parts from Siemens in Germany and Skoda in Czechoslovakia. None of these efforts solved Iran’s problems in rebuilding its reactor program, but all demonstrate the depth of its interest.

• Iran took other measures to strengthen its nuclear program during the early 1990s. It installed a cyclotron from Ion Beam Applications in Belgium at a facility in Karzaj in 1991.

• Iran conducted experiments in uranium enrichment and centrifuge technology at its Sharif University of Technology in Tehran. Sharif University was also linked to efforts to import cylinders of fluorine suitable for processing enriched material, and attempts to import specialized magnets that can be used for centrifuges, from Thyssen in Germany in 1991.

• In 1992, Iran attempted to buy beryllium from a storage site in Kazakhstan that also was storing 600 kilograms of highly enriched uranium. These contacts then seem to have expanded to an attempt to try the material. In 1994, they helped lead the US to buy the enriched material and fly it out of the country.

• It is clear from Iran’s imports that it has sought centrifuge technology ever since. Although many of Iran’s efforts have never been made public, British customs officials seized 110 pounds of maraging steel being shipped to Iran in July 1996.

• Iran seems to have conducted research into plutonium separation and Iranians published research on uses of tritium that had applications to nuclear weapons boosting. Iran also obtained a wide range of US and other nuclear literature with applications for weapons designs. Italian inspectors seized eight steam condensers bound for Iran that could be used in a covert reactor program in 1993, and high technology ultrasound equipment suitable for reactor testing at the port of Bari in January, 1994.

• Other aspects of Iran’s nuclear research effort had potential weapons applications. Iran continued to operate an Argentine-fueled five megawatt light water highly enriched uranium reactor at the University of Tehran. It is operated by a Chinese-supplied neutron source research reactor, and subcritical assemblies with 900 grams of highly enriched uranium, at its Isfahan Nuclear Research Center. This Center has experimented with a heavy water zero-power reactor, a light water sub-critical reactor, and a graphite sub-critical reactor. In addition, it may have experimented with some aspects of nuclear weapons design.
• The German Ministry of Economics has circulated a wide list of such Iranian fronts which are known to have imported or attempted to import controlled items. These fronts include the:
  • Bonyad e-Mostazafan;
  • Defense Industries Organization (Sazemane Sanaye Defa);
  • Pars Garma Company, the Sadadja Industrial Group (Sadadja Sanaye Daryaee);
  • Iran Telecommunications Industry (Sanaye Mokhaberet Iran);
  • Shahid Hemat Industrial Group, the State Purchasing Organization, Education Research Institute (ERI);
  • Iran Aircraft Manufacturing Industries (IAI);
  • Iran Fair Deal Company, Iran Group of Surveyors;
  • Iran Helicopter Support and Renewal Industries (IHI);
  • Iran Navy Technical Supply Center;
  • Iran Tehran Kohakd Daftar Nezarat, Industrial Development Group;
  • Ministry of Defense (Vezerate Defa).

• Iran claims it eventually needs to build enough nuclear reactors to provide 20% of its electric power. This Iranian nuclear power program presents serious problems in terms of proliferation. Although the reactors are scarcely ideal for irradiating material to produce Plutonium or cannibalizing the core, they do provide Iran with the technology base to make its own reactors, have involved other technology transfer helpful to Iran in proliferating and can be used to produce weapons if Iran rejects IAEA safeguards.
  • Russian has agreed to build up to four reactors, beginning with a complex at Bushehr -- with two 1,000-1,200 megawatt reactors and two 465 megawatt reactors, and provide significant nuclear technology.
  • Russia has consistently claimed the light water reactor designs for Bushehr cannot be used to produce weapons grade Plutonium and are similar to the reactors the US is providing to North Korea.
  • The US has claimed, however, that Victor Mikhaliov, the head of Russia’s Atomic Energy Ministry, proposed the sale of a centrifuge plant in April, 1995. The US also indicated that it had persuaded Russia not to sell Iran centrifuge technology as part of the reactor deal during the summit meeting between President’s Clinton and Yeltsin in May, 1995.
  • It was only after US pressure that Russia publicly stated that it never planned to sell centrifuge and advanced enrichment technology to Iran, and Iran denied that it had ever been interested in such technology. For example, the statement of Mohammed Sadegh Ayatollahi, Iran’s representative to the IAEA, stated that, “We’ve had contracts before for the Bushehr plant in which we agreed that the spent fuel would go back to the supplier. For our contract with the Russians and Chinese, it is the same.” According to some reports, Russia was to reprocess the fuel at its Mayak plant near Chelyabinsk in the Urals, and could store it at an existing facility, at Krasnoyarsk-26 in southern Siberia.
  • The CIA reported in June 1997 that Iran had obtained new nuclear technology from Russia during 1996.
  • A nuclear accident at plant at Rasht, six miles north of Gilan, exposed about 50 people to radiation in July, 1996.
  • Russian Nuclear Energy Minister Yevgeny Adamov and Russian Deputy Prime Minister Vladimir Bulgak visited in March, 1998. and Iran and dismissed US complaints about the risk the reactors would be used to proliferate.
    • Russia indicated that it would go ahead with selling two more reactors for construction at Bushehr within the next five years.
    • The first 1,000 megawatt reactor at Bushehr has experienced serious construction delays. In March, 1998, Russia and Iran agreed to turn the construction project into a turn key plant because the Iranian firms working on infrastructure
had fallen well behind schedule. In February, Iran had agreed to fund improved safety systems. The reactor is reported to be on a 30-month completion cycle.

- The US persuaded the Ukraine not to sell Iran $45 million worth of turbines for its nuclear plant in early March, 1998, and to strengthen its controls on Ukrainian missile technology under the MTCR.

- The CIA reported in January 1999 that Russia remained a key supplier for civilian nuclear programs in Iran and, to a lesser extent, India. With respect to Iran’s nuclear infrastructure, Russian assistance would enhance Iran’s ability to support a nuclear weapons development effort. Such assistance is less likely to significantly advance India’s effort, given that India’s nuclear weapons program is more mature. By its very nature, even the transfer of civilian technology may be of use in the nuclear weapons programs of these countries.

- Following intense and continuing engagement with the United States, Russian officials have taken some positive steps. Russia has committed to observe certain limits on its nuclear cooperation with Iran, such as not providing militarily useful nuclear technology.

- In January 1998, the Russian Government issued a broad decree prohibiting Russian companies from exporting items known or believed to be used for developing WMD or related delivery systems, whether or not these items are on Russia’s export control list. In May 1998, Russia announced a decree intended to strengthen compliance of Russian businesses with existing export controls on proliferation-related items. These actions, if enforced, could help to counter the proliferation of WMD and their delivery systems.

- However, there are signs that Russian entities have continued to engage in behavior inconsistent with these steps. Monitoring Russian proliferation behavior, therefore, will have to remain a very high priority for some time to come.

- On January 14, 2000, Russia’s Minister of Defense Igor Ivanov met with Hassan Rowhani, the secretary of Iran’s Supreme National Security Council, and promised that Russia would maintain defense cooperation, and that Russia, “intends to fulfill its obligations under the agreements made in 1989-1990.”

- The same day, Vice Minister Ilya Klebanov met with Hassan Rowhani, and announced that Iran might order three additional Russian reactors.

- The CIA warned in January 2000 that Russia might have sold Iran heavy water and graphite technology.

  - China is reported to have agreed to provide significant nuclear technology transfer and possible sale of two 300 megawatt pressurized water reactors in the early 1990s, but then to have agreed to halt nuclear assistance to Iran after pressure from the US.

  - Iran signed an agreement with China's Commission on Science, Technology, and Industry for National Defense on January 21, 1991, to build a small 27-kilowatt research reactor at Iran's nuclear weapons research facility at Isfahan. On November 4, 1991, China stated that it had signed commercial cooperation agreements with Iran in 1989 and 1991, and that it would transfer an electromagnetic isotope separator (Calutron) and a smaller nuclear reactor, for "peaceful and commercial" purposes.

  - The Chinese reactor and Calutron were small research-scale systems and had no direct value in producing fissile material. They did, however, give Iran more knowledge of reactor and enrichment technology, and US experts believe that China provided Iran with additional data on chemical separation, other enrichment technology, the design for facilities to convert uranium to uranium hexafluoride to make reactor fuel, and help in processing yellowcake.

  - The US put intense pressure on China to halt such transfers. President Clinton and Chinese President Jiang Zemin reached an agreement at an October, 1997 summit. China strengthened this pledge in negotiations with the US in February, 1998.

  - In March, 1998, the US found that the China Nuclear Energy Corporation was negotiating to sell Iran several hundred tons of anhydrous hydrogen fluoride (AHF) to Isfahan Nuclear Research Corporation in central Iran, a site where some experts believe Iran is working on the development of nuclear weapons. AHF can be used to separate plutonium, help refine yellow cake into uranium hexafluoride to produce U-235, and as a feedstock for Sarin. It is on two nuclear control lists. China agreed to halt the sale.
• Iran denied that China had halted nuclear cooperation on March 15, 1998.

• Even so, the US acting Under Secretary of State for Arms Control and International Security Affairs stated that China was keeping its pledge not to aid Iran on March 26, 1998.

• The CIA reported in January 1999 that China continued to take steps to strengthen its control over nuclear exports. China promulgated new export control regulations in June 1998 that cover the sale of dual-use nuclear equipment. This follows on the heels of the September 1997 promulgation of controls covering the export of equipment and materials associated exclusively with nuclear applications. These export controls should give the Chinese Government greater accounting and control of the transfer of equipment, materials, and technology to nuclear programs in countries of concern.

• China pledged in late 1997 not to engage in any new nuclear cooperation with Iran and to complete work on two remaining nuclear projects—a small research reactor and a zirconium production facility—in a relatively short period of time. During the first half of 1998, Beijing appears to have implemented this pledge. The Intelligence Community will continue to monitor carefully Chinese nuclear cooperation with Iran.

• During the reporting period, Chinese entities provided a variety of missile-related items and assistance to several countries of proliferation concern. China also was an important supplier of ACW to Iran through the first half of 1998.

• The control of fissile material in the FSU remains a major problem:
  • US estimates indicate the FSU left a legacy of some 1,485 tons of nuclear material. This include 770 tons in some 27,000 weapons, including 816 strategic bombs, 5,434 missile warheads, and about 20,000 theater and tactical weapons. In addition, there were 715 tons of fissile or near-fissile material in eight countries of the FSU in over 50 sites: enough to make 35,000-40,000 bombs.
  • There are large numbers of experienced FSU technicians, including those at the Russian weapons design center at Arzamas, and at nuclear production complexes at Chelyabinsk, Krasnoyarsk, and Tomsk.
  • These factors led the US to conduct Operation Sapphire in 1994, where the US removed 600 kilograms of highly enriched uranium from the Ulba Metallurgy Plant in Kazakhstan at a time Iran was negotiating for the material.
  • They also led to Britain and the US cooperating in Auburn Endeavor, and airlifting fissile material out of a nuclear research facility in Tbilisi, Georgia. There were 10 pounds of material at the institute, and 8.8 pounds were HEU. (It takes about 35 pounds to make a bomb.) This operation was reported in the New York Times on April 21, 1998. The British government confirmed it took place, but would not give the date.
  • The Jerusalem Post reported on April 9, 1998 that Iran had purchased four tactical nuclear weapons from Russian smugglers for $25 million in the early 1990s, that the weapons had been obtained from Kazakhstan in 1991, and that Argentine technicians were helping to activate the weapon.
  • It quoted what it claimed was an Iranian report, dated December 26, 1991, of a meeting between Brigadier General Rahim Safavi, the Deputy Commander of the Revolutionary Guards and Reza Amrohalli, then head of the Iranian atomic energy organization.
  • It also quoted a second document -- dated January 2, 1992 --- saying the Iranians were awaiting the arrival of Russian technicians to show them how to disarm the protection systems that would otherwise inactivate the weapons if anyone attempted to use them.
  • The documents implied the weapons were flawed by did not indicate whether Iran had succeeded in activating them.
  • The US intelligence community denied any evidence that such a transfer had taken place.
  • The most detailed reports of Iran’s nuclear weapons program are the least reliable, and come from the People's Mujahideen, a violent, anti-regime, terrorist group. Such claims are very doubtful, but the People’s Mujahideen has reported that:
    • Iran’s facilities include a weapons site called Ma'allem Kelayah, near Qazvin on the Caspian. This is said to be an IRGC-run facility established in 1987, which has involved an Iranian investment of $300 million. Supposedly, the site was to house the 10 megawatt reactor Iran tried to buy from India.

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• Two Soviet reactors were to be installed at a large site at Gorgan on the Caspian, under the direction of Russian physicists.

• The People’s Republic of China provided uranium enrichment equipment and technicians for the site at Darkhouin, where Iran once planned to build a French reactor.

• A nuclear reactor was being constructed at Karaj; and that another nuclear weapons facility exists in the south central part of Iran, near the Iraqi border.

• The ammonia and urea plant that the British firm M. W. Kellog was building at Borujerd in Khorassan province, near the border with Turkestan, might be adapted to produce heavy water.

• The Amir Kabar Technical University, the Atomic Energy Organization of Iran (AEOI) (also known as the Organization for Atomic Energy of Iran or AEOI), Dor Argham Ltd., the Education and Research Institute, GAM Iranian Communications, Ghoids Research Center, Iran Argham Co., Iran Electronic Industries, Iranian Research Organization, Ministry of Sepah, Research and Development Group, Sezeman Sanaye Defa, the Sharif University of Technology, Taradis Iran Computer Company, and Zakaria Al-Razi Chemical Company are all participants in the Iranian nuclear weapons effort.

• Other sources based on opposition data have listed the Atomic Energy Organization of Iran, the Laser Research Center and Ibn-e Heysam Research and Laboratory Complex, the Bonab Atomic Energy Research Center (East Azerbaijan), the Imam Hussein University of the Revolutionary Guards, the Jabit bin al-Hayyan Laboratory, the Khoshomi uranium mine (Yazd), a possible site at Moallem Kalayeh, the Nuclear Research Center at Tehran University, the Nuclear Research Center for Agriculture and Medicine (Karaj), the Nuclear Research Center of Technology (Isfahan), the Saghand Uranium mine (Yazd), the Sharif University (Tehran) and its Physics Research Center.

• The CIA estimated in January 1999 that Iran remains one of the most active countries seeking to acquire WMD technology and ACW. During the reporting period, Iran focused its efforts to acquire WMD-related equipment, materials, and technology primarily on two countries: Russia and China. Iran is seeking to develop an indigenous capability to produce various types of nuclear, chemical, and biological weapons and their delivery systems. It also stated that,

  • Russian entities continued to market and support a variety of nuclear-related projects in Iran during the first half of 1998, ranging from the sale of laboratory equipment for nuclear research institutes to the construction of a 1,000-megawatt nuclear power reactor in Bushehr, Iran, that will be subject to International Atomic Energy Agency (IAEA) safeguards. These projects, along with other nuclear-related purchases, will help Iran augment its nuclear technology infrastructure, which in turn would be useful in supporting nuclear weapons research and development.

  • Russia has committed to observe certain limits on its nuclear cooperation with Iran. For example, President Yel’tsin has stated publicly that Russia will not provide militarily useful nuclear technology to Iran. Beginning in January this year, the Russian Government has taken a number of steps. For example, in May 1998, Russia announced a decree intended to strengthen compliance of Russian businesses with existing export controls on proliferation-related items.

  • China continued to work on one of its two remaining projects—to supply Iran’s civil nuclear program with a zirconium production facility. This facility will be used by Iran to produce cladding for reactor fuel. As a party to the Nuclear Nonproliferation Treaty, Iran is required to apply IAEA safeguards to nuclear fuel, but safeguards are not required for the zirconium plant or its products. During the US-China October 1997 Summit, China pledged not to engage in any new nuclear cooperation with Iran and to complete cooperation on two ongoing nuclear projects in a relatively short time. This pledge appears to be holding. In addition, China promulgated new export regulations in June 1998 that cover the sale of dual-use nuclear equipment. The regulations took effect immediately and were intended to strengthen control over equipment and material that would contribute to proliferation. Promulgation of these regulations fulfills Jiang Zemin’s commitment to the United States last fall to implement such controls by the middle of 1998.

