CSIS_____

Center for Strategic and International Studies
1800 K Street N.W.
Suite 400
Washington, DC 20006
(202) 775-3270
For updates: CSIS.ORG "Military Balance"
To comment: Acordesman@aol.com

Proliferation in the "Axis of Evil":

North Korea, Iran, and Iraq

Anthony H. Cordesman
Arleigh Burke Chair in Strategy

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Part One

North Korean Force Trends

US Department of Defense Estimate of North Korean Actions and Intentions Involving Nuclear, Biological, and Chemical Weapons

Objectives, Strategies, and Resources

Despite the June 2000 summit meeting and meetings between high level U.S. and North Korean officials on the one hand, and economic turmoil and continued food shortages on the other, we believe North Korea remains committed to maintaining strong military forces. These forces continue to be deployed close to the border with South Korea in an offensively oriented posture, and North Korea's NBC and missile programs likely remain key components of its overall security strategy. The most likely large-scale regional war scenario over the near term, which would involve the United States, would be on the Korean peninsula. In recent years, North Korea has continued to pose a com-plex security challenge to the United States and its allies. Prior to the 1994 Agreed Framework, North Korea is believed to have produced and diverted sufficient plutonium for at least one, and possibly two, nuclear weapons. In addition, although North Korea froze the production of plutonium in 1994, there are concerns that North Korea is continuing with some elements of a nuclear weapons program. North Korea also possesses stockpiles of chemical weapons, which could be used in the event of renewed hostilities on the peninsula. Research and development into biological agents and toxins suggest North Korea may have a biological weapons capability. North Korea has hundreds of ballistic missiles available for use against targets on the peninsula, some of which are capable of reaching tar-gets in Japan. Its missile capabilities are increasing at a steady pace, and it has progressed to producing medium-range ballistic missiles (MRBMs). North Korea also has continued development of even longer-range missiles that would be able to threaten areas well beyond the region, including portions of the continental United States. As a result of U.S. diplomatic efforts, however, the Democratic People's Republic of Korea (DPRK) has maintained a moratorium on launches of long-range missiles for over one year.

Lastly, North Korea's willingness to sell its ballistic missiles and related missile technologies and, potentially, share its NBC expertise are major proliferation concerns. North Korea's centrally planned economic system has been crippled over the past decade and is unable to meet the most basic needs of its people, although there is limited evidence that the economic decline may have slowed. Certainly, international food aid administered through the United Nations World Food Program has played a significant role in alleviating the food crisis. North Korea likely will continue to require inter-national food assistance for the foreseeable future. The regime continues with its decades old policy to fund its military programs, including NBC and missile forces, at the expense of its civil economy.

Nuclear Program

The 1994 Agreed Framework between the United States and North Korea froze nuclear weapons material production at the Yongbyon and Taechon facilities. However, the United States believes North Korea pro-duced and diverted sufficient plutonium for at least one nuclear weapon prior to the agreement. (In any event, North Korea will have to satisfy the Interna-tional Atomic Energy Agency (IAEA) as to its exact plutonium holdings before key nuclear components can be delivered for the two light-water reactors that are to be provided under the Agreed Framework.) North Korea removed spent fuel from the Yongbyon reactor in 1994. Had Pyongyang reprocessed the spent fuel from the Yongbyon reactor, it could have pro-duced enough plutonium for several nuclear weapons. As part of the Agreed Framework, the IAEA has main-tained a continuous presence at Yongbyon, and IAEA personnel have monitored canning of the spent fuel from the reactor. The canning of all accessible spent fuel rods and rod fragments, which was carried out by a team from the United States, under the auspices of the Department of Energy (DOE), was completed in April 2000. The U.S. team maintains a presence at the site to continue maintenance activities. In 1998, the United States became concerned about an underground construction project at Kumchang-ni, in northern North Korea. The site was believed to be large enough to house a plutonium production facility and possibly a reprocessing plant. Through successful negotiations, U.S. officials were permitted to visit the facility at Kumchang-ni in May 1999. Based on the 1999 team's findings, it was concluded that the facility as then concurrently configured, was not suited to house graphite-moderated reactors or reprocessing operations. A second visit to Kumchang-ni was conducted in May 2000, during which the team found no evidence to contradict the 1999 conclusions. In the summer of 1999, the United States dispatched former Secretary of Defense William Perry to consult with North Korea on key U.S. security concerns such as its nuclear and missile programs. In the North Korea Policy Review, Dr. Perry concluded that the nuclear freeze instituted at Yongbyon's facilities remained in effect, although the U.S. remains concerned about possible continuing North Korean interest in a nuclear weapons program. Moreover, there is some evidence that North Korea has tried to procure technology that could have applications in its nuclear program. North Korea has ratified the NPT. It has not signed the Comprehensive Test Ban Treaty (CTBT). Dr. Perry recommended that the U.S. should seek the complete and verifiable cessation of testing, production, and deployment of missiles exceeding the parameters of the MTCR, and the complete cessation of export sales of such missiles and the equipment and technology associated with them.

Biological Program

North Korea has acceded to the Biological and Toxin Weapons Convention (BWC), but nonetheless has pursued biological warfare capabilities since the 1960s.Pyongyang's resources include a rudimentary (by Western standards) biotechnical infrastructure that could support the production of infectious biological warfare agents and toxins such as anthrax, cholera, and

plague. North Korea is believed to possess a munitions-production infrastructure that would allow it to weaponize biological warfare agents and may have biological weapons available for use.

Chemical Program

Like its biological warfare effort, we believe North Korea has had a long-standing chemical warfare program. North Korea's chemical warfare capabilities include the ability to produce bulk quantities of nerve, blister, choking, and blood agents, using its sizeable, although aging, chemical industry. We believe it possesses a sizeable stockpile of these agents and weapons, which it could employ should there be renewed fighting on the Korean peninsula.

North Korea is believed to be capable of weaponizing such stocks for a variety of delivery means. These would include not only ballistic missiles, but also artillery and aircraft, and possibly unconventional means.

In fact, the United States believes that North Korea has some long-range artillery deployed along the demilitarized zone (DMZ) and ballistic missiles, some of which could deliver chemical warfare agents against forward-based U.S. and allied forces, as well as against rear-area targets.

North Korean forces are prepared to operate in a contaminated environment; they train regularly in chemical defense operations and are taught that South Korean and U.S. forces will employ chemical munitions. North Korea has not signed CWC, nor it is expected to do so in the near future.

Ballistic Missiles

During the last several years, North Korea has made substantial progress with its ballistic missile forces in the areas of research and development, testing, deployment, and, most worrisome, exports. Despite efforts on the part of the United States and its East Asian allies to constrain North Korea's missile development, Pyongyang continues to move ahead.

North Korea produces SCUD B and SCUD C short-range ballistic missiles (SRBMs) as well as the No Dong MRBM. North Korea has over 500 SCUD missiles of various types in its inventory, and enough No Dong missiles for its own use as well as for export. In any attack on the South Korea, Pyongyang could use its missiles in an attempt to isolate the peninsula from strategic reinforcement. In addition, North Korea's No Dong missiles, with their 1,300 kilometer range, are capable of striking targets throughout the peninsula as well as in nearly all of Japan.

In August 1998, North Korea launched a three-stage Taepo Dong 1 system, which it characterized as a space launch vehicle (SLV) attempting to orbit a small satellite. The launch demonstrated several of the key technologies required to develop an ICBM, including stage separation. The existence of a third stage itself was an unanticipated development in the North Korean ballistic missile program. With the Taepo Dong 1, North Korea has now demonstrated the capability to reach the entire territory of South Korea and Japan, as well as large portions of China and Russia. Potentially, a three-stage Taepo Dong 1 SLV could deliver a light payload to the United States, although with very poor accuracy.

North Korea also has moved forward with the development of other longer-range missiles, which has become a matter of growing international concern. North Korea is developing the Taepo Dong 2 (ICBM), which could deliver a several-hundred kilogram pay-load to Alaska or Hawaii, and a lighter payload to the western half of the United States. A three stage Taepo Dong 2 could deliver a several-hundred kilogram pay-load anywhere in the United States. North Korea is much more likely to weaponize the more capable Taepo Dong 2 than the three-stage Taepo Dong 1 as an ICBM. During 1999, there were indications that North Korea would test the Taepo Dong 2, but Pyongyang in September 1999, announced it would refrain from testing long-range missiles while high-level talks to improve bilateral relations with the U.S. are ongoing. The DPRK subsequently reaffirmed the moratorium in June 2000, and again, in writing, in the October 2000 Joint Communique issue at the conclusion of Vice Marshal Jo Myong Rok's visit to Washington. During Secretary Albright's historic trip to Pyongyang 23-25 October, she discussed with DPRK Chairman Kim Jong Il a range of missile-related issues, including Kim's idea of trading long-range missile restraint for launches, outside DPRK borders, of DPRK civil satellites on non-DPRK boosters. However, significant issues remain to be resolved.

Cruise Missiles and Other Means of Delivery

North Korea has several types of short-range land-, air- and sea-launched anti-ship cruise missiles, which are potential means of delivery for NBC weapons. In the past, North Korea has produced two versions of anti-ship cruise missiles based on Soviet and Chinese designs; these have ranges of about 100 kilometers. In the future, North Korea may try to modify some of these anti-ship missiles to extend their range or acquire the technology to do so. Moreover, it may try to develop or purchase land attack cruise missiles. North Korea also has a variety of fighters, bombers, helicopters, artillery, rockets, mortars, and sprayers available as potential means of delivery for NBC weapons.

Role as Supplier

During the last several years, North Korea has been a major proliferator of ballistic missiles and related technologies. The sale of No Dong missile technology to Iran has created an immediate, serious and growing capability to target U.S. forces, and our allies in the Middle East. North Korea also has provided missile technology to Pakistan. Further, these sales have had an impact on the strategic balance in the Middle East and in South Asia. In addition, these exports could lead to additional proliferation. For example, were states like Iran or Pakistan to become missile producers, they in turn could sell the missiles to other states of concern, further upsetting regional balances of power. In the past, North Korea also has brokered deals for missle-related technologies and components produced by third parties for customers in the Middle East. Pyongyang attaches a high priority to the development and sale of ballistic missiles, equipment, and related technology, as these exports are one of the North's major sources of hard currency, which fuel continued missile development and production.

Source: Department of Defense, Proliferation and Response, January 2001, North Korea section.

The Uncertain Status of North Korean Force Developments

- There is no debate within the US intelligence community over the fact that North Korea has long had large stocks of chemical and biological weapons, and has deployed them in warheads that can be used in its Scud and extended range Scud missiles. There is more debate over whether North Korean has nuclear weapons and is continuing its nuclear weapons development and production program.

- The first major reports of North Korea's nuclear program began in 1993, when analysts found satellite reconnaissance evidence that a North Korean nuclear reprocessing center at Yongbyon had gone had begun to process plutonium. This led to a diplomatic confrontation and talks where the Clinton administration obtained a North Korean pledge to freeze plutonium production at the site. In exchange, the United States, South Korea and Japan agreed to give the North oil and technical assistance to build a peaceful nuclear power program. The agreement called for international monitoring of the Yongbyon site, and Energy Department experts were allowed to encase the spent fuel rods at the center to ensure that they could not be used for warheads. Before this production freeze, however, North Korea was able to produce about 26 pounds of weapons-grade plutonium. As a result, a consensus developed that North Korea could produce one or two bombs.

- The current debate focuses on what North Korean has done since that time. The Clinton Administration initially declared that North Korea had agreed to freeze its entire nuclear program. It later became clear, however, that the agreement covered only Yongbyon and did not preclude nuclear activity at other sites. North Korea then dumped radioactive nuclear fuel out of the heavy water reactor into a cooling pool in order to replace it with fresh fuel rods. The US intelligence community estimated that the spent fuel rods contained enough plutonium for 10 nuclear warheads, and this raised serious questions as to whether North Koreans was covertly going on with its nuclear program.

- A report in the *New York Times*, which has been informally confirmed by several US experts, indicates that the Defense Intelligence Agency (DIA) began to report that it had detected a series of other secret sites, many of them underground, that analysts suspected were related to an ongoing nuclear program. By the late-1990's, DIA and the National Imagery and Mapping Agency, compiled a list of at least 10 potential sites which raised questions about their function without providing clear evidence of any weapons activity.

- One installation, at Kumchangri, was believed to house an underground nuclear reactor and plutonium reprocessing operation. In May 1999, this led the US to pressure North Korea to allow an inspection of the installation which had the same visual signatures as if North Korea was installing an underground a reactor, including the water supplies for water cooling. When North Korea did allow inspection, however, the US only found a series of empty tunnels with no large underground chamber able to hold a nuclear reactor. Another inspection in May 2000 had the same result.

- The *Times* reported that some intelligence experts feel the US gave North Korea too much warning before inspecting the site, making it possible for the North Koreans to hide its purpose. However, State Department officials became leary of the DIA estimates, another installation DIA suspected proved to be nothing more that an underground storage site for the memorabilia of the North Korean leadership.

- This eventually led Secretary of State Madeleine K. Albright and Lt. Gen. Patrick Hughes, director of the DIA, to clash over intelligence report suggesting that North Korea had built a storage installation that housed components for nuclear warheads. State Department officials indicated that DIA was reporting an over-pessimistic picture. DIA indicated in turn that the State Department was too willing to overlook reports of suspicious activity. In their view, the failure of a single inspection does not mean the United States should stop pressing the North Koreans about suspect installations, including the building suspected of housing warhead components. Some of the debate focused on an installation DIA suspected of being a storage building for components of nuclear warheads. The identity and exact location of this center, whose existence has not been released, but the Times reports that intelligence on the storage center was obtained at least three years ago, and was based not only on spy satellite photographs and intercepted communications, but also on "human intelligence" -- spies -- reporting to DIA.[i]

- What is clear is that North Korea is steadily acquiring more advanced missile forces in spite of major economic problems, its rapproachment talks with South Korea in June 2000, and its agreements to suspend the test firing of long-range missiles in September 1999 and June 2000. It has tested a booster that could allow it to develop missiles that could strike the US, and it has had a serious nuclear weapons development effort in the past. As Table III.5 shows, North Korea also has a wide range of missile programs. It also has already deployed large numbers of shorter-range missiles with chemical and probably biological warheads. These include extended range Scud-type missiles with ranges over 1,300 kilometers. The US intelligence community also reported in June 2000 that North Korea did not suspend any other aspects of development and production after it agreed to suspend missile tests in September 1999.

- North Korea launched a multistage Taepo Dong-1 missile across Japan on August 31, 1998 -- in an effort to place a satellite in orbit. The mission failed, but the United States and its allies were surprised and shocked by the missile's 2,000-kilometer range. David J. Osias, an officer of the Defense Intelligence Agency, stated that "The third stage concerns us. Nobody knew

they had it," during a national media update April 26-27, 1998 at the Army Space and Missile Defense Command headquarters.[ii]

- North Korea has limits. The Tapeo Dong 1 test was a failure, and the missile was anything but an advanced design. The first stage was modified from a liquid-fueled Scud and the second from the No Dong. Both are 1960s technology. The third stage was a small, solid-fueled rocket designed to put a small satellite into space. It was too small to carry a nuclear weapon or an effective biological payload and dispersal system, and the system was so inherently inaccurate that it was unclear it had growth potential to hit a city-sized target. US experts feel that North Korea has since abandoned work on the Taepo Dong-1 missile, and is now developing the Taepo Dong-2. This missile is a two-stage system that uses a cluster of No Dong engines in the first stage and a single No Dong in the second stage. It has never been tested.[iii]

- Furthermore, North Korea agreed to suspend further tests of long-range missiles in September 1999 -- largely as a result of the negotiating efforts of former Secretary of Defense William Perry,.[iv] This agreement was reached after the NIC report was written, and was renewed in June 2000.. However, US intelligence community also reported in June 2000 that North Korea did not suspend any other aspects of development and production after it agreed to suspend missile tests in September 1999.

- A CIA report in August 2000 also summarized the state of proliferation in North Korea as follows,[v]

- P'yongyang continues to acquire raw materials from out-of-country entities to produce WMD and ballistic missiles. During the reporting period, there were increased reflections of North Korean procurement of raw materials and components for its ballistic missile programs from various foreign sources, especially through firms in China. North Korea produces and is capable of using a wide variety of chemical and possibly biological agents, as well as their delivery means.

- During the second half of 1999, Pyongyang sought to procure technology worldwide that could have applications in its nuclear program, but we do not know of any procurement directly linked to the nuclear weapons program. We assess that North Korea has produced enough plutonium for at least one, and possibly two, nuclear weapons. The United States and North Korea are nearing completion on the joint project of canning spent fuel from the Yongbyon complex for long-term storage and ultimate shipment out of the North in accordance with the 1994 Agreed Framework. That reactor fuel contains enough plutonium for several more weapons.

- P'yongyang continues to seek conventional weapons via the gray market. In 1999, for example, North Korea acquired MiG-21 fighter aircraft from Kazakhstan.

- …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.

- These factors help explain why the report of the National Intelligence Council has seen North Korea as presenting the most serious near term threat to the US, and why this threat has been used as the rationale for setting early deadlines for the deployment of a US NMD system:[vi]

- "After Russia and China, North Korea is the most likely to develop ICBMs capable of threatening the United States during the next 15 years.

- North Korea attempted to orbit a small satellite using the Taepo Dong-1 SLV in August 1998, but the third stage failed during powered flight; other aspects of the flight, including stage separation, appear to have been successful.

- If it had an *operable* third stage and a reentry vehicle capable of surviving ICBM flight, a converted Taepo Dong-1 SLV *could* deliver a light payload to the United States. In these cases, about two-thirds of the payload mass would be required for the reentry vehicle structure. The remaining mass is probably too light for an early generation nuclear weapon but could deliver biological or chemical (BW/CW) warfare agent.

- Most analysts believe that North Korea *probably will test* a Taepo Dong-2 this year, unless delayed for political reasons. A two-stage Taepo Dong-2 could deliver a several-hundred kilogram payload to Alaska and Hawaii, and a lighter payload to the western half of the United States. A three-stage Taepo Dong-2 could deliver a several-hundred kilogram payload anywhere in the United States.

- North Korea is much *more likely* to weaponize the more capable Taepo Dong-2 than the three-stage Taepo Dong-1 as an ICBM."

- These comments are particularly striking in view of the fact North Korea launched a multistage Taepo Dong-1 missile across Japan on August 31, 1998 -- in an effort to place a satellite in orbit. The mission failed, but the United States and its allies were surprised and shocked by the missile's 2,000-kilometer range. David J. Osias, an officer of the Defense

Intelligence Agency, stated that "The third stage concerns us. Nobody knew they had it," during a national media update April 26-27, 1998 at the Army Space and Missile Defense Command headquarters.[vii]

- The fact remains, however, that the Korean test was a failure, and that the missile was anything but an advanced design. The first stage was modified from a liquid-fueled Scud and the second from the No Dong. Both are 1960s technology. The third stage was a small, solid-fueled rocket designed to put a small satellite into space. It was too small to carry a nuclear weapon or an effective biological payload and dispersal system, and the system was so inherently inaccurate that it was unclear it had growth potential to hit a city-sized target. US experts feel that North Korea has since abandoned work on the Taepo Dong-1 missile, and is now developing the Taepo Dong-2. This missile is a two-stage system that uses a cluster of No Dong engines in the first stage and a single No Dong in the second stage. It has never been tested.[viii]
- Furthermore, North Korea agreed to suspend further tests of long-range missiles in September 1999 -- largely as a result of the negotiating efforts of former Secretary of Defense William Perry,.[ix] This agreement was reached after the NIC report was written, and was renewed in June 2000.

CIA Estimate of North Korean Missile Force Trends – January 2002

North Korea has hundreds of Scuds and No Dong missiles and continues to develop the longer range Taepo Dong-2, which will enable the North to target the United States. In May 2001, however, Kim Chong-il unilaterally extended the North's voluntary flight-test moratorium—in effect since 1999—until 2003, provided negotiations with the United States proceeded.

North Korea has extended until 2003 the missile launch moratorium it announced late in 1999, although the North continues to work on the Taepo Dong-2 program. The Taepo Dong-2—capable of reaching parts of the United States with a nuclear weapon-sized payload—may be ready for flight-testing. The initial test likely would be conducted in a space launch configuration. Iran also is pursuing a longer range missile capability.

North Korea has assumed the role as the missile and manufacturing technology source for many programs. North Korean willingness to sell complete systems and components has enabled other states to acquire longer range capabilities earlier than otherwise would have been possible—notably the sale of the No Dong MRBM to Pakistan. The North also has helped countries to acquire technologies to serve as the basis for domestic development efforts—as with Iran's reverse-engineering of the No Dong in the Shahab-3 program. Meanwhile, Iran is expanding its efforts to sell missile technology.

Ballistic Missile Programs

Taepo Dong-2. The multiple-stage Taepo Dong-2—capable of reaching parts of the United States with a nuclear weapon-sized payload—may be ready for flight-testing. The North probably also is working on improvements to its current design.

The Taepo Dong-2 in a two-stage ballistic missile configuration could deliver a several-hundred-kg payload up to 10,000 km—sufficient to strike Alaska, Hawaii, and parts of the continental United States. If the North uses a third stage similar to the one used on the Taepo Dong-1 in 1998 in a ballistic missile configuration, then the Taepo Dong-2 could deliver a several-hundred-kg payload up to 15,000 km—sufficient to strike all of North America. A Taepo Dong-2 flight test probably would be conducted as an SLV with a third stage to place a small payload into the same orbit the North Koreans tried to achieve in 1998.

No Dong. The 1,300-km-range No Dong remains the longest-range ballistic missile North Korea has deployed.

WMD Payload Options: The Intelligence Community judged in the mid-1990s that North Korea had produced one, possibly two, nuclear weapons, although the North has frozen plutonium production activities at Yongbyon in accordance with the Agreed Framework of 1994. North Korea also has chemical and biological weapons programs.

Foreign Assistance: North Korea is nearly self-sufficient in developing and producing ballistic missiles and has demonstrated a willingness to sell complete systems and components that have enabled other states to acquire longer range capabilities earlier than would otherwise have been possible and to acquire the basis for domestic development efforts.