  • Iran claims to desire the establishment of a complete nuclear fuel cycle for its civilian energy program. In that guise, it seeks to obtain whole facilities, such as a uranium conversion facility, that, in fact, could be used in any number of ways in support of efforts to produce fissile material needed for a nuclear weapon. Despite outside efforts to curtail the flow of
critical technologies and equipment, Tehran continues to seek fissile material and technology for weapons development and has set up an elaborate system of military and civilian organizations to support its effort.

- The DCI Nonproliferation Center (NPC) reported in February 2000 that Iran sought nuclear-related equipment, material, and technical expertise from a variety of sources, especially in Russia, during the first half of 1999. Work continues on the construction of a 1,000-megawatt nuclear power reactor in Bushehr, Iran, that will be subject to International Atomic Energy Agency (IAEA) safeguards. In addition, Russian entities continued to interact with Iranian research centers on various activities. These projects will help Iran augment its nuclear technology infrastructure, which in turn would be useful in supporting nuclear weapons research and development. The expertise and technology gained, along with the commercial channels and contacts established—even from cooperation that appears strictly civilian in nature—could be used to advance Iran’s nuclear weapons research and developmental program. It also reported that:

- Russia has committed to observe certain limits on its nuclear cooperation with Iran. For example, President Yel’tsin has stated publicly that Russia will not provide militarily useful nuclear technology to Iran. Beginning in January 1998, the Russian Government took a number of steps to increase its oversight of entities involved in dealings with Iran and other states of proliferation concern. In 1999, it pushed a new export control law through the Duma. Russian firms, however, faced economic pressures to circumvent these controls and did so in some cases. The Russian Government, moreover, failed in some cases regarding Iran to enforce its export controls. Following repeated warnings, the US Government in January 1999 imposed administrative measures against Russian entities that had engaged in nuclear- and missile-related cooperation with Iran. The measures imposed on these and other Russian entities (which were identified in 1998) remain in effect.

- Following intense and continuing engagement with the US, Russian officials took some positive steps to enhance oversight of Russian entities and their interaction with countries of concern. Russia has reiterated previous commitments to observe certain limits on its nuclear cooperation with Iran, such as not providing militarily useful nuclear technology, although— as indicated above—Russia continues to provide Iran with nuclear technology that could be applied to Iran’s weapons program. President Yel’tsin in July 1999 signed a federal export control law, which formally makes WMD-related transfers a violation of law and codifies several existing decrees—including catch-all controls—yet may lessen punishment for violators.

- China pledged in October 1997 not to engage in any new nuclear cooperation with Iran but said it would complete cooperation on two ongoing nuclear projects, a small research reactor and a zirconium production facility at Esfahan that Iran will use to produce cladding for reactor fuel. The pledge appears to be holding. As a party to the Nuclear Nonproliferation Treaty (NPT), Iran is required to apply IAEA safeguards to nuclear fuel, but safeguards are not required for the zirconium plant or its products.

- Iran is attempting to establish a complete nuclear fuel cycle for its civilian energy program. In that guise, it seeks to obtain whole facilities, such as a uranium conversion facility, that, in fact, could be used in any number of ways in support of efforts to produce fissile material needed for a nuclear weapon. Despite international efforts to curtail the flow of critical technologies and equipment, Tehran continues to seek fissile material and technology for weapons development and has set up an elaborate system of military and civilian organizations to support its effort.

- The Washington Times reported on June 30, 2000, that a June 8th U.S. intelligence report by the National Security Agency, had stated that stated that Russia is sending tritium gas to a nuclear weapons research center in Tehran.

- The Iranian Ministry of Defense stated on January 18, 2000 that, “The Islamic Republic of Iran, which has taken the initiative to launch a dialogue of civilizations does not need to resort to nuclear weapons…or violence.”

- On May 17, 2000, Gholamreza Aghazadeh, the head of Iran’s Atomic Energy Organization told the visiting Director General of the IAEA, Mohammed ElBaradei, that Iran was seeking IAEA help in running a nuclear research center west of Tehran studying nuclear applications in medicine and agriculture. He again stated that Iran opposed the use of nuclear technology in weapons, and claimed that Iran’s nuclear power program had suffered because of US efforts to block technology transfer.

- A CIA report in August 2000 summarized the state of nuclear weapons proliferation in Iran as follows:22

- Iran remains one of the most active countries seeking to acquire WMD and ACW technology from abroad. In doing so, Tehran is attempting to develop an indigenous capability to produce various types of weapons—nuclear, chemical, and biological—and their delivery systems. During the reporting period, the evidence indicates increased reflections of Iranian
efforts to acquire WMD- and ACW-related equipment, materials, and technology primarily on entities in Russia, China, North Korea and Western Europe.

- Iran sought nuclear-related equipment, material, and technical expertise from a variety of sources, especially in Russia, during the second half of 1999. Work continues on the construction of a 1,000-megawatt nuclear power reactor in Bushehr, Iran, that will be subject to International Atomic Energy Agency (IAEA) safeguards. In addition, Russian entities continued to interact with Iranian research centers on various activities. These projects will help Iran augment its nuclear technology infrastructure, which in turn would be useful in supporting nuclear weapons research and development. The expertise and technology gained, along with the commercial channels and contacts established—even from cooperation that appears strictly civilian in nature—could be used to advance Iran’s nuclear weapons research and developmental program.

- Beginning in January 1998, the Russian Government took a number of steps to increase its oversight of entities involved in dealings with Iran and other states of proliferation concern. In 1999, it pushed a new export control law through the Duma. Russian firms, however, faced economic pressures to circumvent these controls and did so in some cases. The Russian Government, moreover, failed in some cases regarding Iran to enforce its export controls. Following repeated warnings, the US Government in January 1998 and January 1999 imposed administrative measures against Russian entities that had engaged in nuclear- and missile-related cooperation with Iran. The measures imposed on these and other Russian entities (which were penalized in 1998) remain in effect, although sanctions against two entities—Polyus and Inor—are being lifted.

- China pledged in October 1997 not to engage in any new nuclear cooperation with Iran but said it would complete cooperation on two ongoing nuclear projects, a small research reactor and a zirconium production facility at Esfahan that Iran will use to produce cladding for reactor fuel. The pledge appears to be holding. As a party to the Nuclear Nonproliferation Treaty (NPT), Iran is required to apply IAEA safeguards to nuclear fuel, but safeguards are not required for the zirconium plant or its products.

- Iran claims that it is attempting to establish a complete nuclear fuel cycle for its civilian energy program. In that guise, it seeks to obtain whole facilities, such as a uranium conversion facility, that, in fact, could be used in any number of ways in support of efforts to produce fissile material needed for a nuclear weapon. Despite international efforts to curtail the flow of critical technologies and equipment, Tehran continues to seek fissile material and technology for weapons development and has set up an elaborate system of military and civilian organizations to support its effort.

- During the second half of 1999, Russia also remained a key supplier for civilian nuclear programs in Iran, primarily focused on the Bushehr Nuclear Power Plant project. With respect to Iran’s nuclear infrastructure, Russian assistance enhances Iran’s ability to support a nuclear weapons development effort. By its very nature, even the transfer of civilian technology may be of use in Iran’s nuclear weapons program. We remain concerned that Tehran is seeking more than a buildup of its civilian infrastructure, and the IC will be closely monitoring the relationship with Moscow for any direct assistance in support of a military program. In addition, Russia supplied India with material for its civilian nuclear program during this reporting period.

- Following intense and continuing engagement with the US, Russian officials took some positive steps to strengthen the legal basis of export controls. President Yel’tsin in July 1999 signed a federal export control law, which formally makes WMD-related transfers a violation of law and codifies several existing decrees—including catch-all controls—yet may lessen punishment for violators. Russian export enforcement and prosecution still remains weak, however. The export law is still awaiting completion of implementing decrees and its legal status is unclear. Public comments by the head of Russia’s security council indicate that Russia obtained only three convictions for export control violations involving WMD and missile technology during 1998-99.

- Nonetheless, the Russian government’s commitment, willingness, and ability to curb proliferation-related transfers remain uncertain. Moreover, economic conditions in Russia continued to deteriorate, putting more pressure on Russian entities to circumvent export controls. Despite some examples of restraint, Russian businesses continue to be major suppliers of WMD equipment, materials, and technology to Iran. Specifically, Russia continues to provide Iran with nuclear technology that could be applied to Iran’s weapons program. Monitoring Russian proliferation behavior, therefore, will remain a very high priority.
• ...Chinese missile-related technical assistance to Pakistan increased during this reporting period. In addition, firms in China provided missile-related items, raw materials, and/or assistance to several countries of proliferation concern—such as Iran, North Korea, and Libya….China’s 1997 pledge not to engage in any new nuclear cooperation with Iran has apparently held, but work associated with two remaining nuclear projects—a small research reactor and a zirconium production facility—continues. The Intelligence Community will continue to monitor carefully Chinese nuclear cooperation with Iran.

• US estimates of Iran’s progress in acquiring nuclear weapons have changed over time.
  - In 1992, the CIA estimated that Iran would have the bomb by the year 2000. In 1995, John Holum testified that Iran could have the bomb by 2003.
  - In 1997, after two years in which Iran might have made progress, he testified that Iran could have the bomb by 2005-2007.
  - In 1999, the NIE on proliferation estimated that Iran could test a missile that could reach the US by 2010, but did not change the 1997 estimate or when Iran might acquire a bomb.
  - In early 2000, the New York Time reported that the CIA had warned that Iran might now be able to make a nuclear weapon. The assessment stated that the CIA could not monitor Iran closely enough to be certain whether Iran had acquired fissile material from an outside source.
  - US experts increasingly refer to Iran’s efforts as “creeping proliferation” and there is no way to tell when or if Iranian current efforts will produce a weapon, and unclassified lists of potential facilities have little credibility.
  - Timing of weapons acquisition depends heavily on whether Iran can buy fissile material -- if so it has the design capability and can produce weapons in 1-2 years -- or must develop the capability to process Plutonium or enrich Uranium -- in which case, it is likely to be 5-10 years.

Missile Defenses

• Seeking Russian S-300 or S-400 surface-to-air missile system with limited anti tactical ballistic missile capability.
Iraqi Force Developments

Iraq is currently under UN sanctions that include controls on its imports and how it uses its oil revenues, and which prohibit the sale or transfer of long-range missiles, weapons of mass destruction, and dual-use technology to Iraq. The Gulf War destroyed some of its capability and UNSCOM dismantled much of its missile holdings and production capabilities between 1991 and 1998, as well as many of its stocks and capabilities to produce weapons of mass destruction. The US and Britain struck hard at Iraq’s remaining missile production capabilities in Operation Desert Fox in December 1998.

Nevertheless, Table IX-2 shows that Iraq retains significant capabilities to design and build long-range missiles, and chemical, biological and nuclear weapons. Although UNSCOM and the IAEA succeeded in destroying much of its capabilities, and virtually all of its fissile material production facilities, Iraq has managed to retain the capability to build missiles with ranges of 150 kilometers or less, and has exploited this situation to develop facilities which can rapidly be converted to the production of longer-range missiles. UNSCOM also ceased to carry out effective inspections in late 1998, and its replacement – UNMOVIC – shows little sign of ever accomplishing its goals, Iraq is now free to resume a large-scale covert program.

US Assessments of Iraqi Capabilities

The sheer complexity and persistence of the Iraqi effort described in Table IX-2 is a warning of what the current regime in Iraq may do if it can ever fully free itself of UN sanctions. It shows that Iraq continues to try to import dual-use components that can be used in the production of nuclear weapons, and much of its biological weapons equipment has never been found. It is also important to note that Iraq has persisted in such efforts at the cost of nearly a decade of sanctions, massive economic sacrifices, and the inability to import conventional arms. Table IX-2 is also a history of immense costs and immense sacrifices involving a full spectrum of
massive programs – facts that are generally ignored by those who focus on the human costs of sanctions while ignoring the potential cost of not maintaining them.

A CIA report in August 2000 summarized the overall state of proliferation in Iraq as follows,\textsuperscript{23}

Since Operation Desert Fox in December 1998, Baghdad has refused to allow United Nations inspectors into Iraq as required by Security Council Resolution 687. Although UN Security Council Resolution (UNSCR) 1284, adopted in December 1999, established a follow-on inspection regime to the United Nations Special Commission on Iraq (UNSCOM) in the form of the United Nations Monitoring, Verification, and Inspection Committee (UNMOVIC), there have been no UN inspections during this reporting period. Moreover, the automated video monitoring system installed by the UN at known and suspect WMD facilities in Iraq has been dismantled by the Iraqis. Having lost this on-the-ground access, it is difficult for the UN or the US to accurately assess the current state of Iraq’s WMD programs.

Since the Gulf war, Iraq has rebuilt key portions of its chemical production infrastructure for industrial and commercial use, as well as its missile production facilities. It has attempted to purchase numerous dual-use items for, or under the guise of, legitimate civilian use. This equipment—in principle subject to UN scrutiny—also could be diverted for WMD purposes. Since the suspension of UN inspections in December 1998, the risk of diversion has increased.

Following Desert Fox, Baghdad again instituted a reconstruction effort on those facilities destroyed by the US bombing, to include several critical missile production complexes and former dual-use CW production facilities. In addition, it appears to be installing or repairing dual-use equipment at CW-related facilities. Some of these facilities could be converted fairly quickly for production of CW agents.

UNSCOM reported to the Security Council in December 1998 that Iraq continued to withhold information related to its CW and BW programs. For example, Baghdad seized from UNSCOM inspectors an Air Force document discovered by UNSCOM that indicated that Iraq had not consumed as many CW munitions during the Iran-Iraq War in the 1980s as had been declared by Baghdad. This discrepancy indicates that Iraq may have an additional 6,000 CW munitions hidden.

We do not have any direct evidence that Iraq has used the period since Desert Fox to reconstitute its WMD programs, although given its past behavior, this type of activity must be regarded as likely. We assess that since the suspension of UN inspections in December of 1998, Baghdad has had the capability to reinstitute both its CW and BW programs within a few weeks to months, but without an inspection monitoring program, it is difficult to determine if Iraq has done so. We know, however, that Iraq has continued to work on its unmanned aerial vehicle (UAV) program, which involves converting L-29 jet trainer aircraft originally acquired from Eastern Europe. These modified and refurbished L-29s are believed to be intended for delivery of chemical or biological agents.

Iraq continues to pursue development of two SRBM systems which are not prohibited by the United Nations: the liquid-propellant Al-Samoud, and the solid-propellant Ababil-100. The Al-Samoud is essentially a scaled-down Scud, and the program allows Baghdad to develop technological improvements that could be applied to a longer range missile program. We believe that the Al-Samoud missile, as designed, is capable of exceeding the UN-permitted 150-km-range restriction with a potential operational range of about 180 kilometers.
Personnel previously involved with the Condor II/Badr-2000 missile—which was largely destroyed during the Gulf war and eliminated by UNSCOM—are working on the Ababil-100 program. If economic sanctions against Iraq were lifted, Baghdad probably would attempt to convert these efforts into longer range missile systems, regardless of continuing UN monitoring and continuing restrictions on WMD and long-range missile programs.

The National Intelligence Council has provided an additional summary of a possible future the Iraqi ballistic missile threat to the US:\textsuperscript{24}

“Although the Gulf war and subsequent United Nations activities destroyed much of Iraq's missile infrastructure, Iraq could test an ICBM capable of reaching the United States during the next 15 years.

- After observing North Korean activities, Iraq most likely would pursue a three-stage Taepo Dong-2 approach to an ICBM (or SLV), which could deliver a several-hundred kilogram payload to parts of the United States. If Iraq could buy a Taepo Dong-2 from North Korea, it could have a launch capability within months of the purchase; if it bought Taepo Dong engines, it could test an ICBM by the middle of the next decade. Iraq probably would take until the end of the next decade to develop the system domestically.

- Although much less likely, most analysts believe that if Iraq were to begin development today, it could test a much less capable ICBM in a few years using Scud components and based on its prior SLV experience or on the Taepo Dong-1.

- If it could acquire No Dongs from North Korea, Iraq could test a more capable ICBM along the same lines within a few years of the No Dong acquisition.

- Analysts differ on the likely timing of Iraq’s first flight test of an ICBM that could threaten the United States. Assessments include unlikely before 2015; and likely before 2015, possibly before 2010—foreign assistance would affect the capability and timing.”