North Korean Missile Programs and Developments

Type	Names	Range (KM)	Warhead (Kg)	Stages	Service Status
SRBM	Hawsong 5, Scud B	302-340	1000	1	Since 1985
	Storable liquid fuel; TEL launch Sold to Iran and a number of other states.				
SRBM	Hwasong 6, Scud C	500	770	1	Since 1989
	Storable liquid fuel; TEL launch. Sold to Iran and Syria. Deployed in hardened, underground shelters in North Korea.				
MRBM	No Dong 1, Rodong 1, Scud D	1,350	1200	1	Since 1997
	Storable liquid fuel; Uses missile-erector-launcher (MEL). Seems similar to Shihab 3 in Iran and Ghauri program In Pakistan. First test over East China Sea in May 1993, but did not go over 500 kilometers. Iranian and Pakistani observers present at test. Estimate 50-100 missiles no produced.				
IRBM	Taep'o-Dong 1, No-Dong 2. Rodong 2, Scud X	1,500-2,200	700-1,000	2	1998?
	Some reports is similar to the Chinese DF-3.				
SLV	Taep'o-Dong 1 Space Launch-Vehicle	4,000	50-100	3	1998
	Partially successful test launch on August 23, 1998. Claim launched small satellite.				
ICBM	Taep'o-Dong 2, No Dong 3	4,000-6,000	700-1,000	2	2000+
ICBM	?	6,000+	100-500	3	?

Source: Adapted from Joseph S. Bermudez, Jr., "The Rise and Rise of North Korea's ICBMs, International Defense Review, 7/1999, pp. 57-61.

Part Two

Iranian Force Trends

Iran's Search for Weapons of Mass Destruction

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, 8 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 cites." 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 using 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 or assemble 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 Islaker. 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, Bagheri 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 1550 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. Itan tested the system again in July 2000, at a nominal range of 810 miles.x
- Iranian sources indicate that the missile has a 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 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." 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 Defence Minister Admiral Ali Shamkhani has said a larger missile, Shahab 4, was in production as a vehicle for launching satellites into space.xi
- 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 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.xii
- Secretary of Defense William Cohen stated that, xiii ``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 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.xiv

- 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.
- 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 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 backround 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 that the development of such a booster would give Iran significantly enhanced capabilities to develop an intercontinental ballistic missile.xv 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."xvi

    - 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 depends 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.

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    - 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.
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- 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 Galluci, 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.

- On July 15, 1998, the Rumsfled Commission reported that Iran had engines or engine designs for the Russian RD-214 rocket engine used in both Russian SS-4 and SL-7 space launch vehicle.
- 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; Kutznetzov (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.
- 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 2001 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."
  - 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 Febvruary 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.

- A Department of Defense report in January 2001 summarized Iranian developments as follows:
  - Iran has increased emphasis on its ballistic missile program. Currently, Iran has several hundred SCUD Bs and SCUD Cs and Chinese-made CSS-8 SRBMs.
  - It is now producing SCUD missiles, having received production assistance from North Korea. In recent years, Russian and Chinese entities have continued to supply a wide variety of missile-related goods, technology, and expertise to Iran. Iran is striving to indigenously produce ballistic missiles and become a supplier state. Iran's recent efforts have been on the development of the 1,300-kilometer range missile, which is based on the North Korean No Dong.
  - Iran flight-tested the Shahab-3 in July 1998 and July and September 2000. At this time, Iran likely has the capability to deploy limited numbers of Shahab-3. Iran has built and publicly displayed prototypes of this MRBM and may have achieved an emergency opera-tional capability for it. That is, it could deploy a limited number of the missiles in an operational mode during a perceived crisis. In fact, in July 2000, just prior to the missile's second flight test, the commander of Iran's Revolutionary Guards Corps stated that Iran had formed Shahab-3 units and built launching pads for the missiles. While this may overstate Iran's current capabilities, it clearly demonstrates Iran's intent.
  - In addition, Iran's Defense Minister 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 Minis-ter also has publicly mentioned plans for a "Shahab-5," which may be an IRBM or a space launch vehicle. Such statements, made against the backdrop of sustained cooperation with Russian, North Korean, and Chinese entities, suggest that Tehran may intend to develop and deploy a longer-range ballistic missile capability. In addition, Iran will likely continue to seek longer-range missiles and may have ICBM ambitions.
  - It could test a space launch vehicle, which would have ICBM applications, within the next 15 years. However, if Iran purchased an ICBM from North Korea or elsewhere, further development might not be necessary.
  - Iran has purchased land-, sea-, and air-launched short-range cruise missiles from China; it also has a variety of foreign-made air-launched short-range tactical missiles, which are potential means of delivery for NBC weapons. Many of these systems are deployed as anti-ship weapons in or near the Persian Gulf. In the future, Iran likely will continue to focus on its anti-ship missile capabilities and may try to develop its own missiles using technology it already has as a basis for such development efforts. In addition, Tehran also could try to purchase land attack cruise missiles to complement its ballistic missile force. However, the pace of any of these efforts will be determined by Iran's economic situation. Iran also has a variety of fighter aircraft, artillery, and rockets available as potential means of delivery for NBC weapons.

- The CIA reported in September 2001 that entities in Russia, North Korea, and China continued to supply crucial ballistic missile–related equipment, technology, and expertise to Iran. Tehran is using assistance from foreign suppliers and entities to support current development and 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 is in the late stages of developing the Shahab-3 medium-range ballistic missile (MRBM). Iran has built and publicly displayed prototypes for the Shahab-3 and has tested the Shahab-3 three times—July 1998, July 2000, and September 2000. In addition, Iran has publicly acknowledged the development of a 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.
- The CIA reported in January 2002 that:
    - Iran's missile inventory is among the largest in the Middle East and includes some 1,300-km-range Shahab-3 MRBMs, a few hundred SRBMs, and a variety of unguided rockets. Tehran's longstanding commitment to its ballistic missile programs—for deterrence and war-fighting—is unlikely to diminish.
    - The 1,300-km-range Shahab-3 MRBM—based on the North Korean No Dong—is in the late stages of development.
    - In addition to SRBM and MRBM development, Iran is likely to develop space launch vehicles to put satellites into orbit and to establish the technical base from which it could develop IRBMs/ICBMs capable of delivering payloads to Western Europe and the United States. Iran is likely to test these vehicles initially as SLVs and not as ballistic missiles to demonstrate an inherent IRBM/ICBM capability without risking the potential political and economic costs of a long-range missile test. Iran certainly is aware of the North Korean SLV/missile program and the benefits P'yongyang has tried to gain from the inherent ICBM capability posed by the Taepo Dong-1 and -2.
    - All agencies agree that Iran *could* attempt to launch an ICBM/SLV about mid-decade, although most agencies believe Iran is *likely* to take until the last half of the decade to do so. One agency further judges that Iran is unlikely to achieve a successful test of an ICBM before 2015.
    - Iranian acquisition of complete systems or major subsystems—such as North Korean TD-2 or Russian engines—could accelerate its capability to flight-test an ICBM/SLV.
    - If Iran were to acquire complete TD-2 systems from North Korea, it could conduct a flight test within a year of delivery, allowing time to construct a launch facility. Iran is unlikely to acquire complete ICBM/SLV systems from Russia.
    - In contrast, a halt or substantial decrease in assistance would delay by years the development and flight-testing of these systems.
    - Foreign assistance—particularly from Russia, China, and North Korea—will remain crucial to the success of the Iranian missile program for the duration of this Estimate.

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.
- 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 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 Movalled 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 tionyl 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,
    - 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.

- Western countries were important as sources for WMD-related goods and materials as in past years,,,entities in Western European countries in particular remain significant suppliers for their WMD programs. Increasingly rigorous and effective export controls and cooperation among supplier countries have led the other foreign WMD programs to look elsewhere for many controlled dual-use goods. Machine tools, spare parts for dual-use equipment, and widely available materials**,** scientific equipment**,** and specialty metals were the most common items sought.
- A Department of Defense report in January 2001 summarized Iranian developments as follows:
  - Iran has acceded to the Chemical Weapons Convention (CWC) and in a May 1998 session of the CWC Conference of the States Parties, Tehran, for the first time, acknowledged the existence of a past chemical weapons program. Iran admitted developing a chemical warfare program during the latter stages of the Iran-Iraq war as a "deterrent" against Iraq's use of chemical agents against Iran. Moreover, Tehran claimed that after the 1988 cease-fire, it "terminated" its program. However, Iran has yet to acknowledge that it, too, used chemical weapons during the Iran-Iraq War.
  - Nevertheless, Iran has continued its efforts to seek production technology, expertise and precursor chemicals from entities in Russia and China that could be used to create a more advanced and self-sufficient chemical warfare infrastructure. As Iran's program moves closer to self-sufficiency, the potential will increase for Iran to export dual-use chemicals and related equipment and technologies to other countries of proliferation concern.
  - In the past, Tehran has manufactured and stockpiled blister, blood and choking chemical agents, and weaponized some of these agents into artillery shells, mortars, rockets, and aerial bombs. It also is believed to be conducting research on nerve agents. Iran could employ these agents during a future conflict in the region. Lastly, Iran's training, especially for its naval and ground forces, indicates that it is planning to operate in a contaminated environment.
- The CIA reported in September 2001 that,
  - "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 a domestic capability to produce various types of weapons—chemical, biological, and nuclear—and their delivery systems. During the reporting period, the evidence indicates determined Iranian efforts to acquire WMD- and ACW-related equipment, materials, and technology focused primarily on entities in Russia, China, North Korea, and Western Europe.
  - Iran, a Chemical Weapons Convention (CWC) States party, already has manufactured and stockpiled chemical weapons — including blister, blood, choking, and probably nerve agents, and the bombs and artillery shells for delivering them. During the second half of 2000, Tehran continued to seek production technology, training, expertise, equipment, and chemicals that could be used as precursor agents in its chemical warfare (CW) program from entities in Russia and China."

- Prior to the reporting period, Chinese firms had supplied dual-use 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 shows Iran continues to seek such assistance from Chinese entities, but it is unclear to what extent these efforts have succeeded.

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,
    - 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.

- George Tenet, the Director of the CIA, testified before the Senate Foreign Relations Committee on March 20, 2000 and identified Iran as a key country seeking biological weapons. He stated that, "Iran, for example, driven in part by stringent international export controls, is acquiring the ability to domestically produce raw materials and the equipment to support indigenous biological agent production."

- A Department of Defense report in January 2001 reported that Iran has a growing biotechnology industry, significant pharmaceutical experience and the overall infrastructure to support its biological warfare program. Tehran has expanded its efforts to seek considerable dual-use biotechnical materials and expertise from entities in Russia and elsewhere, ostensibly for civilian reasons. Outside assistance is important for Iran, and it is also difficult to prevent because of the dual-use nature of the materials and equipment being sought by Iran and the many legitimate end uses for these items. Iran's biological warfare program began during the Iran-Iraq war. Iran is believed to be pursuing offensive biological warfare capabilities and its effort may have evolved beyond agent research and development to the capability to produce small quantities of agent. Iran has ratified the BWC.
- The CIA reported in September 2001 that, "Tehran continued 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. We judge that this equipment and know-how could be applied to Iran's biological warfare (BW) program. Iran probably began its offensive BW program during the Iran-Iraq war, and it may have some limited capability for BW deployment."

Nuclear Weapons

- The Shah established the Atomic Energy Organization of Iran in 1974, and rapidly began to negotiate for nuclear power plants.
- He concluded an extendible ten year nuclear fuel contract with the US in 1974, with Germany in 1976, and France in 1977.
- 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.
- 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 Fulashans. 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:
    - Iran attempted to buy highly enriched fissile material from Khazakstan. The US paid between $20 million and $30 million to buy 1,300 pounds of highly enriched uranium from the Ust-Kamenogorsk facility in Khazakstan 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, Adolofo 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 Ivanavov 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 agrements 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.
- 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 Tiblisi, 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.
  - 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, Ghoods Research Center, Iran Argham Co., Iran Electronic Industries, Iranian Research Organization, Ministry of Sepah, Research and Development Group, Sezemane 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 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.
  - 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 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 hexaflouride to make reactor fuel, and help in processing yellowcake.

- 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.

- 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 negations 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 hexaflouride 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.

- 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.

- 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:
- 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 visting Director General of the IAEA, Mohammed Elbaradei, that Iran was seeking IAEA help in running a nuclear research center west of Teheran 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,

    - 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 infratructure, 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 maker 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.

  - George Tenet, the Director of the CIA, testified before the Senate Foreign Relations Committee on March 20, 2000 and stated that, "We are concerned about the potential for states and terrorists to acquire plutonium, highly enriched uranium, and other fissile materials, and even complete nuclear weapons…Iran or Iraq could quickly advance their nuclear aspirations through covert acquisition of fissile material or relevant technology."

- A Department of Defense report in January 2001 reported that,

  - Although a signatory to NPT and the CTBT, Iran also is seeking fissile material and technology for weapons development through an elaborate system of military and civilian organizations. We believe Iran also has an organized structure dedicated to developing nuclear weapons by trying to establish the capability to pro-duce both plutonium and highly enriched uranium. 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 that could be used in numerous ways in support of efforts to pro-duce fissile material for a nuclear weapon. The potential availability of black market fissile material also might provide Iran a way to acquire the fissile material necessary for a nuclear weapon.

- Iran's success in achieving a nuclear capability will depend, to a large degree, on the supply policies of Russia and China or on Iran's successful illicit acqui-sition of adequate quantities of weapons-usable fissile material. Russia is continuing work on a 1,000-mega-watt power reactor at Bushehr. Although Russian officials have provided assurances that Russian cooperation with Iran will be limited to the Bushehr reactor project during the period of its construction, the United States Government is aware that a number of Russian entities are engaged in cooperation with Iran that goes beyond this project. One of Iran's primary goals is the acquisition of a heavy water-moderated,natural uranium-fueled nuclear reactor and associated facilities suitable for the production of weapons-grade plutonium. Although Bushehr will fall under IAEA safeguards, Iran is using this project to seek access to more sensitive nuclear technologies from Russia and to develop expertise in related nuclear technologies. Any such projects will help Iran augment its nuclear technology infrastructure, which in turn would be useful in supporting nuclear weapons research and development.

- In the past, Chinese companies have been major suppliers of nuclear-related facilities and technology albeit under IAEA safeguards. China pledged in 1997 that it would not undertake any new nuclear cooperation with

- Iran and that it would close out its two existing projects —a small research reactor and a zirconium production facility, which will produce cladding for nuclear fuel —as soon as possible. (Neither of these two projects poses a significant proliferation concern.) China also agreed to terminate cooperation on a uranium conversion project. This project would have allowed Iran to produce uranium hexafluoride or uranium dioxide, which are the feedstock materials for the manufacture of weapons grade plutonium. In addition, China announced new export controls in June 1998 that cover the sale of dual-use nuclear equipment. China appears to be living up to its 1997 commitments.

- The CIA reported in September 2001 that,

  - "Iran sought nuclear-related equipment, material, and technical expertise from a variety of sources, especially in Russia. Work continues on the construction of a 1,000-megawatt nuclear power reactor at Bushehr 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—particularly through the Bushehr nuclear power plant project—could be used to advance Iran's nuclear weapons research and development 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 to enforce its export controls in some cases regarding Iran. A component of the Russian Ministry of Atomic Energy (MINATOM) contracted with Iran to provide equipment clearly intended for Atomic Vapor Laser Isotope Separation (AVLIS). The laser equipment was to have been delivered in late 2000 but continues to be held up as a result of US protests. AVLIS technology could provide Iran the means to produce weapons quantities of highly enriched uranium.

  - The Russian Government's commitment, willingness, and ability to curb proliferation-related transfers remain uncertain. The export control bureaucracy was reorganized again as part of President Putin's broader government reorganization in May 2000. The Federal Service for Currency and Export Controls (VEK) was abolished and its functions assumed by a new department in the Ministry of Economic Development and Trade. VEK had been tasked with drafting the implementing decrees for Russia's July 1999 export control law; the status of these decrees is not known. Export enforcement continues to need improvement. In February 2000, Sergey Ivanov, then Secretary of Russia's Security Council, said that during 1998-99 the government had obtained convictions for unauthorized technology transfers in three cases. The Russian press has reported on cases where advanced equipment is simply described as something else in the export documentation and is exported. Enterprises sometimes falsely declare goods to avoid government taxes.

  - China pledged in October 1997 to halt cooperation on a uranium conversion facility (UCF) and not to engage in any new nuclear cooperation with Iran but said it would complete cooperation on two nuclear projects: a small research reactor and a zirconium production facility at Esfahan that Iran will use to produce cladding for reactor fuel. 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. Although the Chinese appear to have lived up to these commitments, we are aware of some interactions between Chinese and Iranian entities that have raised questions about its "no new nuclear cooperation" pledge. According to the State Department, the Administration is seeking to address these questions with appropriate Chinese authorities.

  - Iran has attempted to use its civilian energy program, which is quite modest in scope, to justify its efforts to establish domestically or otherwise acquire assorted nuclear fuel-cycle capabilities. But such capabilities can also support fissile material production for a weapons program, and we believe it is this objective that drives Iran's efforts to acquire

relevant facilities. For example, Iran has sought to obtain turnkey facilities, such as the UCF, that ostensibly would be used to support fuel production for the Bushehr power plant. But the UCF could be used in any number of ways to support fissile material production needed for a nuclear weapon—specifically, production of uranium hexafluoride for use as a feedstock for uranium enrichment operations and production of uranium compounds suitable for use as fuel in a plutonium production reactor. In addition, we suspect that Tehran most likely is interested in acquiring foreign fissile material and technology for weapons development as part of its overall nuclear weapons program."

- The CIA estimated in January 2002 that the US " Intelligence Community judges that Iran does not yet have a nuclear weapon. Most agencies assess that Tehran could have one by the end of the decade, although one agency judges it will take longer. All agree that Iran could reduce this time frame by several years with foreign assistance. Iran has biological and chemical weapons programs."

Missile Defenses

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

Part Three

Iraqi Force Trends

Iraq's Search for Weapons of Mass Destruction

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;
    - 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 191) 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 Iraqi 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.xvii
- 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.
- In late June 2000. Iraq was reported to have carried out eight tests of the Al Samoud missile
- A CIA report in August 2000 summarized the state of missile development in Iraq as follows,
    - 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.
- A Department of Defense report in January 2001 reported that,
    - Iraq likely retains a limited number of launchers and SCUD-variant SRBMs capable of striking its neighbors, as well as the components and manufacturing means to assemble and produce others, anticipating the reestablishment of a long-range ballistic missile force sometime in the future. Baghdad likely also has warheads capable of delivering chemical or biological agents. While Iraq's missile production infrastructure was damaged during the December 1998 strikes, Iraq retains domestic expertise and sufficient infrastructure to support most missile component production, with the exception of a few critical subelements.
    - During 1999, Iraq continued to work on the two short-range ballistic missile systems that fall within the 150-kilometer range restriction imposed by the UN: the liquid-propellant Al Samoud and the solid-propellant Ababil-100. The Al-Samoud is essentially a scaled-down SCUD, and work on it allows Baghdad to develop technological capabilities that could be applied to a longer-range missile program. We believe that the Al Samoud missile, as designed by the Iraqis, has an inherent potential to exceed the 150-kilometers range restriction imposed under UNSCR 687.
    - Iraqi personnel involved with pre-Desert Storm ballistic missile efforts are working on the Ababil-100 SRBM program. Once economic sanctions against Iraq are lifted, unless restricted by future UN monitoring, Baghdad

probably will begin converting these efforts into longer-range missile systems. Despite the damage done to Iraq's missile infrastructure during the Gulf War, Desert Fox, and subsequent UNSCOM activities, Iraq may have ambitions for longer-range missiles, including an ICBM.

- Depending on the success of acquisition efforts and degree of foreign support, it is possible that Iraq could develop and test an ICBM capable of reaching the United States by 2015. Cruise Missiles and Other Means of Delivery Iraq may have a very limited stockpile of land-launched short-range anti-ship cruise missiles and air-launched short-range tactical missiles that it purchased from China and France prior to the Gulf War. These are potential means of delivery for NBC weapons.

- Iraq also has a variety of fighter aircraft, helicopters, artillery, and rockets available as potential means of delivery for NBC weapons, although their operational status is questionable due to the cumulative effects of the UN arms embargo. However, Iraq has continued to work on its UAV program, which involves converting L-29 jet trainer aircraft originally acquired from Eastern Europe. These modified and refurbished L-29s may be intended for the delivery of chemical or biological agents. In the future, Iraq may try to use its research and development infrastructure to produce its own UAVs and cruise missiles or, should the UN arms embargo be lifted, it could try to purchase cruise missiles.

- A CIA report in January 2002 estimated that,

  - Baghdad's goal of becoming the predominant regional power and its hostile relations with many of its neighbors are the key drivers behind Iraq's ballistic missile program. Iraq has been able to maintain the infrastructure and expertise necessary to develop missiles, and the IC believes it has retained a small, covert force of Scud-type missiles, launchers, and Scud-specific production equipment and support apparatus. For the next several years at least, Iraq's ballistic missile initiatives probably will focus on reconstituting its pre-Gulf war capabilities to threaten regional targets and probably will not advance beyond MRBM systems.
  - Prior to the Gulf war, Iraq had several programs to extend the range of the Scud
  - SRBM and became experienced working with liquid-propellant technology. Since the Gulf war, despite UN resolutions limiting the range of Iraq's missiles to 150 km, Baghdad has been able to maintain the infrastructure and expertise necessary to develop longer range missile systems.
  - A military parade in December 2000 showcased Al Samoud missiles on new transporter-erector-launchers (TELs). The liquid-propellant Al-Samoud SRBM probably will be deployed soon.
  - The IC assesses that Iraq retains a small covert force of Scud-variant missiles, launchers, and conventional, chemical, and biological warheads.

  - We cannot project with confidence how long UN-related sanctions and prohibitions will remain in place. They plausibly will constrain Iraq during the entire period of this Estimate. Scenarios that would weaken the prohibitions several years from now also are conceivable, allowing Iraq to reconstitute its missile infrastructure and begin developing long-range missiles before the end of the decade. The discussion that follows addresses developments that *could* and are *likely* to occur should UN prohibitions be significantly weakened in the future.

  - Iraq is likely to use its experience with Scud technology to resume production of the pre-Gulf war 650-km-range Al Hussein, the 900-km-range Al Abbas, or other Scud variants, and it could explore clustering and staging options to reach more distant targets. Iraq *could* resume Scud-variant production—with foreign assistance—quickly after UN prohibitions ended.