**Iraqi Post-Sanctions Capabilities and Iraqi Intentions**

Once again, there is no way to determine what capabilities Iraq will actually create or how far it will go in developing warfighting options. It does seem likely, however, that if Saddam Hussein or his immediate coterie remain in power that Iraqi will be an aggressive and revanchist state. This could take the form of an effort to create a missile threat to the Gulf, the region, Europe, and the US. Any Iraqi leadership with ambitions to seize the territory of another power in the region might conclude that Iraq would need a credible deterrent capability to strike the US in order to prevent the US from using its forces to halt Iraqi military action.
The sheer nature of the past Iraqi actions shown in Table IX-2 is also a warning that Iraq is perfectly capable of using missiles and weapons of mass destruction. At the same time, it is far from clear that Iraq will act recklessly. Even a relatively hostile leadership might conclude that using weapons of mass destruction and long-range missiles would simply catalyze ever more serious action against Iran. It must also be aware that the US might preempt – as it did in striking Iraqi missile production facilities in December 1999 during operation Desert Fox.

At the same time, even a now and more moderate regime might continue to proliferate. Such a regime might conclude that creating a regional capability to strike with missiles and weapons of mass destruction would hold the allies, power projection forces, and bases of the US as hostages without triggering the kind of reaction the US might make to a direct threat to its Homeland. Given the other major proliferators in the region -- which include India, Iran, Israel, Pakistan, and Syria – even a regime that is not actively hostile to the US might continue to develop nuclear weapons and long-range missiles in spite of its agreements not to do so.

The US, the Southern Gulf states, and Europe must not abandon efforts to “roll back” both Iraqi and Iranian proliferation. However, a steadily creeping process of proliferation now seems likely, and may well go on in spite of changes in regime. Deterrence, defense, and retaliation will be most important tools to deal with the problem. The genie probably cannot be forced back into the bottle. The most that can be done is to force it to hide in the cave.
Table IX-2

Iraqi Missile Threats and Proliferation

Delivery Systems

• Prior to the Gulf War Iraq had extensive delivery systems incorporating long-range strike aircraft with refueling capabilities and several hundred regular and improved, longer-range Scud missiles, some with chemical warheads. These systems included:
  • Tu-16 and Tu-22 bombers.
  • MiG-29 fighters.
  • Mirage F-1, MiG-23BM, and Su-22 fighter attack aircraft.
  • A Scud force with a minimum of 819 missiles.
  • Extended range Al Husayn Scud variants (600 kilometer range) extensively deployed throughout Iraq, and at three fixed sites in northern, western, and southern Iraq.
  • Developing Al-Abbas missiles (900 kilometer range), which could reach targets in Iran, the Persian Gulf, Israel, Turkey, and Cyprus.
  • Long-range super guns with ranges of up to 600 kilometers.
• Iraq also engaged in efforts aimed at developing the Tamuz liquid fueled missile with a range of over 2,000 kilometers, and a solid fueled missile with a similar range. Clear evidence indicates that at least one design was to have a nuclear warhead.
• Iraq attempted to conceal a plant making missile engines from the UN inspectors. It only admitted this plant existed in 1995, raising new questions about how many of its missiles have been destroyed.
• Iraq had design work underway for a nuclear warhead for its long-range missiles.
• The Gulf War deprived Iraq of some of its MiG-29s, Mirage F-1s, MiG-23BMs, and Su-22s.
• Since the end of the war, the UN inspection regime has also destroyed many of Iraq’s long-range missiles:
  • UNSCOM has directly supervised the destruction of 48 Scud-type missiles.
  • It has verified the Iraqi unilateral destruction of 83 more missiles and 9 mobile launchers.
• A State Department summary issued on November 16, 1998, indicates that UNSCOM has supervised the destruction of:
  • 48 operational missiles;
  • 14 conventional missile warheads;
  • six operational mobile launchers; 28 operational fixed launch pads;
  • 32 fixed launch pads;
  • 30 missile chemical warheads;
  • other missile support equipment and materials, and a variety of assembled and non-assembled supergun components.
  • 38,537 filled and empty chemical munitions;
  • 90 metric tons of chemical weapons agent;
  • more than 3,000 metric tons of precursor chemicals;

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• 426 pieces of chemical weapons production equipment; and,
• 91 pieces of related analytical instruments.
• The entire al-Hakam biological weapons production facility and a variety of production equipment and materials.
• The UN estimates that it is able to account for 817 of the 819 long-range missiles that Iraq imported in the period ending in 1988:
  • Pre-1980 expenditures, such as training 8
  • Expenditures during the Iran-Iraq War (1980-1981), including the war
  • of the cities in February-April 1988 516
  • Testing activities for the development of Iraq’s modifications of
  • imported missiles and other experimental activities (1985-1990) 69
  • Expenditures during the Gulf War (January-March 1991) 93
  • Destruction under the supervision of UNSCOM 48
  • Unilateral destruction by Iraq (mid-July and October 1991 83
  • UNSCOM’s analysis has shown that Iraq had destroyed 83 of the 85 missiles it had claimed were destroyed. at the same time, it stated that Iraq had not given an adequate account of its proscribed missile assets, including launchers, warheads, and propellants.
  • UNSCOM also reports that it supervised the destruction of 10 mobile launchers, 30 chemical warheads, and 18 conventional warheads.
• Iraq maintains a significant delivery capability consisting of:
  • HY-2, SS-N-2, and C-601 cruise missiles, which are unaffected by UN cease-fire terms.
  • FROG-7 rockets with 70 kilometer ranges, also allowed under UN resolutions.
  • Multiple rocket launchers and tube artillery.
  • Experimental conversions such as the SA-2.
• Iraq claims to have manufactured only 80 missile assemblies, 53 of which were unusable. UNSCOM claims that 10 are unaccounted for.
  • US experts believe Iraq may still have components for several dozen extended-range Scud missiles.
• In addition, Iraq has admitted to:
  • Hiding its capability to manufacture its own Scuds.
  • Developing an extended range variant of the FROG-7 called the Laith. The UN claims to have tagged all existing FROG-7s to prevent any extension of their range beyond the UN imposed limit of 150 kilometers for Iraq missiles.
  • Experimenting with cruise missile technology and ballistic missile designs with ranges up to 3,000 kilometers.
  • Flight testing Al Husayn missiles with chemical warheads in April 1990.
  • Developing biological warheads for the Al Husayn missile as part of Project 144 at Taji.
  • Initiating a research and development program for a nuclear warhead missile delivery system.
  • Successfully developing and testing a warhead separation system.
• Indigenously developing, testing, and manufacturing advanced rocket engines to include liquid-propellant designs.

• Conducting research into the development of Remotely Piloted Vehicles (RPVs) for the dissemination of biological agents.

• Attempting to expand its Ababil-100 program designed to build surface-to-surface missiles with ranges beyond the permitted 100-150 kilometers.

• Importing parts from Britain, Switzerland, and other countries for a 350 mm “super gun,” as well as starting an indigenous 600 mm supergun design effort.

• Iraq initially claimed that it had 45 missile warheads filled with chemical weapons in 1992. It then stated that it had 20 chemical and 25 biological warheads in 1995. UNSCOM established that it had a minimum of 75 operational warheads and 5 used for trials. It has evidence of the existence of additional warheads. It can only verify that 16 warheads were filled with Sarin, and 34 with chemical warfare binary components, and that 30 were destroyed under its supervision -- 16 with Sarin and 14 with binary components.

• US and UN officials conclude further that:
  • Iraq is trying to rebuild its ballistic missile program using a clandestine network of front companies to obtain the necessary materials and technology from European and Russian firms.
  • This equipment is then concealed and stockpiled for assembly concomitant with the end of the UN inspection regime.
  • The equipment clandestinely sought by Iraq includes advanced missile guidance components, such as accelerometers and gyroscopes, specialty metals, special machine tools, and a high-tech, French-made, million-dollar furnace designed to fabricate engine parts for missiles.

• Recent major violations and smuggling efforts:
  • In November, 1995, Iraq was found to have concealed an SS-21 missile it had smuggled in from Yemen.
  • Jordan found that Iraq was smuggling missile components through Jordan in early December, 1995. These included 115 gyroscopes in 10 crates, and material for making chemical weapons. The shipment was worth an estimated $25 million. Iraq claimed the gyroscopes were for oil exploration but they are similar to those used in the Soviet SS-N-18 SLBM. UNSCOM also found some gyroscopes dumped in the Tigris.

• Iraq retains the technology it acquired before the war and evidence clearly indicates an ongoing research and development effort, in spite of the UN sanctions regime.

• The fact the agreement allows Iraq to continue producing and testing short-range missiles (less than 150 kilometers range) means it can retain significant missile development effort.
  • The SA-2 is a possible test bed, but UNSCOM has tagged all missiles and monitors all high apogee tests.
  • Iraq’s Al-Samoud and Ababil-100 programs are similar test beds. The Al-Samoud is a scaled-down Scud which Iraq seems to have tested.
  • Iraq continues to expand its missile production facility at Ibn Al Haytham, which has two new buildings large enough to make much longer-range missiles.
  • US satellite photographs reveal that Iraq has rebuilt its Al-Kindi missile research facility.

• Ekeus reported on December 18, 1996 that Iraq retained missiles, rocket launchers, fuel, and command system to “make a missile force of significance”. UNSCOM reporting as of October, 1997 is more optimistic, but notes that Iraq, “continued to conceal documents describing its missile propellants, and the material evidence relating to its claims to have destroyed its indigenous missile production capabilities indicated in might has destroyed less than a tenth of what it claimed”
• The CIA reported in January 1999 that Iraq is developing two ballistic missiles that fall within the UN-allowed 150-km range restriction. The Al Samoud liquid-propellant missile—described as a scaled-down Scud—began flight-testing in 1997.

• Technicians for Iraq’s pre-war Scud missiles are working on the Al Samoud program and, although under UNSCOM supervision, are developing technological improvements that could be applied to future longer-range missile programs. The Ababil-100 solid-propellant missile is also under development, although progress on this system lags the Al Samoud. After economic sanctions are lifted and UN inspections cease, Iraq could utilize expertise from these programs in the development of longer-range missile systems.

• A State Department report in September 1999 noted that:
  • Iraq has refused to credibly account for 500 tons of SCUD propellant, over 40 SCUD biological and conventional warheads, 7 Iraqi-produced Scuds, and truckloads of SCUD components.
  • Iraq refuses to allow inspection of thousands of Ministry of Defense and Military Industries Commission documents relating to biological and chemical weapons and long-range missiles.

• The CIA estimated in September 1999 that although the Gulf war and subsequent United Nations activities destroyed much of Iraq’s missile infrastructure, Iraq could test an ICBM capable of reaching the United States during the next 15 years.

• After observing North Korean activities, Iraq most likely would pursue a three-stage Taepo Dong-2 approach to an ICBM (or SLV), which could deliver a several-hundred kilogram payload to parts of the United States. If Iraq could buy a Taepo Dong-2 from North Korea, it could have a launch capability within months of the purchase; if it bought Taepo Dong engines, it could test an ICBM by the middle of the next decade. Iraq probably would take until the end of the next decade to develop the system domestically.

• Although much less likely, most analysts believe that if Iraq were to begin development today, it could test a much less capable ICBM in a few years using Scud components and based on its prior SLV experience or on the Taepo Dong-1.

• If it could acquire No Dongs from North Korea, Iraq could test a more capable ICBM along the same lines within a few years of the No Dong acquisition.

• Analysts differ on the likely timing of Iraq’s first flight test of an ICBM that could threaten the United States. Assessments include unlikely before 2015; and likely before 2015, possibly before 2010—foreign assistance would affect the capability and timing.

• The DCI Nonproliferation Center (NPC) reported in February 2000 that Iraq has continued to work on the two SRBM systems authorized by the United Nations: the liquid-propellant Al-Samoud, and the solid-propellant Ababil-100. The Al-Samoud is essentially a scaled-down Scud, and the program allows Baghdad to develop technological improvements that could be applied to a longer range missile program. We believe that the Al-Samoud missile, as designed, is capable of exceeding the UN-permitted 150-km-range restriction with a potential operational range of about 180 kilometers. Personnel previously involved with the Condor II/Badr-2000 missile—which was largely destroyed during the Gulf war and eliminated by UNSCOM—are working on the Ababil-100 program. Once economic sanctions against Iraq are lifted, Baghdad probably will begin converting these efforts into longer range missile systems, unless restricted by future UN monitoring.

• Defense intelligence experts say on background that Iraq has rebuilt many of the facilities the US struck in Desert Fox, including 12 factories and sites associated with missile construction and the production of weapons of mass destruction. These are said to include the missile facilities at Al Taji.25

• US intelligence reports in June 2000 indicated that Iraq has resumed testing of missiles under 150 kilometers in range, possibly the system modified from the SA-2. They say that the system is not ready for deployment, and that there are problems with the rocket motor, guidance system, and there is no evidence Iraq is ready to start production.

• A CIA report in August 2000 summarized the state of missile development in Iraq as follows.26
Since the Gulf war, Iraq has rebuilt key portions of its chemical production infrastructure for industrial and commercial use, as well as its missile production facilities. It has attempted to purchase numerous dual-use items for, or under the guise of, legitimate civilian use. This equipment—in principle subject to UN scrutiny—also could be diverted for WMD purposes. Since the suspension of UN inspections in December 1998, the risk of diversion has increased.

Following Desert Fox, Baghdad again instituted a reconstruction effort on those facilities destroyed by the US bombing, to include several critical missile production complexes and former dual-use CW production facilities. In addition, it appears to be installing or repairing dual-use equipment at CW-related facilities. Some of these facilities could be converted fairly quickly for production of CW agents.

Iraq continues to pursue development of two SRBM systems which are not prohibited by the United Nations: the liquid-propellant Al-Samoud, and the solid-propellant Ababil-100. The Al-Samoud is essentially a scaled-down Scud, and the program allows Baghdad to develop technological improvements that could be applied to a longer range missile program. We believe that the Al-Samoud missile, as designed, is capable of exceeding the UN-permitted 150-km-range restriction with a potential operational range of about 180 kilometers. Personnel previously involved with the Condor II/Badr-2000 missile—which was largely destroyed during the Gulf war and eliminated by UNSCOM—are working on the Ababil-100 program. If economic sanctions against Iraq were lifted, Baghdad probably would attempt to convert these efforts into longer range missile systems, regardless of continuing UN monitoring and continuing restrictions on WMD and long-range missile programs.

**Chemical Weapons**

Iraq is the only major recent user of weapons of mass destruction. US intelligence sources report the following Iraqi uses of chemical weapons:

<table>
<thead>
<tr>
<th>Date</th>
<th>Area</th>
<th>Type of Gas</th>
<th>Approximate</th>
<th>Casualties</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 1983</td>
<td>Haij Umran</td>
<td>Mustard</td>
<td>Less than 100</td>
<td>Iranians/Kurds</td>
</tr>
<tr>
<td>October-November 1983</td>
<td>Panjwin</td>
<td>Mustard</td>
<td>3,0000</td>
<td>Iranians/Kurds</td>
</tr>
<tr>
<td>February-March 1984</td>
<td>Majnoon Island</td>
<td>Mustard</td>
<td>2,500</td>
<td>Iranians</td>
</tr>
<tr>
<td>March 1984</td>
<td>Al Basrah</td>
<td>Tabun</td>
<td>50-100</td>
<td>Iranians</td>
</tr>
<tr>
<td>March 1985</td>
<td>Hawizah Marsh</td>
<td>Mustard/Tabun</td>
<td>3,000</td>
<td>Iranians</td>
</tr>
<tr>
<td>February 1996</td>
<td>Al Faw</td>
<td>Mustard/Tabun</td>
<td>8,000-10,000</td>
<td>Iranians</td>
</tr>
<tr>
<td>December 1986</td>
<td>Umm ar Rasas</td>
<td>Mustard</td>
<td>1,000s</td>
<td>Iranians</td>
</tr>
<tr>
<td>April 1987</td>
<td>Al Basrah</td>
<td>Mustard/Tabun</td>
<td>5,000</td>
<td>Iranians</td>
</tr>
<tr>
<td>October 1987</td>
<td>Sumar/Mehran</td>
<td>Mustard/Nerve Agents</td>
<td>3,000</td>
<td>Iranians</td>
</tr>
<tr>
<td>March 1988</td>
<td>Halabjah</td>
<td>Mustard/Nerve Agents</td>
<td>Hundreds</td>
<td>Iranians/Kurds</td>
</tr>
</tbody>
</table>

Note: Iranians also used poison gas at Halabjah and may have caused some of the casualties.