  - With substantial foreign assistance, Baghdad *could* flight-test a domestic MRBM by mid-decade. This possibility presumes rapid erosion of UN prohibitions and Baghdad's willingness to risk detection of developmental steps, such as static engine testing, earlier. An MRBM flight test is *likely* by 2010. An imported MRBM *could* be flight-tested within months of acquisition.

  - For the first several years after relief from UN prohibitions, Iraq probably will strive to reestablish its SRBM inventory to pre-Gulf war numbers, continue developing and deploying solid-propellant systems, and pursue MRBMs to keep pace with its neighbors. Once its regional security concerns are being addressed, Iraq may pursue a first-generation ICBM/SLV.

  - Although Iraq *could* attempt before 2015 to test a rudimentary long-range missile based on its failed Al-Abid SLV, such a missile almost certainly would fail. Iraq is unlikely to make such an attempt. After observing North Korean missile developments the past few years, Iraq would be more likely to pursue a three-stage TD-2 approach to an SLV or ICBM, which would be capable of delivering a nuclear weapon-sized payload to the United States. Some postulations for potential Iraqi ICBM/SLV concepts and timelines from the beginning of UN prohibition relief include:
  - If Iraq could buy a TD-2 from North Korea, it *could* have a launch capability within a year or two of a purchase.
  - It *could* develop and test a TD-1-type system within a few years.

- If it acquired No Dongs from North Korea, it *could* test an ICBM within a few years of acquisition by clustering and staging the No Dongs—similar to the clustering of Scuds for the Al Abid SLV.
- If Iraq bought TD-2 engines, it *could* test an ICBM within about five years of the acquisition.
- Iraq *could* develop and test a Taepo Dong-2-type system within about ten years of a decision to do so.

- Most agencies believe that Iraq is *unlikely* to test before 2015 any ICBMs that would threaten the United States, even if UN prohibitions were eliminated or significantly reduced in the next few years. Some believe that if prohibitions were eliminated in the next few years, Iraq would be *likely* to test an ICBM probably masked as an SLV before 2015, possibly before 2010. In this view, foreign assistance would affect the timing and the capability of the missile.

- Foreign assistance is key to Iraqi efforts to develop quickly longer range missiles. Iraq relied on extensive foreign assistance before the Gulf war and will continue to seek foreign assistance to expand its current capabilities.

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:

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

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
  - 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 time the 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):

Agent	Declared	Potential Unaccounted For	Comments
Chemical Agents	(Metric Tons)	(Metric Tons)	
VX Nerve Gas	3	300	Iraq lied about the program until 1995
G Agents (Sarin)	100-150	200	Figures include weaponized and bulk agents
Mustard Gas	500-600	200	Figures include weaponized and bulk agents
Delivery Systems	(Number)	(Number)	
Missile Warheads	75-100	2-25	UNSCOM supervised destruction of 30
Rockets	100,000	15,000-25,000	UNSCOM supervised destruction of 40,000, 28,000 of which were filled.
Aerial Bombs	16,000	2,000-8,000	High estimate reflects the data found in an Iraqi Air Force document in July, 1998.
Artillery shells	30,000	15,000	
Aerial Spray Tanks	?	?	

- 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."
- 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 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. 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.
- 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 bee 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.[xviii]
- 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.
    - 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.
- A Department of Defense report in January 2001 reported that,

- Since the Gulf War, Baghdad has rebuilt key portions of its industrial and chemical production infrastructure; it has not become a state party to the CWC. Some of Iraq's facilities could be converted fairly quickly to production of chemical warfare agents. Following Operation Desert Fox, Baghdad again instituted a rapid reconstruction effort on those facilities to include former dual-use chemical warfare-associated production facilities, destroyed by U.S. bombing. In 1999, Iraq may have begun installing or repairing dual-use equipment at these and other chemical war-fare-related facilities. Previously, Iraq was known to have produced and stockpiled mustard, tabun, sarin, and VX, some of which likely remain hidden. It is likely that an additional quantity of various precursor chemicals also remains hidden.
- In late 1998, UNSCOM reported to the UN Security Council that Iraq continued to withhold information related to its chemical program. UNSCOM cited an example where Baghdad seized from inspectors a document discovered by UNSCOM inspectors, which indicated that Iraq had not consumed as many chemical munitions during the Iran-Iraq War as had been declared previously by Baghdad. This document suggests that Iraq may have an additional 6,000 chemical munitions hidden. Similarly, UNSCOM discovery in 1998 of evidence of VX in Iraqi missile warheads showed that Iraq had lied to the international community for seven years when it repeatedly said that it had never weaponized VX.
- Iraq retains the expertise, once a decision is made, to resume chemical agent production within a few weeks or months, depending on the type of agent. However, foreign assistance, whether commercial procurement of dual-use technology, key infrastructure, or other aid, will be necessary to completely restore Iraq's chemical agent production capabilities to pre-Desert Storm levels. Iraqi doctrine for the use of chemical weapons evolved during the Iran-Iraq War, and was fully incorporated into Iraqi offensive operations by the end of the war in 1988. During different stages of that war, Iraq used aerial bombs, artillery, rocket launchers, tactical rockets, and sprayers mounted in helicopters to deliver agents against Iranian forces. It also used chemical agents against Kurdish elements of its own civilian population in 1988.

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 at least 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.
- Other reports indicate that Iraq obtained nearly 40 tons of the medium to grow anthrax and botulinum bacterium for its biological weapons program from Oxoid Ltd, and other suppliers in the UK in 1988.
    - Imported type cultures from the US which can be modified to develop biological weapons. Tried to import the Ames strain of Anthrax from the US but does not seem to have succeeded. Did import the Sterne and A-3 strains of Anthrax from the Institut Pasteur in France, and two Vollum strains and five other strains of Anthrax from the American Type Culture collection, located near Manassas, Virginia. Vollum 1B is the strain of Anthrax the US developed for its own biological weapons program before it signed the BWC.
    - 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 aspergilus 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.
    - Iraq moved its production of Aflatoxin to Fudaliyah in 1989, and produced 481 gallons of toxin in solution between November, 1988 and May, 1990.
    - Produced 1,850 liters of Aflatoxin in solution at Fudaliyah.
    - It produced a total of at least 2,500 liters of concentrated Aflatoxin (1,850 liters filled into munitions).
    - 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); and 8,500 liters of concentrated Anthrax (6,500 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 acknowledged to UN SCOM that it had produced at least 19,000 liters of botulinum toxin, using more than half to fill at least 116 bombs and missile warheads.
- Filled at least 50 bombs and missile warheads with a wet Anthrax agent using the Vollum strain, or one very similar.
- Some Al Hussein warheads were found at the Al-Nibal missile destruction site with traces of wet Anthrax agent, similar to the Vollum strain.
- Vials were found with a dry freeze-dried Anthrax agent of the Vollum strain; reports differ as the whether Iraq weaponized a dry clay coated of the particle size most lethal for delivering inhaled Anthrax, and clay coasted the particles to eliminate the electrostatic charge and ensure optimal dispersion.
- Iraq is also known to have produced at least:
- 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 RPV s 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):

Agent	Declared Concentrated Amount		Declared Total Amount		Uncertainty	
	Liters	Gallons	Liters	Gallons		
Anthrax	8500		12,245	85000	22457	Could be 3-4 times declared amount
Botulinum toxin	19,400		NA	380,000	NA	Probably twice declared amount. Some extremely concentrated.
Gas Gangrene Clostridium Perfingens	340		90	3,400	900	Amounts could be higher
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.
- UNSCOM used to 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."
- Iraqi defector claims in February 2000 that Iraq had maintained a missile force armed with chemical and biological warheads that can bee 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.[xix]
- George Tenet, the Director of the CIA, testified before the Senate Foreign Relations Committee on March 20, and identified Iraq as a key country seeking biological weapons.
- A CIA report in August 2000 summarized the state of biological weapons proliferation in Iraq as follows,[xx]
    - 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 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. 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.

- A Department of Defense report in January 2001 stated that Iraq's continued refusal to disclose fully the extent of its biological program suggests that Baghdad retains a biological warfare capability, despite its membership in the BWC. After four and one-half years of claiming that it had conducted only "defensive research" on biological weapons Iraq declared reluctantly, in 1995, that it had produced approximately 30,000 liters of bulk biological agents and/or filled munitions. Iraq admitted that it produced anthrax, botulinum toxins and aflatoxins and that it prepared biological agent-filled munitions, including missile warheads and aerial bombs. However, UNSCOM believed that Iraq had produced substantially greater amounts than it has admitted —three to four times greater. Iraq also admitted that, during the Persian Gulf War, it had deployed biological agent-filled munitions to air-fields and that these weapons were intended for use against Israel and coalition forces in Saudi Arabia. Iraq stated that it destroyed all of these agents and munitions in 1991, but it has provided insufficient credible evidence to support this claim. The UN believes that Baghdad has the ability to reconstitute its biological warfare capabilities within a few weeks or months, and, in the absence of UNSCOM inspections and monitoring during 1999 and 2000, we are concerned that Baghdad again may have produced some biological warfare agents.

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_2, UCL_4, UF_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_4.
    - Al Qaim - phosphate plant for production of U308.
    - Akashat uranium mine.
    - Iraq had three reactor programs:

- Osiraq/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.
  - Are there elements for radiological weapons.
  - Is it actively seeking to clandestinely buy components for nuclear weapons and exami9ning 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.
- Work by David Albright indicates that Iraq still holds approximately 1.7 metric tons (MT) of low-enriched uranium (LEU) and several hundred MT of natural uranium. He estimates that if Iraq should master one of the uranium enrichment technologies that it was pursuing before the Gulf War, its LEU stock would provide a means to rapidly make enough HEU for at least one nuclear weapon, and that the natural uranium could become the feedstock for many more. This uranium remains in Iraq because the UN Action Team did not have a mandate under resolution 687 to "remove, destroy or render harmless" this uranium. Without further enrichment or irradiation in a nuclear reactor, it is not "weapons-usable nuclear material."
- Dr. Khidhir Hamza a highest-ranking Iraqi scientist who defected from Iraq claims Iraqi scientists were commanded to build one nuclear bomb immediately after Saddam invaded Kuwait in 1990, and that the resulting device was crude and untested and might even could fall apart. In an April 2, 2001 edition of Middle East Forum Wire, he says that,
  - Iraq still runs its nuclear program and distributes its nuclear program infrastructure among dozens of small corporations, as it does with biological and chemical weapons.
  - One group was responsible for enrichment of uranium by diffusion, and did this under the front of a large refinery in Baghdad. A refinery and a uranium enrichment plant require similar piping, structures, compressors, and handling of gases. He says

  - His assistant, who designed bombs under Hamza, is now running the program while also doing seismic prospecting for oil maps. Apart from designing weapons, he engineers underground explosions that generate seismic waves in order to locate oil. When an inspector visits, all programs relating to the bomb design are put aside, and replaced with seismic prospecting maps. The bomb designer is a real expert at seismic prospecting, so he is very convincing to the inspectors.
  - In a 1998, New York Times interview, he stated that Iraq was three years away from nuclear capability. Sadly, inspections ceased that same year. Three years have passed, and Saddam is undoubtedly on the precipice of nuclear power.
  - He now estimates that Iraq will have between three to five nuclear weapons by 2005. Iraq now has twelve tons of uranium and 1.3 tons of low enriched uranium. This is enough for at least four bombs already.
- 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 and August 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.[xxi]
- George Tenet, the Director of the CIA, testified before the Senate Foreign Relations Committee on March 20, 2000 and stated that, "We are concerned about the potential for states and terrorists to acquire plutonium, highly enriched uranium, and other fissile materials, and even complete nuclear weapons…Iran or Iraq could quickly advance their nuclear aspirations through covert acquisition of fissile material or relevant technology."
- A Department of Defense report in January 2001 stated that,
  - Despite these severe pressures on its economy, Saddam Hussein's government continues to devote Iraqi resources to rebuilding certain portions of its development program that was focused on building an implosion-type device. The program was linked to a ballistic missile project that was the intended delivery system. From April 1991 to December 1998, Iraqi nuclear aspirations were held in check by IAEA/ UNSCOM inspections and monitoring. All known weapons-grade fissile material was removed from the country.
  - Although Iraq claims that it destroyed all of the specific equipment and facilities useful for developing nuclear weapons, it still retains sufficient skilled and experienced scientists and engineers as well as weapons design information that could allow it to restart a weapons program.
  - Iraq would need five or more years and key foreign assistance to rebuild the infrastructure to enrich enough material for a nuclear weapon. This period would be substantially shortened should Baghdad successfully acquire fissile material from a foreign source.
- The CIA estimated in January 2002 that Baghdad had a crash program to develop a nuclear weapon for missile delivery in 1990, but coalition bombing and IAEA and UNSCOM activities significantly set back the effort. The Intelligence Community estimates that Iraq, unconstrained, would take several years to produce enough fissile material to make a weapon. Iraq has admitted to having biological and chemical weapons programs before the Gulf war and maintains those programs.

Source: Prepared by Anthony H. Cordesman, Arleigh A. Burke Chair in Strategy, CSIS.

Iraqi Covert Break Out Capabilities

- UNSCOM and the IAEA's success have created new priorities for Iraqi proliferation. The UN's success in destroying the large facilities Iraq needs to produce fissile materials already may well have led Iraq to focus on covert cell-like activities to manufacture highly lethal biological weapons as a substitute for nuclear weapons.
- All of the biological agents Iraq had at the time of the Gulf War seem to have been "wet" agents with limited storage life and limited operational lethality. Iraq may have clandestinely carried out all of the research necessarily to develop a production capability for dry, storage micro-power weapons which would be far easier to clandestinely stockpile, and have much more operational lethality.
- Iraq did not have advanced binary chemical weapons and most of its chemical weapons used unstable ingredients. Iraq has illegally imported specialized glassware since the Gulf War, and may well have developed advanced binary weapons and tested them in small numbers. It may be able to use a wider range of precursors and have developed plans to produce precursors in Iraq. It may have improved its technology for the production of VX gas.
- Iraq is likely to covertly exploit Western analyses and critiques of its pre-war proliferation efforts to correct many of the problems in the organization of its proliferation efforts, its weapons design, and its organization for their use.
- Iraq bombs and warheads were relatively crude designs which did not store chemical and biological agents well and which did a poor job of dispersing them. Fusing and detonation systems did a poor job of ensuring detonation at the right height and Iraq made little use of remote sensors and weather models for long-range targeting and strike planning. Iraq could clandestinely design and test greatly improve shells, bombs, and warheads. The key tests could be conducted using towers, simulated agents, and even indoors. Improved targeting, weather sensors, and other aids to strike planning are dual-use or civil technologies that are not controlled by UNSCOM. The net impact would weapons that could be 5-10 times more effective than the relatively crude designs Iraq had rushed into service under the pressure of the Iran-Iraq War.
- UNSCOM and the IAEA's success give Iraq an equally high priority to explore ways of obtaining fissile material from the FSU or other potential supplier country and prepare for a major purchase effort the moment sanctions and inspections are lifted and Iraq has the hard currency to buy its way into the nuclear club. Iraq could probably clandestinely assemble all of the components of a large nuclear device except the fissile material, hoping to find some illegal source of such material.
- The components for cruise missiles are becoming steadily more available on the commercial market, and Iraq has every incentive to create a covert program to examine the possibility of manufacturing or assembling cruise missiles in Iraq.
- UN inspections and sanctions may also drive Iraq to adopt new delivery methods ranging from clandestine delivery and the use of proxies to sheltered launch-on-warning capabilities designed to counter the US advantage in airpower.
- Iraq can legally maintain and test missiles with ranges up to 150 kilometers. This allows for exoatmospheric reentry testing and some testing of improved guidance systems. Computer simulation, wind tunnel models, and production engineering tests can all be carried out clandestinely under the present inspection regime. It is possible that Iraq could develop dummy or operational high explosive warheads with shapes and weight distribution of a kind that would allow it to test concepts for improving its warheads for weapons of mass destruction. The testing of improved bombs using simulated agents would be almost impossible to detect as would the testing of improved spray systems for biological warfare.
- Iraq has had half a decade in which to improve its decoys, dispersal concepts, dedicated command and control links, targeting methods, and strike plans. This kind of passive warfare planning is impossible to forbid and monitor, but ultimately is as important and lethal as any improvement in hardware.
- There is no evidence that Iraq made an effort to develop specialized chemical and biological devices for covert operations, proxy warfare, or terrorist use. It would be simple to do so clandestinely and they would be simple to manufacture.

What is At Stake in Terms of the UNSCOM Crisis in Iraq:

Summary of the Iraqi Threat Reported in the Note by the Secretary General, "Report of the Secretary-General on the Activities of the Special Commission," S/1997/774, October 6, 1997

- Analysis had 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. It also stated that Tariq Aziz, Iraq's Deputy Prime Minister, "gave an explicit order in the presence of the Executive Chairman, to the Iraqi experts not to discuss such issues with the Chairman."
- Iraq had continued to lie regarding the way in which it has destroyed its pre-war inventory of missile launchers, and major uncertainties remained over its holdings of biological and chemical missile warheads. 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. Iraq again failed to provide documentation on this issue in September, 1997.
- It 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 Commission identified some other areas of concern related to Iraq's chemical weapons program. The most important among them are the accounting 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."
- UNSCOM stated that it had been able to destroy 120 pieces of additional equipment for the production of chemical weapons that Iraq had only disclosed in August, 1997. Major uncertainties still existed regarding 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, and Iraq's claims to have unilaterally destroyed some 130 tons of chemical warfare agents. Major uncertainties existing regarding 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."
- The uncertainties affecting the destruction of VX gas 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 out of this latter total, and destroy a further 36 tons on its own. 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.
- "Iraq has not provided physical evidence (relating to) binary artillery munitions and aerial bombs, chemical warheads for short range missiles, cluster aerial bombs, and spray tanks." Iraq has claimed these were only prototype programs, but there is no current way to know how many were deployed as weapons.
- "Until July, 1995, Iraq totally denied it had any offensive biological warfare program. Since then, Iraq has presented three versions of FFCDs and four "drafts." The most recent FFCD was presented by Iraq on 11 September 1997. This latest submission followed the Commission's rejection, in April 1997, of the previous FFCD of June 1996...In the period since that report, the Commission 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, along with documents and other evidence available to the Commission, confirmed the assessment that the June 1996 declaration was deeply deficient....The new FFCD, received on 11 September 1997, contains fewer errata and is more coherent. However, with regard to the important issues...the report contains no significant changes from the June 1996 FFCD. ..the Commission's questions are rephrased to in order to avoid having to produce direct answers, or are answer incompletely, or are ignored completely...Little of the information the Commission has gathered since June 1996 has been incorporated into the new document."
- 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. "Media unaccounted for is sufficient, in quantity, for the production of over three times more of the biological agent -- Anthrax -- stated by Iraq to have been produced...Bulk warfare agent production appears to be vastly understated by Iraq...Experts calculations of possible agent

production quantities, either by equipment capacity or growth media amounts, far exceed Iraq's stated results....Significant periods when the fermenters were claimed not to be utilized are unexplained."

- Iraq's accounting for its Aflatoxin production is not credible. 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." No documentation has been provided on munitions filling. The account of Iraq's unilateral destruction of bulk biological agents is "incompatible with the facts...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."

Iraqi Ballistic Missile Program in 1998

Item	Initial Inventory	Comments
Soviet supplied Scud Missiles (includes Iraqi Modifications of the Al-Husayn with a range of 650 km and the Al-Abbas with a range of 950 km)	819	UNSCOM accepts Iraqi accounting for all but two of the original 819 Scud missiles acquired from the Soviet Union. Iraq hasn't explained the disposition of major components that it may have stripped from operational missiles before their destruction, and some Iraqi claims-- such as the use of 14 Scuds in ATBM tests- are not believable. Gaps in Iraqi declarations and Baghdad's failure to fully account for indigenous missile programs strongly suggest that Iraq retains a small missile force.
Iraqi-Produced Scud Missiles	Unknown	Iraq denied producing a completed Scud missile, but it produced/procured and tested all major subcomponents.
Iraqi-Produced Scud Warheads	120	Iraq claims all 120 were used or destroyed. UNSCOM supervised the destruction of 15. Recent UNSCOM inspections found additional CW/BW warheads beyond those currently admitted.
Iraqi-Produced Scud Airframes	2	Iraq claims testing 2 indigenous airframes in 1990. It is unlikely that Iraq produced only 2 Scud airframes.
Iraqi-Produced Scud Engines	80	Iraq's claim that it melted 63 engines following acceptance tests--53 of which failed quality controls-- are unverinable and not believable. UNSCOM is holding this as an open issue.
Soviet-Supplied Missile Launchers	11	UNSCOM doubts Iraq's claim that it unilaterally destroyed 5 launchers. The Soviet Union may have sold more than the declared 11 launchers.
Iraqi-Produced Missile Launchers	8	Iraq has the capability to produce additional launchers.

Adapted by Anthony H. Cordesman from material provided by the NSC on February 19, 1998.

Iraqi Chemical Warfare Program in 1998

CW Agent Stockpiles (In Metric tons)

CW Agent	Chemical Agents Declared by Iraq	Potential CW Agents based on Unaccounted Precursors [1.)]	Comments
VX	At least 4	200	Iraq denied producing VX until Husayn Kamil's defection in 1995
G-agents (Sarin)	100-150	200	Figures include both weaponized and bulk agents
Mustard	500-600	200	Figures include both weaponized and bulk agents.

CW Delivery Systems (In Numbers of Weapons Systems)

Delivery System	Estimated Numbers Before the Gulf War	Munitions Unaccounted for [2.)]	Comments
Missile Warheads Al-Husayn (Modified Scud B)	75-100	45-70	UNSCOM supervised the destruction of 30 warheads
Rockets	100,000	15,000-25,000	UNSCOM supervised the destruction of
Aerial bombs	16,000	2,000	
Artillery Shells	30,000	15,000	
Aerial Spray Tanks	Unknown	Unknown	

1.) These estimates are very rough. They are derived from reports provided by UNSCOM to the Security Council and to UNSCOM plenary meetings. Gaps in Iraqi disclosures strongly suggest that Baghdad is concealing chemical munitions and precursors. Iraq may also retain a small stockpile of filled munitions. Baghdad has the capability to quickly resume CW production at known duel-use facilities that currently produce legitimate items, such as pharmaceuticals and pesticides. UNSCOM has supervised the destruction of some 45 different types of CW precursors (1,800,000 liters of liquid and 1,000,000 kg of solid).