In revelations to the UN, Iraq admitted that, prior to the Gulf War, it:

- Procured more than 1,000 key pieces of specialized production and support equipment for its chemical warfare program.
- Maintained large stockpiles of mustard gas, and the nerve agents Sarin and Tabun.
- Produced binary Sarin filled artillery shells, 122 mm rockets, and aerial bombs.
- Manufactured enough precursors to produce 70 tons (70,000 kilograms) of the nerve agent VX. These precursors included 65 tons of choline and 200 tons of phosphorous pentasulfide and di-isopropylamine.

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• Tested Ricin, a deadly nerve agent, for use in artillery shells.
• Had three flight tests of long-range Scuds with chemical warheads.
• Had a large VX production effort underway at the time of the Gulf War. The destruction of the related weapons and feedstocks has been claimed by Iraq, but not verified by UNSCOM. Iraq seems to have had at least 3,800 kilograms of V-agents by the time of the Gulf War, and 12-16 missile warheads.

• The majority of Iraq’s chemical agents were manufactured at a supposed pesticide plant located at Muthanna. Various other production facilities were also used, including those at Salman Pak, Samara, and Habbiniyah. Though severely damaged during the war, the physical plant for many of these facilities has been rebuilt.
• Iraq possessed the technology to produce a variety of other persistent and non-persistent agents.
• The Gulf War and the subsequent UN inspection regime may have largely eliminated some of stockpiles and reduced production capability.
• During 1991-1994, UNSCOM supervised the destruction of:
  • 38,537 filled and unfilled chemical munitions.
  • 690 tons of chemical warfare agents.
  • More than 3,000 tons of precursor chemicals.
  • Over 100 pieces of remaining production equipment at the Muthan State Establishment, Iraq’s primary CW research, production, filling and storage site.
• Since that time, UNSCOM has forced new disclosures from Iraq that have led to:
  • The destruction of 325 newly identified production equipment, 120 of which were only disclosed in August, 1997.
  • The destruction of 275 tons of additional precursors.
  • The destruction of 125 analytic instruments.
  • The return of 91 analytic pieces of equipment to Kuwait.
• As of February, 1998, UNSCOM had supervised the destruction of a total of:
  • 40,000 munitions, 28,000 filled and 12,000 empty.
  • 480,000 liters of chemical munitions
  • 1,800,000 liters of chemical precursors.
  • eight types of delivery systems including missile warheads.
• US and UN experts believe Iraq has concealed significant stocks of precursors. Iraq also appears to retain significant amounts of production equipment dispersed before, or during, Desert Storm and not recovered by the UN.
• UNSCOM reports that Iraq has failed to account for
  • Special missile warheads intended for filling with chemical or biological warfare agent.
  • The material balance of some 550 155 mm mustard gas shells, the extent of VX programs, and the rationale for the acquisition of various types of chemical weapons
  • 130 tons of chemical warfare agents.
  • Some 4,000 tons of declared precursors for chemical weapons,
  • The production of several hundred tons of additional chemical warfare agents, the consumption of chemical precursors,
• 107,500 empty casings for chemical weapons,
• Whether several thousand additional chemical weapons were filled with agents,
• The unilateral destruction of 15,620 weapons, and the fate of 16,038 additional weapons Iraq claimed it had discarded. “The margin of error” in the accounting presented by Iraq is in the neighborhood of 200 munitions.
• Iraq systematically lied about the existence of its production facilities for VX gas until 1995, and made “significant efforts” to conceal its production capabilities after that date. Uncertainties affecting the destruction of its VX gas still affect some 750 tons of imported precursor chemicals, and 55 tons of domestically produced precursors. Iraq has made unverifiable claims that 460 tons were destroyed by Coalition air attacks, and that it unilaterally destroyed 212 tons. UNSCOM has only been able to verify the destruction of 155 tons and destroy a further 36 tons on its own.

• Iraq has developed basic chemical warhead designs for Scud missiles, rockets, bombs, and shells. Iraq also has spray dispersal systems.
• Iraq maintains extensive stocks of defensive equipment.
• The UN feels that Iraq is not currently producing chemical agents, but Iraq has offered no evidence that it has destroyed its VX production capability and/or stockpile. Further, Iraq retains the technology it acquired before the war and evidence clearly indicates an ongoing research and development effort, in spite of the UN sanctions regime.
• Recent UNSCOM work confirms that Iraq did deploy gas-filled 155 mm artillery and 122 mm multiple rocket rounds into the rear areas of the KTO during the Gulf War.
• Iraq’s chemical weapons had no special visible markings, and were often stored in the same area as conventional weapons.
• Iraq has the technology to produce stable, highly lethal VX gas with long storage times.
• May have developed improved binary and more stable weapons since the Gulf War.
• Since 1992, Iraq attempted to covertly import precursors and production equipment for chemical weapons through Qatar, Saudi Arabia, and Jordan since the Gulf War.
• The current status of the Iraqi program is as follows (according to US intelligence as of February 19, 1998 and corrected by the National Intelligence Council on November 16, 1998):

<table>
<thead>
<tr>
<th>Agent</th>
<th>Declared (Metric Tons)</th>
<th>Potential Unaccounted (Metric Tons)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>VX Nerve Gas</td>
<td>3</td>
<td>300</td>
<td>Iraq lied about the program until 1995</td>
</tr>
<tr>
<td>G Agents (Sarin)</td>
<td>100-150</td>
<td>200</td>
<td>Figures include weaponized and bulk agents</td>
</tr>
<tr>
<td>Mustard Gas</td>
<td>500-600</td>
<td>200</td>
<td>Figures include weaponized and bulk agents</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Delivery Systems</th>
<th>Declared (Number)</th>
<th>Potential Unaccounted (Number)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Missile Warheads</td>
<td>75-100</td>
<td>2-25</td>
<td>UNSCOM supervised destruction of 30</td>
</tr>
<tr>
<td>Rockets</td>
<td>100,000</td>
<td>15,000-25,000</td>
<td>UNSCOM supervised destruction of 40,000, 28,000 of which were filled.</td>
</tr>
<tr>
<td>Aerial Bombs</td>
<td>16,000</td>
<td>2,000-8,000</td>
<td>High estimate reflects the data found in an Iraqi Air Force document in July, 1998.</td>
</tr>
<tr>
<td>Artillery shells</td>
<td>30,000</td>
<td>15,000</td>
<td></td>
</tr>
<tr>
<td>Aerial Spray Tanks</td>
<td>?</td>
<td>?</td>
<td></td>
</tr>
</tbody>
</table>
• A US State Department spokesman reported on November 16, 1998 that Iraq has reported making 8,800 pounds (four tons) of VX nerve gas, 220,000 pounds (100 tons) to 330,000 pounds (150 tons) of nerve agents such as Sarin and 1.1 million pounds (500 tons) to 1.32 million pounds (600 tons) of mustard gas. Data from UN weapons inspectors indicates that Iraq may have produced an additional 1.32 million pounds (600 tons) of these agents, divided evenly among the three. "In other words, these are the differences between what they say they have and what we have reason to believe they have."

• The CIA reported in January 1999 that Iraq had purchased numerous dual-use items for legitimate civilian projects—in principle subject to UN scrutiny—that also could be diverted for WMD purposes. Since the Gulf war, Baghdad has rebuilt key portions of its chemical production infrastructure for industrial and commercial use. Some of these facilities could be converted fairly quickly for production of CW agents. The recent discovery that Iraq had weaponized the advanced nerve agent VX and the convincing evidence that fewer CW munitions were consumed during the Iran-Iraq war than Iraq had declared provide strong indications that Iraq retains a CW capability and intends to reconstitute its pre-Gulf war capability as rapidly as possible once sanctions are lifted.

• A State Department report in September 1999 noted that:
  • In July 1998, Iraq seized from the hands of UNSCOM inspectors an Iraqi Air Force document indicating that Iraq had misrepresented the expenditure of over 6,000 bombs which may have contained over 700 tons of chemical agent. Iraq continues to refuse to provide this document to the UN.
  • Iraq continues to deny weaponizing VX nerve agent, despite the fact that UNSCOM found VX nerve agent residues on Iraqi SCUD missile warhead fragments. Based on its investigations, international experts concluded that "Iraq has the know-how and process equipment, and may possess precursors to manufacture as much as 200 tons of VX ... The retention of a VX capability by Iraq cannot be excluded by the UNSCOM international expert team.”

• The DCI Nonproliferation Center (NPC) reported in February 2000 that “We do not have any direct evidence that Iraq has used the period since Desert Fox to reconstitute its WMD programs, although given its past behavior, this type of activity must be regarded as likely. The United Nations assesses that Baghdad has the capability to reinitiate both its CW and BW programs within a few weeks to months, but without an inspection monitoring program, it is difficult to determine if Iraq has done so.” It also reported that,
  • Since Operation Desert Fox in December 1998, Baghdad has refused to allow United Nations inspectors into Iraq as required by Security Council Resolution 687. As a result, there have been no UN inspections during this reporting period, and the automated video monitoring system installed by the UN at known and suspect WMD facilities in Iraq has been dismantled by the Iraqis. Having lost this on-the-ground access, it is difficult for the UN or the US to accurately assess the current state of Iraq’s WMD programs.
  • Since the Gulf war, Iraq has rebuilt key portions of its chemical production infrastructure for industrial and commercial use, as well as its missile production facilities. It has attempted to purchase numerous dual-use items for, or under the guise of, legitimate civilian use. This equipment-in principle subject to UN scrutiny-also could be diverted for WMD purposes. Following Desert Fox, Baghdad again instituted a reconstruction effort on those facilities destroyed by the US bombing, to include several critical missile production complexes and former dual-use CW production facilities. In addition, it appears to be installing or repairing dual-use equipment at CW-related facilities. Some of these facilities could be converted fairly quickly for production of CW agents.
  • The United Nations Special Commission on Iraq (UNSCOM) reported to the Security Council in December 1998 that Iraq continued to withhold information related to its CW and BW programs. For example, Baghdad seized from UNSCOM inspectors an Air Force document discovered by UNSCOM that indicated that Iraq had not consumed as many CW munitions during the Iran-Iraq War in the 1980s as declared by Baghdad. This discrepancy indicates that Iraq may have an additional 6,000 CW munitions hidden. This intransigence on the part of Baghdad ultimately led to the Desert Fox bombing by the US.
  • Iraqi defector claims in February 2000 that Iraq had maintained a missile force armed with chemical and biological warheads that can be deployed from secret locations, and they that warheads are stored separately near Baghdad and have been deployed to the missiles in the field in exercises.27
A CIA report in August 2000 summarized the state of chemical weapons proliferation in Iraq as follows:

Since Operation Desert Fox in December 1998, Baghdad has refused to allow United Nations inspectors into Iraq as required by Security Council Resolution 687. Although UN Security Council Resolution (UNSCR) 1284, adopted in December 1999, established a follow-on inspection regime to the United Nations Special Commission on Iraq (UNSCOM) in the form of the United Nations Monitoring, Verification, and Inspection Committee (UNMOVIC), there have been no UN inspections during this reporting period. Moreover, the automated video monitoring system installed by the UN at known and suspect WMD facilities in Iraq has been dismantled by the Iraqis. Having lost this on-the-ground access, it is difficult for the UN or the US to accurately assess the current state of Iraq’s WMD programs.

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**Biological Weapons**

- Had highly compartmented “black” program with far tighter security regulations than chemical program.
- Had 18 major sites for some aspect of biological weapons effort before the Gulf War. Most were nondescript and had no guards or visible indications they were a military facility.
- The US targeted only one site during the Gulf War. It struck two sites, one for other reasons. It also struck at least two targets with no biological facilities that it misidentified.
- Systematically lied about biological weapons effort until 1995. First stated that had small defensive efforts, but no offensive effort. In July, 1995, admitted had a major defensive effort. In October, 1995, finally admitted major weaponization effort.
- Iraq has continued to lie about its biological weapons effort since October, 1995. It has claimed the effort was headed by Dr. Taha, a woman who only headed a subordinate effort. It has not admitted to any help by foreign personnel or contractors. It has claimed to have destroyed its weapons, but the one site UNSCOM inspectors visited showed no signs of such destruction and was later said to be the wrong site. It has claimed only 50 people were employed full time, but the scale of the effort would have required several hundred.
- Since July 1995, Iraq has presented three versions of FFCDs and four “drafts.”
  - The most recent FFCD was presented by Iraq on 11 September 1997. This submission followed the UNSCOM’s rejection, of the FFCD of June 1996. In the period since receiving that report, UNSCOM conducted eight inspections in an attempt to investigate critical areas of Iraq’s proscribed activities such as warfare agent production and
destruction, biological munitions manufacturing, filling and destruction, and military involvement in and support to the proscribed program. Those investigations, confirmed the assessment that the June 1996 declaration was deeply deficient. The UNSCOM concluded that the new FFCD, it received on 11 September 1997, contains no significant changes from the June 1996 FFCD

- Iraq has not admitted to the production of 8,500 liters of anthrax, 19,000 liters of Botulinum toxin, 2,200 liters of Aflatoxin,

- Reports indicate that Iraq tested at least 7 principal biological agents for use against humans.
  - Anthrax, Botulinum, and Aflatoxin are known to be weaponized.
  - Looked at viruses, bacteria, and fungi. Examined the possibility of weaponizing gas gangrene and Mycotoxins. Some field trials were held of these agents.
  - Examined foot and mouth disease, haemorrhagic conjunctivitis virus, rotavirus, and camel pox virus.
  - Conducted research on a “wheat pathogen” and a Mycotoxin similar to “yellow rain” defoliant.
  - The “wheat smut” was first produced at Al Salman, and then put in major production during 1987-1988 at a plant near Mosul. Iraq claims the program was abandoned.

- The August 1995 defection of Lieutenant general Husayn Kamel Majid, formerly in charge of Iraq’s weapons of mass destruction, revealed the extent of this biological weapons program. Lt. General Kamel’s defection prompted Iraq to admit that it:
  - Imported 39 tons of growth media (31,000 kilograms or 68,200 pounds) for biological agents obtained from three European firms. According to UNSCOM, 3,500 kilograms or 7,700 pounds) remains unaccounted for. Some estimates go as high as 17 tons. Each ton can be used to produce 10 tons of bacteriological weapons.
  - Imported type cultures from the US which can be modified to develop biological weapons.
  - Had a laboratory- and industrial-scale capability to manufacture various biological agents including the bacteria which cause Anthrax and botulism; Aflatoxin, a naturally occurring carcinogen; clostridium perfringens, a gangrene-causing agent; the protein toxin Ricin; tricothecene Mycotoxins, such as T-2 and DAS; and an anti-wheat fungus known as wheat cover smut. Iraq also conducted research into the rotavirus, the camel pox virus and the virus which causes haemorrhagic conjunctivitis.
  - Created at least seven primary production facilities including the Sepp Institute at Muthanna, the Ghazi Research Institute at Amaria, the Daura Foot and Mouth Disease Institute, and facilities at Al-Hakim, Salman Pak Taji, and Fudaliyah. According to UNSCOM, weaponization occurred primarily at Muthanna through May, 1987 (largely Botulinum), and then moved to Al Salman. (Anthrax). In March, 1988 a plant was open at Al Hakim, and in 1989 an Aflatoxin plant was set up at Fudaliyah.
  - Had test site about 200 kilometers west of Baghdad, used animals in cages and tested artillery and rocket rounds against live targets at ranges up to 16 kilometers.
  - Took fermenters and other equipment from Kuwait to improve effort during the Gulf War.
  - Iraq had least 79 civilian facilities capable of playing some role in biological weapons production still in existence in 1997.

- The Iraqi program involving Aflatoxin leaves many questions unanswered.
  - Iraqi research on Aflatoxin began in May 1988 at Al Salman, where the toxin was produced by the growth of fungus aspergillus in 5.3 quart flasks.
  - The motives behind Iraq’s research on Aflatoxin remain one of the most speculative aspects of its program. Aflatoxin is associated with fungal-contaminated food grains, and is considered non-lethal. It normally can produce liver cancer, but only after a period of months to years and in intense concentrations. There is speculation, however, that a weaponized form might cause death within days and some speculation that it can be used as an incapacitating agent.

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• It developed 16 R-400 Aflatoxin bombs and two Scud warheads. Conducted trials with Aflatoxin in 122 mm rockets and R-400 bombs in November 1989 and May and August 1990. Produced a total of 572 gallons of toxin and loaded 410.8 gallons into munitions.

• UNSCOM concluded in October, 1997, that Iraq’s accounting for its Aflatoxin production was not credible.