2.) All these munitions could be used to deliver CW or BW agents. The numbers for missile warheads include 25 that Iraq claims to have unilaterally destroyed after having filled them with biological agents during the Gulf war. UNSCOM has been unable to verify the destruction of these warheads.

Adapted by Anthony H. Cordesman from material provided by the NSC on February 19, 1998.

Iraq's Major Uses of Chemical Weapons 1983-1988

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

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

Source: Adapted from material provided by the NSC on February 19, 1998.

Iraqi Biological Warfare Program in 1998

BW Agent Production Amounts

BW Agent	Declared Concentrated Amounts	Declared Total Amounts	Comments
Anthrax (Bacillusanthracis)	8,500 liters (2,245 gallons)	85,000 liters (22,557 gallons)	UNSCOM estimates production amounts were actually 3-4 times more than the
Botulinum toxin (Clostridium Botulinum)	19,400 liters (10x and 20x concentrated) (5,125 gallons)	380,000 liters (100,396 gallons)	UNSCOM estimates production amounts Were actually 2 times more than the Declared amounts, but is unable to confirm.
Gas Gangrene (Clostridium perfringens)	340 liters (90 gallons)	3,400 liters (900 gallons)	Production amounts could be higher, but UNSCOM is unable to confirm.
Aflatoxin (Aspergillus flavus and Aspergillus parasiticus)	N/A	2,200 liters (581 gallons)	Production amounts and time frame of production claimed by Iraq do not correlate.
Ricin (Castor Bean plant)	N/A	10 liters (2.7 gallons)	Production amounts could be higher, but UNSCOM is unable to confirm.

BW-Filled and Deployed Delivery Systems

Delivery System	Anthrax	Botulinum Toxin	Aflatoxin	Comments
Missile warheads Al-Husayn (modified Scud B)	5	16	4	UNSCOM cannot confirm the unilateral Destruction of these 25 warheads due to conflicting accounts provided by Iraq.
R-400 aerial bombs	50	100	7	Iraq claimed unilateral destruction of 157 Bombs, but UNSCOM is unable to confirm
Aircraft aerosol spray tanks F-1 Mirage modified fuel drop tank	4			Iraq claims to have produced 4, but may Have manufactured others.

BW Agent Growth Media

Media	Quantity Imported	Unaccounted For Amounts
BW Agent Growth Media	31,000 kg (68,200 lbs.)	3,500 kg (7,700 lbs.)

Total refers to the amount of material obtained from production process, while *concentrated* refers to the amount of concentrated .agent obtained after final filtration/purification. The *concentrated* number is the amount used to fill munitions.

Media refers to the substance used to provide nutrients for the growth and multiplication of micro-organisms.

Adapted by Anthony H. Cordesman from material provided by the NSC on February 19, 1998.

Iraqi Key Personalities in Proliferation

Husayn Kamil Hasan al-Majid, Saddam's son-in-law, was the pre-eminent military industries official and a fundamental player in Iraq's efforts to procure weapons of mass destruction before his defection to Jordan in August 1995. A strict and capable manager, Kamil took charge of Iraq's efforts to develop its WMD program around 1987. As the head of the Ministry of Industry and Military Industrialization until 1990, he oversaw Iraq's nuclear weapons research, continued Iraq's development of biological and chemical weapons, and supervised the successful development of the Al-Husayn missile -- an indigenous modification of the Scud. During this time, it is possible that Kamil directed Iraq's testing of its chemical and biological weapons on Iranian prisoners of war.

-- After the Gulf war, Kamil -- first from his position as Minister of Defense and then as the director of the Ministry of Industry and Minerals and the Organization of Military Industrialization -- led Iraq's efforts to conceal its WMD program from international inspectors.

-- Husayn Kamil's influence over the Iraqi weapons of mass destruction program did not end with his defection in 1995. For instance, he is largely responsible for using Saddam's security services -- of which he was a member in the early 1980s -- to hide proscribed materials and documents from the United Nations.

Despite Kamil's influence, the Iraqi WMD program did not die with his defection and subsequent murder, as Iraq claims it did. Qusay Husayn -- Saddam's second son -- has assumed many of the responsibilities for concealing the proscribed programs. In addition, many of the leading scientists in Iraq's WMD programs during Husayn Kamil's tenure are still associated with the regime:

-- Lt. Gen. Amir Hamud Sadi -- who serves officially as a presidential adviser and is a leading official in Iraqi relations with UNSCOM -- was one of the principal engineers in the WMD program and essentially served as Husayn Kamil's deputy. With a doctorate in chemical engineering, Sadi has dedicated his entire career to conventional and non-conventional weapons development. In 1987, Sadi received rare public praise from Saddam for his role in the development of the Al-Husayn missile.

-- Humam Abd al-Khaliq Abd al-Ghafur -- currently Minister of Culture and Information -- is Iraq's leading nuclear official and the former head of its nuclear program. Abd al-Ghafur also was a close associate of Husayn Kamil, and he occasionally serves as an interlocutor with the IAEA, leading an Iraqi delegation to the IAEA annual conference in October 1997.

-- Jafar Dia Jafar is perhaps Iraq's foremost nuclear scientist and served as Abd al-Ghafur's deputy in the Iraqi Atomic Energy Organization. Jafar now officially serves as a presidential adviser, but his position -- unlike that of Sadi -- appears to be largely nominal.

-- Dr. Rihab Taha is the leading official in charge of Iraq's biological weapons program. She has overseen Iraqi efforts to develop anthrax and Botulinum toxin and directed testing on animal subjects. Taha is also politically well-connected -- she is married to the Minister of Oil, Amir Rashid Ubaydi, who helps direct Iraqi relations with UNSCOM.

Adapted by Anthony H. Cordesman from material provided by the NSC on February 19, 1998.

Part Four

The Threat Posed by Weapons of Mass Destruction

Weapons of Mass Destruction: What Are We Really Talking About?

- Differ radically in inherent lethality.
- Chemical weapons have marginal real-world status as weapon of mass destruction.
- Lethality models are terrible, both in terms of prompt and long-term effects.
- The actual process of weaponization is critical in determining effectiveness.
- Missiles are only one of many delivery systems and often not the best one.

The Comparative Effects of Biological, Chemical, and Nuclear Weapons 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 this is inefficient. It is unclear this is realistic.

	Area Covered in Square Kilometers	Deaths Assuming 3,000-10,000 people Per Square Kilometer
Chemical: 300 kilograms of Sarin nerve gas with a density of 70 milligrams per cubic meter	0.22	60-200
Biological 30 kilograms of Anthrax spores with a density of 0.1 milligram per cubic meter	10	30,000-100,000
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 dispensing the agent as an aerosol. The study assumes that the biological agent would not make maximum use of this payload capability because this is inefficient. It is unclear this is realistic.

	Area Covered in Square Kilometers	Deaths Assuming 3,000-10,000 people Per Square Kilometer
Clear sunny day, light breeze		
Sarin Nerve Gas	0.74	300-700
Anthrax Spores	46	130,000-460,000
Overcast day or night, moderate wind		
Sarin Nerve Gas	0.8	400-800
Anthrax Spores	140	420,000-1,400,000
Clear calm night		
Sarin Nerve Gas	7.8	3,000-8,000
Anthrax Spores	300	1,000,000-3,000,000

Source: Adapted by the Anthony H. Cordesman from Office of Technology Assessment, Proliferation of Weapons of Mass Destruction: Assessing the Risks, US Congress OTA-ISC-559, Washington, August, 1993, pp. 53-54.

The Thermal and Blast Effects of Nuclear Weapons: The US Department of Defense Estimates

Radii of Effects in Kilometers versus Weapons Yield

Effect	1 KT	20 KT	100 KT	1 MT	10 MT
Nuclear Radiation (1,000 cGY or lethal dose in open)	0.71	1.3	1.6	2.3	3.7
Blast: 50% incidence of translation with subsequent impact on a Non-yielding surface	0.28	1.0	1.4	3.8	11.7
Thermal: 50% incidence of 2nd degree burns to bare skin, Kilometer visibility	0.77	1.8	3.2	4.8	14.5
Duration of Thermal Pulse in Seconds	0.12	0.32	0.9	2.4	6.4

Ranges in Kilometers for Probabilities of Flying Debris

Yield in KT	Probability of Serious Injury		
	1%	50%	99%
1	0.28	0.22	0.17
10	0.73	0.57	0.44
20	0.98	0.76	0.58
50	1.4	1.1	0.84
100	1.9	1.5	1.1
200	2.5	1.9	1.5
500	3.6	2.7	2.1
1000	4.8	3.6	2.7

Ranges in Kilometers for Translational (Blast) Injuries

Yield in KT	Range for Probability Blunt Injuries & Fractures			Range for Probable Fatal Injuries	
	-1%	50%	99%	-1%	50%
1	0.38	0.27	0.19	0.27	0.19
10	1.0	0.75	0.53	0.75	0.53
20	1.3	0.99	0.71	0.99	0.71
50	1.9	1.4	1.0	1.4	1.0
100	2.5	1.9	1.4	1.9	1.4
200	3.2	2.5	1.9	2.5	1.9
500	4.6	3.6	2.7	3.6	2.7
1000	5.9	4.8	3.6	4.8	3.6

Source: Adapted from Table 2-1 and Table 2-7 of FM 8-10-7 and Table IV of FM-8-9, Part I, and USACHPPM, The Medical NBC Battlebook, USACHPPM Technical Guide 244, pp. 2-2 and 2-3.

The Thermal and Blast Effects of Nuclear Weapons - Part Two: The British RUSI Estimates

Radius of Effect in Kilometers

Yield in Kilotons	Metals Vaporize	Metals Melt	Wood Burns	3rd Degree Burns	5 psi/ 160 mph Winds	3 psi 116 mph Winds
10	0.337	0.675	1.3	1.9	1.3	1.6
20	0.477	0.954	1.9	2.7	1.6	2.0
50	0.754	1.5	3.0	4.3	2.0	2.7
100	1.0	2.0	4.3	5.7	2.7	3.5
2001.5	2.8	5.7	8.0	3.5	4.5	

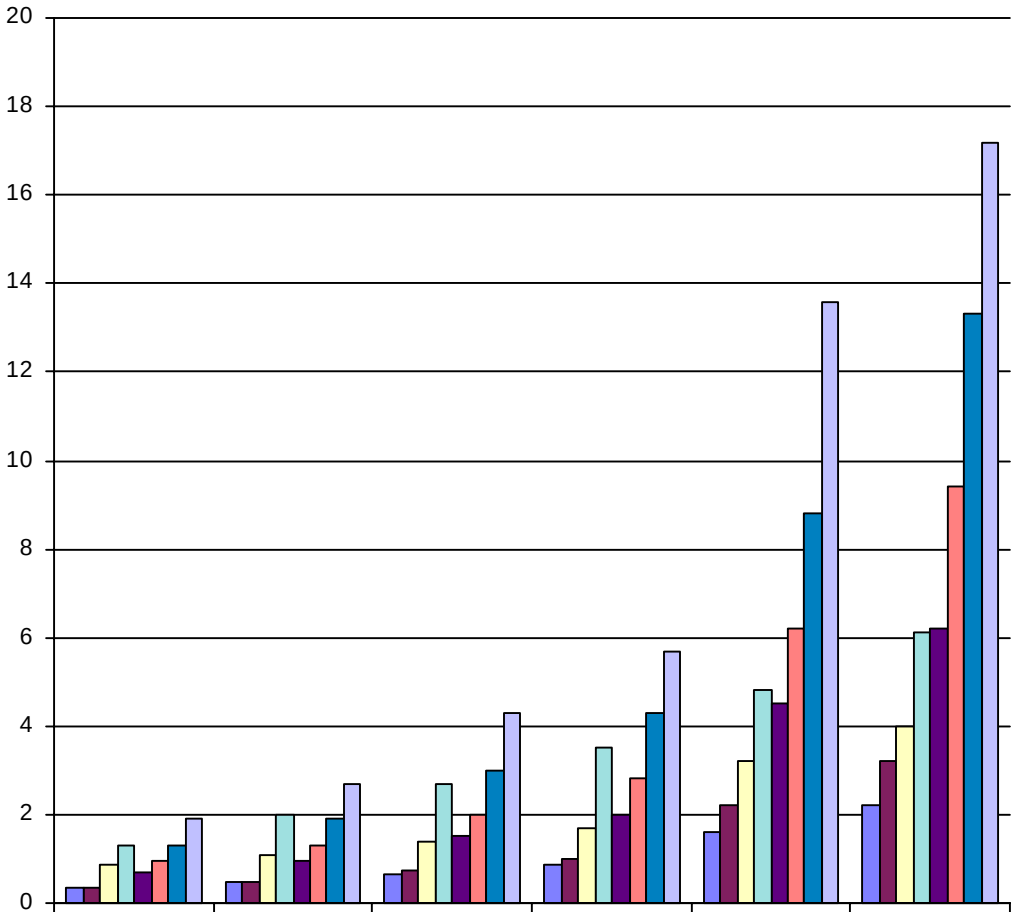
Impact of Killing Effects by Yield

Cause	Effect	Radius in Nautical Miles 40 KT	170 KT	1MT	
Overpressure	Lethality threshold		0.1	0.15	0.25
(crushing)	Severe lung damage		0.7	1.1	2.1
	Broken eardrums		0.3	0.5	0.8
Translation	Personnel in open (1%)		0.9	1.6	3.3
	Personnel near structures (1%)		1.0	1.9	3.8
	Personnel near structures (50%)		0.6	1.0	2.1
Thermal	Third degree burn – 100%		1.5	2.6	5.2
	No burns – 100%		2.8	4.8	8.7
	Retinal burn – daytime safe distance		20.0	23.0	25.0
Radiation	Lethal does (1,000 rads)		0.7	0.8	0.9
	No immediate harm (100 rads or less)		1.0	1.1	1.2

Source: Adapted by Anthony H. Cordesman from the Royal United Services Institute, Nuclear Attack: Civil Defense, London, RUSI/Brassey's, 1982, pp. 30-36; and Office of Technology Assessment, "The Effects of Nuclear War," Washington, US Congress, OTA-NS-89, May 1979, pp. 43-46.

The Nominal Lethality of Different Nuclear Weapons

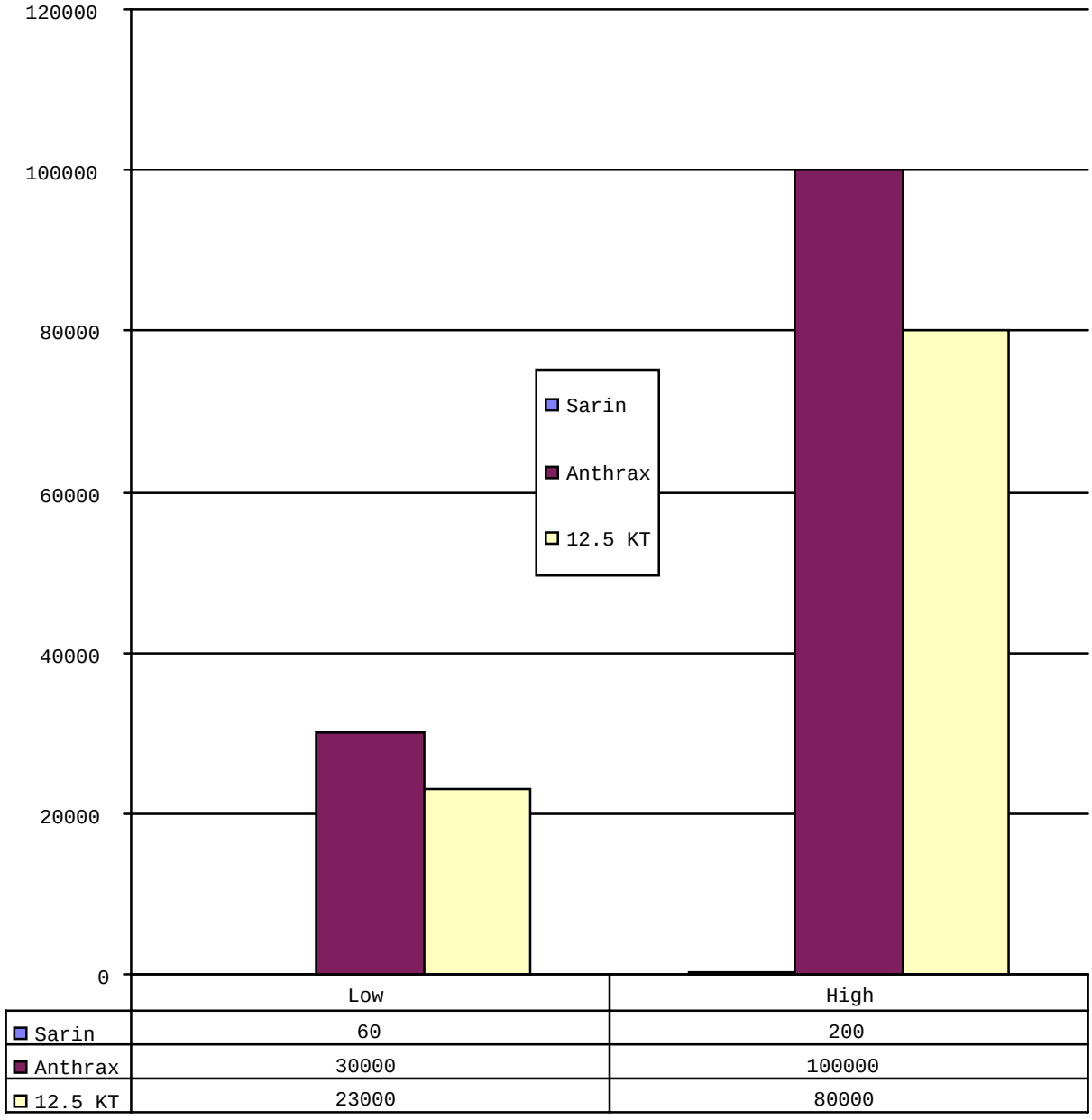
(Seriousness of Effect in Kilometers as a Function of Yield)



	10KT	20 KT	50 KT	100 KT	500 KT	1 MT
Fireball	0.352	0.464	0.67	0.884	1.6	2.2
Metals Vaporize	0.337	0.477	0.754	1	2.2	3.2
10-Psi	0.875	1.1	1.4	1.7	3.2	4
5-Psi	1.3	2	2.7	3.5	4.8	6.1
Metals Melt	0.675	0.954	1.5	2	4.5	6.2
Plastics Melt/Ignite	0.954	1.3	2	2.8	6.2	9.4
Wood chars/Burns	1.3	1.9	3	4.3	8.8	13.3
3rd Degree Burns	1.9	2.7	4.3	5.7	13.6	17.2

Source: Adapted by Anthony H. Cordesman from the Royal United Services Institute, Nuclear Attack: Civil Defense, London, RUSI/Brassey's, 1982, pp. 30-36

The Relative Killing Effect of Chemical vs. Biological vs. Nuclear Weapons



	Low	High
Sarin	60	200
Anthrax	30000	100000
12.5 KT	23000	80000

Source: Adapted by Anthony H. Cordesman from Victor A. Utgoff, The Challenge of Chemical Weapons, New York, St. Martin's, 1991, pp. 238-242 and Office of Technology Assessment, Proliferation of Weapons of Mass Destruction: Assessing the Risks, U.S. Congress OTA-ISC-559, Washington, August, 1993, pp. 56-57.

[i] New York Times, August 5, 2000, p. A-1.
[ii] Douglas J. Gilbert,. "Missile Threats Growing as Nation Pursues Defense," American Forces Press Service, May 7, 1999.
[iii] New York Times, p. A-10.
[iv] For further details, see Review of United States Policy Toward North Korea: Findings and Recommendations, Unclassified Report by Dr. William J. Perry, U.S. North Korea Policy Coordinator and Special Advisor to the President and the Secretary of State, Washington, DC, October 12, 1999; and Testimony Before the Senate Foreign Relations Committee, Subcommittee on East Asian and Pacific Affairs, Washington, DC, October 12, 1999.
[v] CIA, August 10, 2000, Unclassified Report to Congress on the Acquisition of Technology Relating to Weapons of Mass Destruction and Advanced Conventional Munitions, 1 July Through 31 December 1999 internet edition.
[vi] 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). Also see the report of the Rumsfeld Commission, Commssion to Assess the Ballistic Missile Threat to the United States, Executive Summary, July 15, 1998, pp. 6-7.
[vii] Douglas J. Gilbert,. "Missile Threats Growing as Nation Pursues Defense," American Forces Press Service, May 7, 1999.
[viii] New York Times, p. A-10.
[ix] For further details, see Review of United States Policy Toward North Korea: Findings and Recommendations, Unclassified Report by Dr. William J. Perry, U.S. North Korea Policy Coordinator and Special Advisor to the President and the Secretary of State, Washington, DC, October 12, 1999; and Testimony Before the Senate Foreign Relations Committee, Subcommittee on East Asian and Pacific Affairs, Washington, DC, October 12, 1999.
[x] Associated Press, September 21, 2000, 1930; Reuters, September 28, 2000, 1236.
[xi] Associated Press, July 15, 2000, 0935; Reuters, July 15, 2000, 0714.
[xii] Associated Press, July 15, 2000, 0935; Reuters, July 15, 2000, 0714.
[xiii] Reuters, July 17, 2000, 1257.
[xiv] Reuters, July 15, 2000, 2158.
[xv] Elaine Sciolino and Steven Lee Myers, "U.S. Study Reopens Division Over Nuclear Missile Threat," New York Times, July 4, 2000.
[xvi] July 16, 2000, 0826.
[xvii] New York Times, February 1, 2000.
[xviii] London Sunday Times, February 21, 2000.
[xix] London Sunday Times, February 21, 2000.
[xx] CIA, August 10, 2000, Unclassified Report to Congress on the Acquisition of Technology Relating to Weapons of Mass Destruction and Advanced Conventional Munitions, 1 July Through 31 December 1999 internet edition.
[xxi] Associated Press, February 9, 2000, 0154; Washington Post, February 10, 2000, p. A-23; New York Times International, February 8, 2000.