• Total Iraqi production of more orthodox biological weapons reached at least 19,000 liters of concentrated Botulinum (10,000 liters filled into munitions); 8,500 liters of concentrated Anthrax (6,500 liters filled into munitions); and 2,500 liters of concentrated Aflatoxin (1,850 liters filled into munitions).

• It manufactured 6,000 liters of concentrated Botulinum toxin and 8,425 liters of Anthrax at Al-Hakim during 1990; 5400 liters of concentrated Botulinum toxin at the Daura Foot and Mouth Disease Institute from November 1990 to January 15, 1991; 400 liters of concentrated Botulinum toxin at Taji; and 150 liters of concentrated Anthrax at Salman Pak.

• Iraq is also known to have produced at least:
  • 1,850 liters of Aflatoxin in solution at Fudaliyah.
  • 340 liters of concentrated clostridium perfringens, a gangrene-causing biological agent, beginning in August 1990.
  • 10 liters of concentrated Ricin at Al Salam. Claim abandoned work after tests failed.

• Iraq weaponized at least three biological agents for use in the Gulf War. The weaponization consisted of at least:
  • 100 bombs and 16 missile warheads loaded with Botulinum.
  • 50 R-400 air-delivered bombs and 5 missile warheads loaded with anthrax; and
  • 4 missile warheads and 7 R-400 bombs loaded with Aflatoxin, a natural carcinogen.
  • The warheads were designed for operability with the Al Husayn Scud variant.

• Iraq had other weaponization activities:
  • Armed 155 mm artillery shells and 122 mm rockets with biological agents.
  • Conducted field trials, weaponization tests, and live firings of 122 mm rockets armed with Anthrax and Botulinum toxin from March 1988 to May 1990.
  • Tested Ricin, a deadly protein toxin, for use in artillery shells.
  • Iraq produced at least 191 bombs and 25 missile warheads with biological agents.
  • Developed and deployed 250 pound aluminum bombs coverage in fiberglass. Bombs were designed so they could be mounted on both Soviet and French-made aircraft. They were rigged with parachutes for low altitudes drops to allow efficient slow delivery and aircraft to fly under radar coverage. Some debate over whether bombs had cluster munitions or simply dispersed agent like LD-400 chemical bomb.
  • Deployed at least 166 R-400 bombs with 85 liters of biological agents each during the Gulf War. Deployed them at two sites. One was near an abandoned runway where it could fly in aircraft, arm them quickly, and disperse with no prior indication of activity and no reason for the UN to target the runway.
  • Filled at least 25 Scud missile warheads, and 157 bombs and aerial dispensers, with biological agents during the Gulf War.
  • Developed and stored drop tanks ready for use for three aircraft or RPVs with the capability of dispersing 2,000 liters of anthrax. Development took place in December 1990. Claimed later that tests showed the systems were ineffective.
• The UN found, however, that Iraq equipped crop spraying helicopters for biological warfare and held exercises and tests simulating the spraying of Anthrax spores.

• Iraqi Mirages were given spray tanks to disperse biological agents.
  • Held trials as late as January 13, 1991.
  • The Mirages were chosen because they have large 2,200 liter belly tanks and could be refueled by air, giving them a longer endurance and greater strike range.
  • The tanks had electric valves to allow the agent to be released and the system was tested by releasing simulated agent into desert areas with scattered petri dishes to detect the biological agent. UNSCOM has video tapes of the aircraft.

• Project 144 at Taji produced at least 25 operational Al Husayn warheads. Ten of these were hidden deep in a railway tunnel, and 15 in holes dug in an unmanned hide site along the Tigris.

• Biological weapons were only distinguished from regular weapons by a black stripe.

• The UN claims that Iraq has offered no evidence to corroborate its claims that it destroyed its stockpile of biological agents after the Gulf War. Further, Iraq retains the technology it acquired before the war and evidence clearly indicates an ongoing research and development effort, in spite of the UN sanctions regime.

• UNSCOM reported in October 1997 that:
  • Iraq has never provided a clear picture of the role of its military in its biological warfare program, and has claimed it only played a token role.
  • It has never accounted for its disposal of growth media. The unaccounted for media is sufficient, in quantity, for the production of over three times more of the biological agent -- Anthrax -- Iraq claims to have been produced.
  • Bulk warfare agent production appears to be vastly understated by Iraq. Expert calculations of possible agent production quantities, either by equipment capacity or growth media amounts, far exceed Iraq’s stated results.
  • Significant periods when Iraq claims its fermenters were not utilized are unexplained.
  • Biological warfare field trials are underreported and inadequately described.
  • Claims regarding field trials of chemical and biological weapons using R400 bombs are contradictory and indicate that, “more munitions were destroyed than were produced.
  • The Commission is unable to verify that the unilateral destruction of the BW-filled Al Hussein warheads has taken place.”
  • There is no way to confirm whether Iraq destroyed 157 bombs of the R400 type, some of which were filled with Botulin or anthrax spores.
  • “The September 1997 FFCD fails to give a remotely credible account of Iraq’s biological program. This opinion has been endorsed by an international panel of experts.”

• The current status of the Iraqi program is as follows (according to US intelligence as of February 19, 1998):

<table>
<thead>
<tr>
<th>Agent</th>
<th>Declared Concentrated Amount</th>
<th>Declared Total Amount</th>
<th>Uncertainty</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Liters</td>
<td>Gallons</td>
<td>Liters</td>
</tr>
<tr>
<td>Anthrax</td>
<td>8500</td>
<td>12,245</td>
<td>8500</td>
</tr>
<tr>
<td>Botulin toxin</td>
<td>19,400</td>
<td>NA</td>
<td>380,000</td>
</tr>
</tbody>
</table>

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Gas Gangrene 340 90 3,400 900 Amounts could be higher
Clostridium Perfingens

Aflatoxin NA NA 2,200 581 Major uncertainties

Ricin NA NA 10 2.7 Major uncertainties

• UNSCOM cannot confirm the unilateral destruction of 25 warheads. It can confirm the destruction of 23 of at least 157 bombs. Iraq may have more aerosol tanks.

• UN currently inspects 79 sites -- 5 used to make weapons before war; 5 vaccine or pharmaceutical sites; 35 research and university sites; thirteen breweries, distilleries, and dairies with dual-purpose capabilities; eight diagnostic laboratories.

• Iraq retains laboratory capability to manufacture various biological agents including the bacteria which cause anthrax, botulism, tularemia and typhoid.

• Many additional civilian facilities are capable of playing some role in biological weapons production.

• A State Department spokesman reported on November 16, 1998 that there is a large discrepancy between the amount of biological growth media -procured and the amount of agents that were or could have been produced. Baghdad has not adequately explained where some 8,000 pounds (3,500 kg) of the material went out of some 68,000 pounds (31,000 kg) of biological growth media it imported. Iraq’s accounting of the amount of the agent it produced and the number of failed batches is seriously flawed and cannot be reconciled on the basis of this full disclosure Iraq has made.

• The CIA reported in January 1999 that Iraq continues to refuse to disclose fully the extent of its BW program. After four years of denials, Iraq admitted to an offensive program resulting in the destruction of Al Hakam—a large BW production facility Iraq was trying to hide as a legitimate biological plant. Iraq still has not accounted for over a hundred BW bombs and over 80 percent of imported growth media—directly related to past and future Iraqi production of thousands of gallons of biological agent. This lack of cooperation is an indication that Baghdad intends to reconstitute its BW capability when possible.

• A State Department report in September 1999 noted that:
  • Iraq refuses to allow inspection of thousands of Ministry of Defense and Military Industries Commission documents relating to biological and chemical weapons and long-range missiles.
  • In 1995, Iraqis who conducted field trials of R-400 bombs filled with biological agents described the tests to UNSCOM experts in considerable detail, including the use of many animals. These field trials were reflected in Iraq’s June 1996 biological weapons declaration. Yet, amazingly, Iraq now denies that any such trials were conducted at all.
  • In September 1995, Iraq finally declared the existence of two projects to disseminate biological agents from Mirage F-1 and MiG-21 aircraft, yet there is no evidence that the prototype weapons and aircraft were ever destroyed. There is also no evidence that the 12 Iraqi helicopter-borne aerosol generators for biological weapon delivery were ever destroyed.
  • Apart from one document referring to a single year, no Iraqi biological weapon production records have been given to the UN—no records of storage, of filling into munitions, or of destruction. This is why UNSCOM refers to Iraq’s biological weapons program—which deployed SCUD missile warheads filled with anthrax and botulinum toxin to be ready for use against Coalition forces—as a “black hole.”
  • The Iraqis have repeatedly changed their story about their biological weapons warheads. Iraq has revised several times its declarations regarding the precise locations of warhead destruction and the fill of warheads. The movements of concealed warheads prior to unilateral destruction, claimed by Iraq, have been proven to be false.
  • The DCI Nonproliferation Center (NPC) reported in February 2000 that “We do not have any direct evidence that Iraq has used the period since Desert Fox to reconstitute its WMD programs, although given its past behavior, this type of activity...
must be regarded as likely. The United Nations assesses that Baghdad has the capability to reinitiate both its CW and BW programs within a few weeks to months, but without an inspection monitoring program, it is difficult to determine if Iraq has done so.”

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Nuclear Weapons

- Inspections by UN teams have found evidence of two successful weapons designs, a neutron initiator, explosives and triggering technology needed for production of bombs, plutonium processing technology, centrifuge technology, Calutron enrichment technology, and experiments with chemical separation technology. Iraq had some expert technical support, including at least one German scientist who provided the technical plans for the URENCO TC-11 centrifuge.

- Iraq’s main nuclear weapons related facilities were:
  - Al Atheer - center of nuclear weapons program. Uranium metallurgy; production of shaped charges for bombs, remote controlled facilities for high explosives manufacture.
• Al Tuwaitha - triggering systems, neutron initiators, uranium metallurgy, and hot cells for plutonium separation. Laboratory production of UO\textsubscript{2}, UCL\textsubscript{4}, UF\textsubscript{6}, and fuel fabrication facility. Prototype-scale gas centrifuge, prototype EMIS facility, and testing of laser isotope separation technology.

• Al Qa Qa - high explosives storage, testing of detonators for high explosive component of implosion nuclear weapons.

• Al Musaiyib/Al Hatteen - high explosive testing, hydrodynamic studies of bombs.

• Al Hadre - firing range for high explosive devices, including FAE.

• Ash Sharqat - designed for mass production of weapons grade material using EMIS.

• Al Furat - designed for mass production of weapons grade material using centrifuge method.

• Al Jesira (Mosul) - mass production of UCL\textsubscript{4}.

• Al Qaim - phosphate plant for production of U308.

• Akashat uranium mine.

• Iraq had three reactor programs:
  • Osirak/Tammuz I 40 megawatt light-water reactor destroyed by Israeli air attack in 1981.
  • Isis/Tammuz II 800 kilowatt light water reactor destroyed by Coalition air attack in 1991.
  • IRT-5000 5 megawatt light water reactor damaged by Coalition air attack in 1991.

• Iraq used Calutron (EMIS), centrifuges, plutonium processing, chemical defusion and foreign purchases to create new production capability after Israel destroyed most of Osiraq.

• Iraq established a centrifuge enrichment system in Rashidya and conducted research into the nuclear fuel cycle to facilitate development of a nuclear device.

• After invading Kuwait, Iraq attempted to accelerate its program to develop a nuclear weapon by using radioactive fuel from French and Russian-built reactors. It made a crash effort in September, 1990 to recover enriched fuel from its supposedly safe-guarded French and Russian reactors, with the goal of producing a nuclear weapon by April, 1991. The program was only halted after Coalition air raids destroyed key facilities on January 17, 1991.

• Iraq conducted research into the production of a radiological weapon, which disperses lethal radioactive material without initiating a nuclear explosion.
  • Orders were given in 1987 to explore the use of radiological weapons for area denial in the Iran-Iraq War.
  • Three prototype bombs were detonated at test sites -- one as a ground level static test and two others were dropped from aircraft.
  • Iraq claims the results were disappointing and the project was shelved but has no records or evidence to prove this.

• UN teams have found and destroyed, or secured, new stockpiles of illegal enriched material, major production and R&D facilities, and equipment– including Calutron enriching equipment.

• UNSCOM believes that Iraq’s nuclear program has been largely disabled and remains incapacitated, but warns that Iraq retains substantial technology and established a clandestine purchasing system in 1990 that it has used to import forbidden components since the Gulf War.

• The major remaining uncertainties are:
  • Iraq still retains the technology developed before the Gulf War and US experts believe an ongoing research and development effort continues, in spite of the UN sanctions regime.
  • Did Iraq conceal an effective high speed centrifuge program.

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• Are there elements for radiological weapons.

• Is it actively seeking to clandestinely buy components for nuclear weapons and examining the purchase of fissile material from outside Iraq.

• Is it continuing with the development of a missile warhead suited to the use of a nuclear device.

• A substantial number of declared nuclear weapons components and research equipment has never been recovered. There is no reason to assume that Iraqi declarations were comprehensive.

• The CIA reported in January 1999 that Iraq continues to hide documentation, and probably some equipment, relating to key aspects of past nuclear activities. After years of Iraqi denials, the IAEA was able to get Iraq to admit to a far more advanced nuclear weapons program and a project based on advanced uranium enrichment technology. However, Baghdad continues to withhold significant information about enrichment techniques, foreign procurement, and weapons design.

• The DCI Nonproliferation Center (NPC) reported in February 2000 that “We do not have any direct evidence that Iraq has used the period since Desert Fox to reconstitute its WMD programs, although given its past behavior, this type of activity must be regarded as likely. The United Nations assesses that Baghdad has the capability to reinitiate both its CW and BW programs within a few weeks to months, but without an inspection monitoring program, it is difficult to determine if Iraq has done so.”

• Press reports in February 2000 claimed that Iraq might have developed biological warfare agents it had kept secret from UNSCOM inspectors and which were never discovered. The reports followed similar warnings by UNSCOM experts on January 25, 2000 that Iraq might have done so, that not all suspected biological weapons production and research facilities had been inspected, and that the undiscovered weapons might include infectious viral agents.31

Source: Prepared by Anthony H. Cordesman, Co-Director, Middle East Program, CSIS.
Proliferation is a Supply, as Well as Demand, Driven Issue

The US and Israeli focus on proliferation in Iran and Iraq sometimes disguises the fact that proliferation is becoming globalized as well as regionalized. As the previous analysis has shown, Russia, China, and North Korea continue to be major sources of weapons, equipment, and technology that can be used to create and deliver chemical, biological, radiological, and nuclear weapons. The latest unclassified publications of the CIA track a continuing transfer of such technology into the Gulf, and it is supplemented by major transfers of dual-use and smuggled technology out of the West and the rest of Asia.\textsuperscript{32}

A recent CIA analysis describes the role of global suppliers as follow: \textsuperscript{33}

“…Russian entities during the reporting period continued to supply a variety of ballistic missile-related goods and technical know-how to countries such as Iran, India, and Libya. Iran’s earlier success in gaining technology and materials from Russian entities accelerated Iranian development of the Shahab-3 MRBM, which was first flight-tested in July 1998. Russian entities during the second six months of 1999 have provided substantial missile-related technology, training, and expertise to Iran that almost certainly will continue to accelerate Iranian efforts to develop new ballistic missile systems.

“During the second half of 1999, Russia also remained a key supplier for civilian nuclear programs in Iran, primarily focused on the Bushehr Nuclear Power Plant project. With respect to Iran’s nuclear infrastructure, Russian assistance enhances Iran’s ability to support a nuclear weapons development effort. By its very nature, even the transfer of civilian technology may be of use in Iran’s nuclear weapons program. We remain concerned that Tehran is seeking more than a buildup of its civilian infrastructure, and the IC will be closely monitoring the relationship with Moscow for any direct assistance in support of a military program. In addition, Russia supplied India with material for its civilian nuclear program during this reporting period.

“Russian entities remain a significant source of biotechnology and chemicals for Iran. Russia’s world-leading expertise in biological and chemical weapons would make it an attractive target for Iranians seeking technical information and training on BW and CW agent production processes.

“Russia (along with its sister republics in the FSU) also remains an important source of conventional weapons and spare parts for Iran, which is seeking to upgrade and replace its existing conventional weapons inventories.

“… the Russian government’s commitment, willingness, and ability to curb proliferation-related transfers remain uncertain. Moreover, economic conditions in Russia continued to deteriorate, putting more pressure on Russian entities to circumvent export controls. Despite some examples of restraint, Russian businesses continue to be major suppliers of WMD equipment, materials, and technology to Iran. Specifically, Russia continues to provide Iran with nuclear technology that could be applied to Iran’s weapons program. Monitoring Russian proliferation behavior, therefore, will remain a very high priority.

“…Throughout the second half of 1999, North Korea continued to export significant ballistic missile-related equipment and missile components, materials, and technical expertise to countries in the Middle East, South Asia, and North Africa. Pyongyang attaches a high priority to the development and sale of ballistic missiles, equipment, and
related technology. Exports of ballistic missiles and related technology are one of the North’s major sources of hard currency, which fuel continued missile development and production.

“…Chinese missile-related technical assistance to Pakistan increased during this reporting period. In addition, firms in China provided missile-related items, raw materials, and/or assistance to several countries of proliferation concern—such as Iran, North Korea, and Libya.

“…China’s 1997 pledge not to engage in any new nuclear cooperation with Iran has apparently held, but work associated with two remaining nuclear projects—a small research reactor and a zirconium production facility—continues. The Intelligence Community will continue to monitor carefully Chinese nuclear cooperation with Iran.

“Prior to the reporting period, Chinese firms had supplied CW-related production equipment and technology to Iran. The US sanctions imposed in May 1997 on seven Chinese entities for knowingly and materially contributing to Iran’s CW program remain in effect. Evidence during the current reporting period suggests Iran continues to seek such assistance from Chinese entities, but it is unclear to what extent these efforts have succeeded. In June 1998, China announced that it had expanded its chemical export controls to include 10 of the 20 Australia Group chemicals not listed on the CWC schedules.

“…As was the case in 1998, entities in Western countries in 1999 were not as important as sources for WMD-related goods and materials as in past years—with the exceptions of Iran and Libya, where entities in Western European countries in particular remain significant suppliers for their WMD programs.

As the previous chapters have shown, these trends show that the US must do far more than simply try to enforce sanctions at the buyer level. It must keep up constant diplomatic pressure on suppliers and consider sanctions as well.

The Meaning of the Globalization and Regionalization of Proliferation for Gulf Defense

There is little present prospect for the effective globalization or regionalization of arms control, and there is a near certain prospect that Iran and Iraq will acquire more sophisticated and lethal weapons of mass destruction and long range delivery systems. In the process, they will acquire weapons that they can use to strike with precision at critical strategic targets like oil shipments, desalination plants, etc. At the same time, the spread of biotechnology, petrochemical technology, food processing technology, fermenters, and pharmaceutical technology will steadily increase regional capabilities to produce advanced biological weapons that are storable, resistant to heat and light, and have nuclear lethabilities.

Iran and Iraq do face international sanctions, and/or are signatories to arms control agreements that have such sanctions. The irony is that the “globalism” of arms control provides a strong incentive to keep their efforts covert. The good news is that such constraints have often
reduced their rate of activity and success, and have sharply increased the cost of acquiring and deploying key threats like nuclear weapons. The bad news is that nations like India and Pakistan have shown such barriers do not block military change, and nations like Iran and Iraq, continue to acquire new technology necessary to improve their capabilities.34

In practice, this means that the US and its Gulf allies will probably face the following continuing problems dealing with proliferation:

- **Making weapons of mass destruction an international norm:** As the Iran-Iraq War has shown, the present political barriers to the use of weapons of mass destruction are tenuous and can vanish under the pressure of war. The Gulf War showed that missile attacks against population centers and “horizontal escalation” are very real threats, and the course of the Gulf War might well have led to the widespread use of weapons of mass destruction if it had occurred several years later. There is a serious risk that a new conflict using weapons of mass destruction – such as a nuclear conflict between India and Pakistan – could suddenly “legitimize” both proliferation and the use of weapons of mass destruction in the sense that it could become a new “norm” for many developing countries.

- **Proliferating global “breakout capabilities:** Proliferation has been slowed down in the past by the difficulties in acquiring nuclear weapons, and in weaponizing chemical and biological weapons with real effectiveness. Some of these trends may continue. While most powers can now design fission and boosted weapons, there has been only limited progress in the technology needed to develop fissile material. This situation seems likely to continue, although the acquisition of high speed centrifuge technology, the technology needed to build small reactors designed to produce plutonium, or fissile material from the FSU present continuing risks. It would take the collapse of the political restraints enforced by the NNPT, and a major increase in supplier willingness to sell relevant technologies to radically change the present mix of risks the US faces.

- **Similar constraints do not apply to chemical and biological weapons:** The global spread of biotechnology, more food processing facilities, fertilizer plants, and petrochemical plants is slowly giving a wide range of nations the ability to manufacture advanced chemical and biological weapons. Moreover, the spread of missile warhead, cluster munition, sprayer, and UAV technology is simplifying the weaponization of such weapons.

- **The risk posed by biotechnology:** Modern biological weapons can easily be as lethal as fission and boosted weapons. They can also be used to attack in ways that incapacitate or threaten the agricultural sector, or modified – with or without genetic engineering – to defeat current vaccines and medical treatment. “Globalization” is making such weapons steadily cheaper and more accessible, and is creating a wide range of national research and production capabilities that can mass produce such weapons with only a limited chance of detection. There is a high probability that the threat of nuclear proliferation, which dominated the “globalism” of the last half of the 20th Century will be matched or surpassed by the threat posed by the globalization of biotechnology.

- **Long-range strike systems:** Iran, and Iraq are demonstrating that developing states can acquire the technology to produce missile boosters capable of launching weapons of mass destruction with enough
accuracy to hit city-sized targets at ranges of more than 1,000 miles, and eventually to intercontinental ranges. At the same time, the proliferation of GPS guidance systems and specialized commercial jet engines is greatly reducing the cost of developing and producing cruise missiles with ranges in excess of 600 miles.35

- **Weapons of mass destruction and asymmetric warfare:** The technologies and weapons necessary to carry out covert and proxy attacks using weapons of mass destruction are far cheaper than those required to use ballistic and cruise missiles. They are also becoming available to non-state actors like terrorists and extremists, and such attacks offer the potential ability to attack without attribution.

- **Homeland and allied defense:** All of these risks combine to create a need for homeland defense that most western states have not seriously contemplated since the early days of the thermonuclear era and that Southern Gulf states have just begun to consider. It is far from clear that Iran and Iraq will have the kind of political leadership that is as subject to rationale deterrence as Russia. Certainly, Iraq has been erratic enough in the past to create serious concerns about their conduct, and even a “rational” Iran might become involved in a process of escalation that ended in little restraint. The practical problem is that there are many forms of attack that could be used that do not require an overt declaration of war or clearly identify the attacker, and that the most costly form of defense – national and theater missile defenses – deal with only the most costly and overt form of attack. As a result, effective counterproliferation may require a global shift to a broad mix of costly homeland defense measures ranging from missile defense and counterproliferation to response measures designed to limit damage and deal with its effects.

There are no certainties involved in any of these threats. It is impossible to assign reliable probabilities to their nature, timing, or effectiveness, and it is at least possible that diplomacy, political change, and economic development may reduce them, roll them back, or at least prevent the emergence of major paradigm shifts. It is equally possible, however, that they will interact to create the same broad changes in the military environment in the Gulf as the more “conventional” aspects of asymmetric warfare.36

It is also a grim fact of life that this particular brave new world can interact disastrously with the world’s dependence on Gulf energy exports, and with the growth of far more lethal forms of asymmetric warfare and terrorism. The energy facilities of the Middle East are already often highly lucrative targets. The hyperurbanization of the Gulf, usually with one key urban area that defines the political structure of each country, makes most Gulf nations “one-bomb states.” The use of such weapons would also force the near or total collapse of most regional economies. The end result that proliferating states may be able to conduct “wars of intimidation” against those states that cannot retaliate or which are not supported by defenses and outside deterrents. If
such weapons are ever actually used, the result may be a form of “globalization” that sinks all boats rather than raising them.

**US Counterproliferation Capabilities**

Table IX-3 illustrates just how lethal future Iranian and Iraqi capabilities can be. The chemical weapons in this table may not have anything approaching the destructive power of biological and nuclear weapons. However, they cannot be disregarded -- particularly if an attacking state should use aircraft or cruise missiles to deliver such weapons in aerosol form -- rather than in the far less lethal form likely to result from ballistic missile attacks. Chemical weapons could still radically alter the nature of the escalation and targeting in a future Gulf conflict. At the same time, they cannot threaten the survival of states in their current form.

In contrast, biological weapons are a true weapon of mass destruction. They can be as destructive as small nuclear weapons, and both Iran and Iraq have biological weapons efforts. Further, covert delivery of such weapons is by far the most lethal way of using them. It would take a very advanced ballistic missile warhead to disseminate a survivable and fully lethal biological agent over a wide area at the right height. At the same time, crude unconventional delivery systems like releasing a biological agent from a ship, roof top, or commercial aircraft can be very effective.

The US, for example, experimented during the Cold War by dispersing inert particulate matter the same size and weight as Anthrax spores. It delivered such spores from commercial vessels moving along the coast of New Jersey and in “terrorist” attacks sprinkling the spores over commuters rushing home through Grand Central Station in New York. Both dissemination systems were very effective and would have produced very high death rates. Both would have required human intelligence identifying the attackers in advance to prevent heavy losses. Metal detectors and other technological means would not have been effective, and most conventional anti-terrorist protective measures would have failed.
The effects of biological and nuclear weapons should not be exaggerated, a single nuclear device could destroy a majority of the population, particularly under conditions where increases in the long-term death rate were included in the estimate of casualties shown in Table IX-3 -- which only includes short-term deaths within a 48 hour to seven day period. At the same time, a nuclear attack on the capital of any of the states just listed could destroy its current political leadership, much of its economy, and a great deal of the state’s cohesion and national identity. Recovery would be questionable, and the social and economic impact of any such strike would last a decade or more.

Advances in technology also present growing problems. There have been no breakthroughs in the production of fissile material, but there is a vast amount of fissile material in the former Soviet Union, and more and more countries could produce an aircraft deliverable nuclear device in a matter of a few months or years if they could buy weapons-grade material. The very nature of biotechnology means all of the countries in the Middle East are steadily acquiring the capability to make extremely lethal, dry-storable biological weapons, and to do so with fewer and fewer indicators in terms of imports of specialized technology, with more use of dual-use or civilian production facilities, and in smaller spaces.

All of these developments have dangerous war-fighting effects. Nations like Iran and Iraq that are in the process of acquiring a few nuclear weapons or serious biological weapons tend to see wars involving such weapons in terms of threats to enemy population centers and often feel they have little option other than to strike or concede if intimidation fails. They also keep their capabilities covert, and scarcely debate the potential use of such weapons as part of their normal process of decision making. This approach to acquiring truly lethal weapons of mass destruction can lead to rapid massive escalation or surprise attacks -- particularly if Iran or Iraq fears preemption, structures its forces to launch under attack, and/or seeks to strike before its opponent can bring its retaliatory forces and air and missile defenses to full readiness. Fewer weapons do not mean great stability and security, and they almost inevitably mean counter-value targeting.
As the East-West arms race showed, there also is no logical stopping point in such an arms race. Broadening the number and type of weapons to allow strikes against military targets creates an incentive to be able to strike as many targets as possible. Obtaining the option to strike at tactical military targets lowers the threshold of escalation and may lead a given side to be more willing to attack. Reducing the vulnerability of steadily larger inventories of weapons and delivery systems may lead to a loss of control, or more lethal plans to preempt or launch under attack. Larger forces potentially increase the risk that weapons directed against military targets will hit population centers. Further, a state under existential attack by one neighbor may lash out against other states -- a pattern Iraq already has exhibited by launching missile attacks against Israel during the Gulf War.

It cannot be stressed too firmly, however, that the possibility of such “worst-case” risks does not make them probable. Rational, moderate leaders do not take existential risks or escalate to genocidal conflicts. At the same time, it is difficult to say that proliferation leads to predictable crisis behavior or escalation ladders. Further, they create problems in terms of establishing any clear limits as to how the potential use of given types of weapons of mass destruction -- like chemical weapons -- relate to the use of biological weapons and nuclear weapons. These uncertainties mean that the US must at least consider worst-case contingencies.
### Table IX-3

**The Comparative Effects of Biological, Chemical, and Nuclear Weapons Delivered Against a Typical Urban Target in the Middle East**

Using missile warheads: Assumes one Scud sized warhead with a maximum payload of 1,000 kilograms. The study assumes that the biological agent would not make maximum use of this payload capability because the country deploying such systems cannot make an efficient warhead. It is unclear this assumption is realistic.

<table>
<thead>
<tr>
<th>Area Covered in Square Kilometers</th>
<th>Deaths Assuming 3,000-10,000 people</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical: 300 kilograms of Sarin nerve gas with a density of 70 milligrams per cubic meter</td>
<td>0.22</td>
</tr>
<tr>
<td>Biological: 30 kilograms of Anthrax spores with a density of 0.1 milligram per cubic meter</td>
<td>10</td>
</tr>
</tbody>
</table>

**Nuclear:**

One 12.5 kiloton nuclear device achieving 5 pounds per cubic inch of over-pressure | 7.8 | 23,000-80,000 |
One 1 megaton hydrogen bomb | 190 | 570,000-1,900,000 |

Using one aircraft delivering 1,000 kilograms of Sarin nerve gas or 100 kilograms of anthrax spores: Assumes the aircraft flies in a straight line over the target at optimal altitude, and dispenses the agent as an aerosol. The study assumes that the biological agent would not make maximum use of the weapons weight carrying capability. It is unclear this assumption is realistic.

<table>
<thead>
<tr>
<th>Area Covered in Square Kilometers</th>
<th>Deaths Assuming 3,000-10,000 people</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear sunny day, light breeze</td>
<td>Sarin Nerve Gas</td>
</tr>
<tr>
<td>Anthrax Spores</td>
<td>46.00</td>
</tr>
<tr>
<td>Overcast day or night, moderate wind</td>
<td>Sarin Nerve Gas</td>
</tr>
<tr>
<td>Anthrax Spores</td>
<td>140.00</td>
</tr>
<tr>
<td>Clear calm night</td>
<td>Sarin Nerve Gas</td>
</tr>
<tr>
<td>Anthrax Spores</td>
<td>300.00</td>
</tr>
</tbody>
</table>

The US has begun to develop a more effective counterproliferation program, but this effort has been slow, has often had a somewhat theoretical character, and has sometimes substituted rhetoric, research, and development, for reality. The US did form a new Counterproliferation Support Program in the mid-1990s. This program was intended to bring a new degree of coordination to some $3 billion worth of on-going programs that affect some aspect of counterproliferation, including theater ballistic missile defense, and the Department of Defense requested $108 million in new funding for the office in FY1996.\(^{37}\)

The US has also begun to develop a more precise set of goals for counterproliferation that can be applied to specific military capabilities in the Gulf. Secretary Perry listed eight possible US responses in dealing with the problem of proliferation in his FY1996 annual report, and these remain relevant today: \(^{38}\)

- Dissuasion to convince non-weapons of mass destruction states that their security interests are best served through not acquiring weapons of mass destruction.
- Denial to curtail access to technology and materials for weapons of mass destruction through export controls and other tools,
- Arms control efforts to reinforce the Nuclear Non-Proliferation Treaty, Biological and Chemical Weapons Conventions, nuclear free zones, conventional arms treaties that stabilize arms races, confidence and security building measures, and Anti-Ballistic Missile Treaty clarification efforts to allow US deployment of advanced theater ballistic missile defenses.
- International pressure to punish violators with trade sanctions, to publicize and expose companies and countries that assist proliferators, and to share intelligence to heighten awareness of the proliferation problem.
- Defusing potentially dangerous situations by undertaking actions to reduce the threat from weapons of mass destruction already in the hands of selected countries -- such as agreements to destroy, inspect, convert, monitor, or even reverse their capabilities.
- Military capabilities to be prepared to seize, disable, or destroy weapons of mass destruction in time of conflict.
- Defensive capabilities, both active (theater missile defenses) and passive (protective gear and vaccines) that will mitigate or neutralize the effects of weapons of mass destruction and enable US forces to fight effectively even on a contaminated battlefield.
The US made counterproliferation a military mission as part of its Unified Command Plan on May 24, 1995, and has progressively improved its plans to deal with such threats.\textsuperscript{39} Department of Defense plans for FY2001 describe the situation as follows:\textsuperscript{40}

…the threat or use of chemical and biological weapons, is a likely condition of future warfare, especially in the early stages of war for purposes of disrupting U.S. operations and logistics. These weapons may be delivered by ballistic missiles, cruise missiles, aircraft, special operations forces, or other means. This requires that U.S. forces continue to improve their capabilities to locate and destroy such weapons, preferably before such weapons can be used, and to defend against and manage the consequences if these weapons are used. Capability enhancements alone are not enough. Equally important is continuing to adapt U.S. doctrine, operational concepts, training, and exercises to take full account of the threat posed by chemical and biological weapons and other likely asymmetric threats. Moreover, given that the United States will most likely conduct future operations in coalition with other countries, the United States must also continue to encourage its friends and allies to train and equip their forces for effective operations in chemical and biological weapons environments.

…The Department has progressed substantially toward fully integrating considerations of nuclear, biological, and/or chemical weapons use against U.S. forces into its military planning, acquisition, intelligence, and international cooperation activities. These include efforts to:

- Embed counterproliferation considerations in all aspects of the planning and programming process.
- Adapt military doctrine and operational plans to deal with NBC weapons in regional contingencies.
- Adjust acquisition programs to ensure that U.S. forces will be adequately trained and equipped to operate effectively in contingencies involving NBC threats.
- Reallocate intelligence resources to provide better information about adversary NBC capabilities and how they are likely to be used
- Undertake multilateral and bilateral cooperative efforts with U.S. allies and friends to develop a common defense response to the military risks posed by NBC proliferation.

The Quadrennial Defense Review underscored the need for these efforts; accordingly, the Secretary of Defense in 1997 increased planned spending on counterproliferation by $1 billion over the Future Years Defense Program.

DoD must meet two key challenges as part of its strategy to ensure future NBC attack preparedness. It must institutionalize counterproliferation as an organizing principle in every facet of military activity, from logistics to maneuver and strike warfare. It must also internationalize those same efforts to ensure U.S. allies and potential coalition partners train, equip, and prepare their forces to operate with U.S. forces under NBC conditions.

To advance the institutionalization of counterproliferation, the Joint Staff and CINCs will develop a joint counter–NBC weapons operational concept that integrates both offensive and defensive measures. This strategy will serve as the basis for refining existing doctrine so that it more fully integrates all aspects of
counter-NBC operations. In addition, the Services and CINCs will place greater emphasis on regular individual, unit, joint, and combined training and exercises that incorporate realistic NBC threats. The Services will work to develop new training standards for specialized units, such as logistics and medical units, and larger formations to improve their ability to perform complex tasks under prolonged NBC conditions. Finally, many counterproliferation-related capabilities must be available prior to or very early in a conflict. The Services will develop capability packages that provide for prepositioning or early deployment of NBC and theater missile defense capabilities and personnel into theaters of operations. The timing necessary for the arrival of such capabilities will in part determine whether or not those capabilities reside in active or reserve components.

Unless properly prepared to deal with NBC threats or attacks, allies and friends may present vulnerabilities for a U.S.-led coalition. In particular, potential coalition partners cannot depend on U.S. forces to provide passive and active defense capabilities to counter NBC threats. U.S. counterproliferation cooperation with its NATO allies through the Senior Defense Group on Proliferation provides a template for improving the preparedness of long-standing allies and other countries that may choose to act in concert with the United States in future military coalitions. Similar efforts with allies in Southwest Asia and Asia-Pacific will continue to ensure that potential coalition partners for major theater wars have effective plans for NBC defense of populations and forces.

**Force Improvements Affecting Counterproliferation Capability**

The problem is that the US has not got following up by creating a comprehensive program for acting on these options. In fact, the US has had considerable difficulty in defining the exact programs that it should fund. The Department of Defense does have a major research and development effort to improve related intelligence, battlefield surveillance, passive defense, active defense, and counter-force capabilities, as well as related counter-terrorism, export control and arms control inspection activities.

US work on counterproliferation has also identified 16 priority technologies and 14 warfighting capabilities where the US must make improvements in its counterproliferation capabilities. These warfighting capabilities were selected as part of the Joint Staff’s Warfighting Capabilities Assessment (JWCA) process. They can be grouped into seven areas where US capabilities in the Gulf all need major improvement:

- *Detection and characterization of biological and chemical agents.* This initiative is intended to accelerate the fielding of stand-off and point-detection and characterization systems by up to six years. It also addresses the integration of sensors into existing and planned carrier platforms, emphasizing man-portability and compatibility with UAVs.
• *Detection, characterization, and defeat of hard, underground targets.* The US is seeking new sensors, enhanced lethality, and penetrating weapons to increase the probability of defeating the target while minimizing the risk of collateral damage.

• *Detection, localization and neutralization of weapons of mass destruction inside and outside the US.* The US is seeking to identify and evaluate systems, force structures, and operational plans to protect key military facilities and logistic nodes, and conduct joint exercises to improve the capability to respond to potential biological and chemical threats.

• *Development and deployment of additional passive defense capabilities for US forces, including development and production of biological agent vaccines.* This program will develop and field improved protective suits, shelters, filter systems, and equipment two to five years faster than previously planned. It also restores funding to the development of improved decontamination methods.

• *Support for weapons of mass destruction-related armed control measures include strengthening the NNPT, CTB, and BWC.* They include establishing a COCOM successor regime, and improving controls on exports and technology by strengthening the MTCR, Nuclear Suppliers Group and Australia Group.

• *Missile defense capabilities, with primary emphasis on theater ballistic missile defenses.* This activity involves improvements in active and passive defenses, attack operations, and improvements in BM/C'I as well as the deployment of theater missile defenses. The primary focus, however, is on anti-ballistic missile defenses, and in the near-term, this involves the development of the Patriot Advanced Capability Level-3 (PAC-3/ERINT), Navy area theater missile defense (Aegis), and theater high altitude area defense (THAAD).

Such goals, priorities, and research and development activities are all very well, but warfighters cannot use RDT&E activity in the field. They need actual deployments to have warfighting capability. The US gave early deployment priority to programs to detect and characterize biological and chemical weapons beginning in FY1995 -- including programs using new UAVs and protected vehicles. From FY1996 on, it began to deploy new emitter identifiers to identify and track ships carrying NBC-related cargoes. It accelerated the long-range biological stand-off detector system, and joint lightweight protective suit program. It improved its targeting systems to attack NBC facilities and minimize collateral damage. It improved intelligence support for counterproliferation efforts, strengthened cooperative programs with allied forces, and continued to invest heavily in new theater missile defense programs.
The US, however, has deferred many new program initiatives, partly because of the need to allocate resources to conventional programs and partly because of the need to eliminate duplicative and low-priority research efforts and to focus on specific options to correct the gaps in existing US capabilities.\(^{42}\)

**Counterstrike and Missile Defense Capabilities**

US military planners have long emphasized the need for the early arrival of an integrated missile defense, and the Congress has placed a new emphasis on theater missile defense (TMD) in its mark-up of the FY1996 defense budget. Theater missile defense is seen as performing three critical roles: reinforcing the deterrence of the use of weapons of mass destruction, providing active counterproliferation defenses in combat, and protecting the infrastructure, ports, prepositioned equipment, and allied forces necessary to support forces deploying from CONUS and outside the theater.\(^{43}\)

The US has already offered its Southern Gulf allies early warning data on missile launches against them, and has made at least the tacit recommendation that that the Southern Gulf states develop an integrated theater ballistic missile defense system to supplement or replace their present IHawk and Patriot surface-to-air missiles.

The Department of Defense summarizes its present plans to develop and deploy theater ballistic missile defenses as follows:

- … the Department’s immediate missile defense priority is to develop, procure, and deploy TAMD systems to protect key facilities and forward–deployed elements of the U.S. armed forces, as well as allies and friends. This plan envisions time–phased acquisition of a multi–tier, interoperable ballistic missile defense system that provides defense in depth against theater ballistic and cruise missiles....The increased emphasis on interoperable air and missile defenses has led to a family of systems concept. A key aspect of the family of systems approach is to leverage the synergy among air, ballistic, and cruise missile defenses, and to integrate various systems in a comprehensive effort to defeat the threat. This concept calls for a flexible combination of integrated, interoperable TAMD systems capable of coalition joint theater operations. It includes several individual weapon systems, various sensors, and advanced battle management/command, control, communications, computers, and intelligence capabilities.
• Lower-tier systems remain the top priority to defeat short-range ballistic missiles. The Patriot Advanced Capability–3 (PAC–3) and the Navy Area Defense systems are the key lower-tier systems for the TAMD mission. PAC–3 will provide air defense of ground combat forces and defense of high-value assets against high-performance, air-breathing, and theater ballistic missiles. The FY 2001 budget begins to procure PAC–3 missiles, with first unit equipped (FUE) projected for FY 2001. Consistent with congressional direction, the program has completed two successful intercepts and is awaiting a final decision before proceeding to low-rate initial production.

• The Navy Area Defense program, using a reconfigured SPY–1 phased-array radar and an upgraded version of the Standard Missile (Block IVA) on Aegis-equipped ships, will provide U.S. forces, allied forces, and areas of vital national interest at sea and in coastal regions with an active defense against theater ballistic and cruise missiles. Low-rate initial production of the Block IVA missiles will begin in FY 2001 in support of developmental and operational testing prior to planned FUE in FY 2003. As of the second quarter of FY 1999, an interim Navy Area Theater Ballistic Missile Defense software capability, Linebacker, was deployed and put into operation on two ships.

• The Department has worked with its international partners, Germany and Italy, to restructure the Medium Extended Air Defense System (MEADS), to include a three-year Risk Reduction Effort (RRE). The RRE will allow the Department to take advantage of less costly program options that build on capabilities from existing TMD weapons systems, such as the PAC–3. The NATO MEADS Management Agency awarded a contract to MEADS International (comprised of Lockheed Martin, Daimler Chrysler Aerospace AG, and Alenia Marconi Systems) in November 1999 to begin work on the next phase of the program. The RRE effort will focus on reducing the risk and cost of the critical elements of the systems (i.e., fire control radar and mobile launcher) needed to fulfill the requirements for a highly mobile, rapidly deployable TMD system capable of providing 360-degree coverage for maneuver forces. The Department fully funded the MEADS program by adding $721 million from FY 2002 to FY 2005.

• Upper-tier systems—the Theater High Altitude Area Defense (THAAD) system and the Navy Theater Wide program—are designed to intercept incoming missiles at high altitudes in order to defend larger areas, defeat medium- and intermediate-range ballistic missiles, and increase theater commanders’ effectiveness against weapons of mass destruction (WMD). THAAD will make possible more effective protection of broad areas, dispersed assets, and population centers against TBM attacks. With two recent successful intercept tests, the Department determined that the THAAD program had met the exit criteria necessary for entering the engineering and manufacturing development phase of acquisition. Based on this decision, an FUE of FY 2007 is anticipated for THAAD.

• The Navy Theater Wide system builds upon the existing Aegis Combat System as well as the Navy Area Defense system and is funded to continue Aegis Leap Intercept (ALI) flight testing through FY 2002. The Leap testing program will determine whether a modified standard missile, operating in conjunction with the Aegis weapon system, can intercept a ballistic missile in the exoatmosphere. The ALI flight test results will provide the data necessary to determine whether the program performance supports accelerated development and deployment of the system, which would require additional funds in FY 2003 and the subsequent fiscal years. Currently the budget provides for continued development through the Future Years Defense Program at approximately $200 million per year.

• As an additional layer of missile defense, the Airborne Laser (ABL) will engage ballistic missiles during their boost phase of flight. By terminating powered flight early, ABL causes a missile’s warhead to fall...
short of its intended target. ABL development is paced to accomplish a lethality demonstration against an in–flight ballistic missile in FY 2005.

- **Cruise missile defenses (CMD)** are either evolving from existing systems or are being developed from scratch. The Cooperative Engagement Capability is being used to net together air defense radar systems while investigations of selected ballistic missile defense weapons’ elements, such as missile defense sensors; elevated network sensors; battle management/command, control, and communications; and weapons, are underway to adapt and apply them to CMD. The investigations include elements from PAC–3 and Navy Area lower–tier systems. The CMD development strategy is to identify and leverage the synergy possibilities among ballistic missile, cruise missile, and air defense, and to employ them to build–up CMD via an integration of weapons systems into a comprehensive network that can defeat the cruise missile threat. In addition, CMD–focused advanced technology programs are investigating ways to add depth to existing capability, such as shooting down land attack cruise missiles at extended ranges, possibly even over an adversary’s territory. One such program is the Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System (JLENS), which will provide a long–endurance, extended range detection and tracking capability required to defeat the land attack cruise missile threat. To position the Department to capitalize on all CMD developments, a collaborative process is underway to devise concepts for joint employment and a TAMD investment plan, including CMD. The combatant commanders in chief, the Services, the Ballistic Missile Defense Organization, and the Joint Theater Air and Missile Defense Organization are participating in this collaborative process.

- **...As part of broader efforts to enhance the security of U.S., allied, and coalition forces against ballistic missile strikes and to complement U.S. counterproliferation strategy, the United States is exploring opportunities for theater ballistic missile defense cooperation with its allies and friends. The objectives of U.S. cooperative efforts are:**

  - To provide effective missile defense for U.S., allied, and friendly troops, and for allied and friendly civilian populations.
    - To strengthen U.S. security relationships.
    - To enhance collective deterrence of missile attacks.
    - To share the burden of developing and fielding theater missile defenses.
    - To enhance interoperability between U.S. forces and those of allies and friends.

  - **...The United States is taking an evolutionary and tailored approach to allied cooperation that accommodates varying national programs and plans, as well as special national capabilities. This approach includes bilateral and multilateral research and development, off–the–shelf purchases, and coproduction of TMD components or entire systems. Furthermore, as part of an ongoing initiative aimed at countering the TBM threat, the United States is sharing early warning data on launches of theater–range ballistic missiles with allies and friends as a means of engendering greater cooperation on theater missile defense.

  - **...U.S.–Israeli cooperative programs, including shared early warning on theater missile launches and the development of the Arrow weapon system, assist Israel in developing a ballistic missile defense capability to deter and, if necessary, defend against current and emerging ballistic missile threats in the region.**

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Planned interoperability with U.S. theater missile defense systems will afford Israel a more robust defense. Moreover, the program provides technical benefits for both sides by expanding the theater missile defense technology base and providing risk mitigation for U.S. weapon systems.

These theater missile defense programs offer significant potential benefits, but most are in far more trouble than the Department’s plans indicate, and are experiencing major development, cost, and effectiveness problems. They now only seem likely to be deployable after 2010, and they serious questions about their area defense capability, because the US is currently placing on the wide-area defense coverage to eliminate any risk it may violate the ABM Treaty. This may be the equivalent of “overkill” in terms of arms limitations and “underkill” in terms of effective missile defense. It could sharply degrade the effectiveness of US missile defense efforts, and may make area-defense of a region like the Gulf unaffordable.

**Extended Deterrence with US Strategic Forces and Nuclear Weapons**

There is one other important option for counterproliferation. The US can deal with the problem of Iranian and Iraqi proliferation through the threat of conventional or nuclear retaliation as well as by efforts at prevention and defense. The US demonstrated its potential capabilities for conventional retaliation during its strategic strikes against Iraq during the Gulf War, but it has never publicly stated that it has a doctrine of conventional strategic retaliation to deal with Iranian or Iraqi use of weapons of mass destruction.

US policy has been ambiguous about providing nuclear guarantees, but it has not rejected them. The US Nuclear Posture Review of 1993 concluded that, 44

> “the US does not have a purely national deterrent posture, it extended the deterrent posture of its nuclear arsenal to its allies. A very progressive aspect of US nuclear posture is that it is, in part, an international posture. The NPR strongly supports continued commitment to NATO and Pacific allies.”

The omission of any specific mention of extending the US nuclear umbrella to cover the Gulf and Middle East does not mean that the US should or would not provide such coverage. In 1990, President Bush and Secretary Baker at least implied that the US might use such weapons in response to an Iraqi use of weapons of mass destruction during the Gulf War. On April 26, 1996,
Secretary Perry hinted that the US might use nuclear weapons to deal with the chemical threat from Libya, although his press spokesman later stressed conventional options.\textsuperscript{45} Further, the Joint Staff directed in their Joint Strategic Capabilities Plan beginning in 1992 that US forces should target weapons of mass destruction in “threat” states and USCENTCOM is known to have assisted the US Strategic Command in identifying suitable threat states and targets. This has led to reports that targets in states like Iran and Iraq are included in the Single Integrated Operational Plan (SIOP) used for nuclear targeting.\textsuperscript{46}

US officials may well feel that any public statement that the US might use nuclear weapons in regional contingencies would do more to provoke hostile states into proliferating than to deter their use of weapons of mass destruction, and that any such US threats should be carefully targeted to deal with specific contingencies. Nevertheless, it is far from clear that the US now has a well-defined doctrine for extended deterrence, for using conventional or nuclear weapons against the threats posed by weapons of mass destruction, and for signaling to potential threat states the conditions under which the US might retaliate or preempt. The Department of Defense has consistently failed to deal with this issue in its policy statements since 1993. Its FY1997-FY2002 budget requests, and recent reports on proliferation, have rarely discussed the counterforce aspects of counterproliferation and have then focused heavily on conventional weapons.\textsuperscript{47}

This inattention dramatizes the potential need to develop a retaliatory doctrine tailored to the defense of the Gulf. It also raises questions about the long-term regional implications of cuts in US nuclear capabilities. The US has already reduced its active nuclear stockpile more than 60\% since the Cold War and will reduce it by well over 80\% by 2005. The US has also eliminated about 75\% of all of its nuclear weapons storage facilities, including most forward-deployed storage sites outside the US. It has removed all tactical nuclear weapons from its ground force, taken nuclear weapons off of its carriers, removed most nuclear weapons from its tactical aircraft, and removed nuclear-armed cruise missiles from its surface ships.\textsuperscript{48}
These are all important steps towards reducing the nuclear arms race, but there are limits as to how far the US should go until the Gulf becomes a weapons of mass destruction-free zone. If Iran or Iraq should acquire nuclear weapons, the US will almost certainly be forced to extend its nuclear umbrella to the Gulf, either through its bombers or systems like its submarine-launched cruise missiles.

**The Problem of Proxies, Unconventional Means and Terrorism**

Finally, much of the current discussion of counterproliferation, defenses, and extended deterrence assumes that the enemy will be a state that has declared war and/or uses an orthodox military delivery system. It is far from clear that this is the case. Iran, Iraq, or some other threat might chose to deliver weapons of mass destruction using covert means, some proxy or terrorist organization, or a commercial transport rather than a weapons system. It is impossible to explore all of the options involved in an overview of US power projection capabilities in the Gulf, but some have been discussed in previous chapters and Table IX-4 provides a brief outline of the possibilities. These factors cannot be ignored in any realistic assessment of the risk posed by nuclear, chemical, and biological weapons, and the US must tailor its counter proliferation capabilities in the Gulf as much around acts of asymmetric warfare as missile defense, conventional retaliations, and extended deterrence.
Table IX-4

The Problem of Terrorism and Unconventional Warfare

- Existing and projected detection and control technologies, arms control proposals, and concepts for missile defense assume that the primary threats are organized states and that relatively large efforts must be used.
- Conventional structures of deterrence assume identifiable and limited sets of opponents and similar values in dealing with issues like mutual destruction. Terrorist movements may be willing to take catastrophic risks, as may leaders who identify themselves with state and/or see martyrdom as a valid alternative to victory.
- War may not be between states or fought for limited strategic objectives. It may be a war of proxies or terrorists. It may be fought to destroy peoples or with minimal regard for collateral damage and risks.
- The target of unconventional uses of weapons of mass destruction may not be military in the normal sense of the term. It may be a peace process, US commitment to the defense of a given region, a peace keeping force, an election or ruling elite, or growing cooperation between formerly hostile groups.
- Terrorist organizations have already attempted to use crude chemical weapons. The development and use of chemical and biological weapons is well within the capability of many extremist and terrorist movements, and states can transfer weapons or aid such movements indirectly or with plausible deniability.
- Covert or unconventional delivery means may be preferable to both states and non-state organizations. Cargo ships, passenger aircraft, commercial vehicles, dhows, or commercial cargo shipments can all be used, and routed through multiple destinations. A well established series of covert transport and smuggling networks exist throughout the region. Biological weapons can be manufactured in situ.
- The Marine Corps Barracks incident has already shown the potential value of “mass terrorism,” as had the media impact of the Oklahoma City bombing and disruptive effect of far more limited events like the suicide bombings by Hamas and the assassination of Yitzak Rabin.
- Biological weapons and chemical present special problems because they can be used in so many ways. Chemical poisons were once used to contaminate the Israeli fruit group. Infectious biological agents could be used to mirror image local diseases or with long gestation times. Persistent nerve agents could be used in subways, large buildings, shopping malls/bazaars, etc. to create both immediate casualties and long term risks. Mixes of biological and chemical agents could be used to defeat detection, protection gear or vaccines.
- Arms control efforts assume large state efforts with detectable manufacturing and weaponization programs in peacetime. The development of a capability to suddenly manufacture several hundred biological and chemical weapons with little or no warning is well within the state of the art using nothing but commercial supplies and equipment, and much of the R&D effort could be conducted as civil or defensive research.
- Unconventional and terrorist uses of weapons can involve the use of extremely high risk biological weapons transmitted by human carriers, commercial cargoes, etc.
- The incentives for the unconventional use of weapons of mass destruction increase in proportion to the lack of parity in conventional weapons, the feelings of hopelessness by alienated or extremist groups, or the prospect of catastrophic defeat.
- Similarly, the incentive for the unconventional use of weapons of mass destruction will increase in direct proportion to the perceived effectiveness of theater missile and other regular military defense systems.
- Rogue operations will be a constant temptation for state intelligence groups, militant wings of extremist groups, revolutionary forces, etc.
Such attacks are technically feasible and could offer Iran and Iraq significant advantages in a wide range of scenarios. These contingencies are the most threatening form of asymmetric warfare the US could face in the Gulf, and the range of contingencies could include the following types of cases:

- A radiological powder is introduced into the air conditioning systems of Saudi high-rise buildings or tourist hotels. Symptoms are only detected over days or weeks and public warning is given several weeks later. The authorities detect the presence of such a power, but cannot estimate its long-term lethality and have no precedents for decontamination. Tourism collapses, and the hotels eventually have to be torn down and rebuilt.

- An Iraqi/Iranian-backed terrorist group smuggles parts for a crude gun-type nuclear device into Israel or bought in the marketplace. The device is built in a medium sized commercial truck. A physics student reading the US Department of Defense weapons effects manual maps Tel Aviv to maximize fall out effects in an area filled with buildings with heavy metals and waits for a wind maximizing the fall out impact. The bomb explodes with a yield of only 8 kilotons, but with an extremely high level of radiation. Immediate casualties are limited but the long-term death rate mounts steadily with time. Peace becomes impossible and security measures become Draconian. Immigration halts and emigration reaches crisis proportions. Israel as such ceases to exist.

- Several workers move drums labeled as cleaning agents into a large shopping mall, large public facility, subway, train station, or airport. They dress as cleaners and are wearing what appear to be commercial dust filters or have taken the antidote for the agent they will use. They mix the feedstocks for a persistent chemical agent at the site during a peak traffic period. Large scale casualties result, and Draconian security measures become necessary on a national level. A series of small attacks using similar "binary" agents virtually paralyze the economy, and detection is impossible except to identify all canisters of liquid.

- Immunized terrorists visit a US carrier or major Marine assault ship during the first hours of visitor’s day during a port call in the Middle East. They are carrying Anthrax powder in bags designed to make them appear slightly overweight. They slowly scatter the powder as they walk through the ship visit. The immediate result is 50% casualties among the ship’s crew, its Marine complement, and the visitors that follow. The US finds it has no experience with decontaminating a large ship where Anthrax has entered the air system and is scattered throughout closed areas. After long debates over methods and safety levels, the ship is abandoned.

- An Iraqi/Iranian-backed terrorist group seeking to "cleanse" a nation of its secular regime and corruption introduces a modified type culture of Ebola or a similar virus into an urban area. It scatters infectious cultures in urban areas for which there is no effective treatment. By the time the attack is detected, it has reached epidemic proportions. Medical authorities rush into the infected area without proper protection, causing the collapse of medical facilities and emergency response capabilities. Other nations and regions have no alternative other than to isolate the nation or center under attack, letting the disease take its course.

- An Iraqi/Iranian-backed terrorist group modifies the valves on a Japanese remote-controlled crop spraying helicopter which has been imported legally for agricultural purposes. It uses this system at night or near dawn to spray a chemical or biological agent at altitudes below radar coverage in a line-source configuration. Alternatively, it uses a large home-built RPV with simple GPS guidance. The device eventually crashes undetected into the sea or in the desert. Delivery of a chemical agent achieves far higher casualties than any conventional military warhead. A biological agent is equally effective and the first symptoms appear days after the actual attack -- by which time treatment is difficult or impossible.

- A truck filled with what appears to be light gravel is driven through the streets of Riyadh, Kuwait City, Tehran, or Tel Aviv during rush hour or another maximum traffic period. A visible powder does come out through the tarpaulin
covering the truck, but the spread of the power is so light that no attention is paid to it. The driver and his assistant are immunized against the modified form of Anthrax carried in the truck that is being released from behind the gravel or sand in the truck. The truck slowly quarters key areas of the city. Unsuspected passersby and commuters not only are infected, but carry dry spores home and into other areas. By the time the first major symptoms of the attack occur some 3-5 days later, Anthrax pneumonia is epidemic and some septicemic Anthrax has appeared. Some 40-65% of the exposed population dies and medical facilities collapse causing serious, lingering secondary effects.

- Iraq equips a freighter or dhow to spread Anthrax along a coastal area in the Gulf. It uses a proxy terrorist group, and launches an attack on Kuwait City and Saudi oil facilities and ports. It is several days before the attack is detected, and the attacking group is never fully identified. The form of Anthrax involved is dry and time encapsulated to lead to both massive prompt casualties and force time consuming decontamination. Iraq not only is revenged, but benefits from the resulting massive surge in oil prices.

Such scenarios may seem to borrow plots from bad spy novels and science fiction, but all of the scenarios are at least technically possible. These scenarios also illustrate the fact that Iraq does not need sophisticated military delivery systems or highly lethal weapons of mass destruction, but can use terrorism to pose existential threats, complex mixes of weapons of mass destruction, and mix terrorism with elements of covert action and deniability. As a result, they present a major challenge to both the "revolution in military affairs" and US counterproliferation programs.

Missile and conventional defenses can do nothing to prevent these ultimate forms of asymmetric attacks. Improved intelligence and dedicated efforts to train and equip allied internal security forces can. So can a clear US commitment to retaliating against such an attack on any Southern Gulf ally, including the possible use of nuclear weapons in retaliation against a truly devastating attack.

Effective counterproliferation capability requires a dedicated US effort to detect and defend against asymmetric attacks on its Gulf allies as well as the creation of the kind of well defined offensive options that can attack as a powerful deterrent and serve as a means of retaliation that will prevent Iran or Iraq from exploiting an attack and deter any repetition.

The US should also recognize that such attacks may be directed at its Arab allies outside the Gulf such as Egypt and other regional allies like Israel and Turkey. It is possible that Britain or some other European coalition ally could be a target. US forces in the theater are certainly as much a possible target as any ally, and so are major US facilities ranging from embassies and
businesses. Such attacks would also be the most effective way Iran and Iraq could attack the American homeland and do so with the most hope of anonymity and least risk of attribution. The asymmetric use of weapons of mass destruction is another key aspect of the “globalization” of proliferation.

**Implications for US Policy**

In the near-term, the US can probably deal with proliferation by Iran and Iraq by a combination of missile and air defense, using the Patriot and other US and regional air defenses, retaliatory threats or strikes, using conventional air and missile power, and passive defense measures like chemical protection gear. It is doubtful, however, that such measures will be adequate much beyond the early 2000s, and it is increasingly doubtful that arms control measures and efforts to limit technology transfer to Iran and Iraq offer the US and the Southern Gulf states even mid-term security against Iran and Iraq.

The US will need a far more capable program in the future, and this should involve the following US policies:

- *The development of a comprehensive counterproliferation future year budget program focused on deployed warfighting capabilities and not research and development, and with clear milestones for improving these capabilities over time.* There should be a detailed and fully funded five year plan for improving deployed US intelligence, battlefield surveillance, passive defense, active defense, and counter-force capabilities, as well as related counter-terrorism, export control and arms control inspection activities. This should be supported by a 10 or 20 year RDT&E plan oriented at near and mid-term deployment and with clearly described plans to deploy the technologies under study.
• **The US needs to improve its capability to use strike aircraft and cruise missiles against the facilities and actual weapons systems linked to weapons of mass destruction.** These programs will reinforce ongoing efforts that include the development and deployment of improved sensors, ELINT capabilities, and intelligence collection assets, along with the ability to conduct 24 hour operations and respond to new targeting data at a near real-time pace.

• **The US needs to develop and deploy an integrated air and missile defense capability in the Gulf.** The US needs a clear plan to choose between RDT&E options and to actually deploy theater ballistic missile defenses. Such defenses must be clearly tied to equally effective defenses against aircraft and cruise missiles, and covert or terrorist attacks using chemical, biological, radiological, and nuclear weapons.

• The US should coordinate with its Southern Gulf allies, and develop a clear plan for providing extended deterrence, including the possible US use of nuclear weapons against any Gulf power that uses weapons of mass destruction against US or allied forces and the territory of any ally. The US should make it clear that it will target weapons of mass destruction, military, and leadership targets in Iraq and Iraq, and that nuclear targeting will be an option. Ambiguity and uncertainty have their place; the Gulf is not one of them. The clear and certain threat of force will be clearly understood, and minimize the political complications if the US has to use it. It should be clear to both Iran and Iraq, and the world, that the US will regard any attack on Southern population centers using any weapon of mass destruction as justification for using massive conventional strikes, and possibly nuclear weapons, against the attacker’s population centers.

• **The US should extend this doctrine to any covert, asymmetric, or proxy use of weapons of mass destruction against an ally.** As has been mentioned earlier, effective
counterproliferation capability requires a dedicated US effort to detect and defend against asymmetric attacks on its Gulf allies as well as the creation of the kind of well-defined offensive options that can attack as a powerful deterrent and serve as a means of retaliation that will prevent Iran or Iraq from exploiting an attack and deter any repetition. The US should also recognize that such attacks may be directed at its Arab allies outside the Gulf such as Egypt and other regional allies like Israel and Turkey. It is possible that Britain or some other European coalition ally could be a target. US forces in the theater are certainly as much a possible target as any ally, and so are major US facilities ranging from embassies and businesses.

- **One key aspect of the effort will be to reexamine US physical protection methods.** Although the US pays in excess of $4 billion a year for the improved physical security of US military, diplomatic, and federal facilities, this effort is largely designed only to reduce vulnerability to small attacks and the use of high explosives. Little effort is put into improving detection and defense against CBRN attacks or terrorism.

These policy recommendations may initially sound “hawkish” or “draconian.” They are not. The real dangers lie in the kind of ambiguity as to the US response that existed at the time of the start of the “tanker war” against Iran, and the Gulf War against Kuwait. Deterrence can only work in the Gulf if there are no doubts about what will happen if weapons of mass destruction are used, and if all concerned understand that the attacking nation may well be attacked in kind. The goal is to prevent any use of such weapons, not to bind the US to policies that may be well-intended, but which ultimately could create enough doubt about American resolve to encourage an attack on an ally.


4 Associated Press, July 15, 2000, 0935; Reuters, July 15, 2000, 0714.


6 July 16, 2000, 0826.

7 Reuters, July 17, 2000, 1257.

8 Reuters, July 15, 2000, 2158.

9 Reuters, July 18, 2000, 0634.


11 Associated Press, September 21, 2000, 1930; Reuters, September 28, 2000, 1236.

12 Associated Press, September 21, 2000, 1930; Reuters, September 28, 2000, 1236.

13 Associated Press, July 15, 2000, 0935; Reuters, July 15, 2000, 0714.

14 Associated Press, July 15, 2000, 0935; Reuters, July 15, 2000, 0714.

15 Reuters, July 17, 2000, 1257.

16 Reuters, July 15, 2000, 2158.


18 July 16, 2000, 0826.


35 National Intelligence Council, “Foreign Missile Developments and the Ballistic Missile Threat to the United States Through 2015, (September 1999 (www.cia.gov/cia/publications/nie/nie99);
36 For an interesting discussion of some of these issues, see Michael O’Hanlon, Technological Change and the Future of Warfare, Washington, Brookings, 2000, pp. 160-166.