

Weapons of Mass Destruction in Iran

Delivery Systems, and Chemical, Biological, and Nuclear Programs

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Delivery Systems

- The Soviet-designed Scud B (17E) guided missile currently forms the core of Iran's ballistic missile forces -- largely as a result of the Iran-Iraq War.
 - Iran only 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 cities." Sixty-one were fired at Baghdad, nine at Mosul, five at Kirkuk, one at Takrit, and one at Kuwait. Iran fired as many as five missiles on a single day, and once fired three missiles within 30 minutes. This still, however, worked out to an average of only about one missile a day, and Iran was down to only 10-20 Scuds when the war of the cities ended.
 - Iran's missile attacks were initially more effective than Iraq's attacks. This was largely a matter of geography. Many of Iraq's major cities were comparatively close to its border with Iran, but Tehran and most of Iran's major cities that had not already been targets in the war were outside the range of Iraqi Scud attacks. Iran's missiles, in contrast, could hit key Iraqi cities like Baghdad. This advantage ended when Iraq deployed extended range Scuds.
 - The Scud B is a relatively old Soviet design which first became operational in 1967, designated as the R-17E or R-300E. The Scud B has a range of 290-300 kilometers with its normal conventional payload. The

export version of the missile is about 11 meters long, 85-90 centimeters in diameter, and weighs 6,300 kilograms. It has a nominal CEP of 1,000 meters. The Russian versions can be equipped with conventional high explosive, fuel air explosive, runway penetrator, submunition, chemical, and nuclear warheads.

- The export version of the Scud B comes with a conventional high explosive warhead weighing about 1,000 kilograms, of which 800 kilograms are the high explosive payload and 200 are the warhead structure and fusing system. It has a single stage storable liquid rocket engine and is usually deployed on the MAZ-543 eight wheel transporter-erector-launcher (TEL). It has a strap-down inertial guidance, using three gyros to correct its ballistic trajectory, and uses internal graphite jet vane steering. The warhead hits at a velocity above Mach 1.5.
- Most estimates indicate that Iran now has 6-12 Scud launchers and up to 200 Scud B (R-17E) missiles with 230-310 KM range.
- Some estimates give higher figures. They estimate Iran bought 200-300 Scud Bs from North Korea between 1987 and 1992, and may have continued to buy such missiles after that time. Israeli experts estimate that Iran had at least 250-300 Scud B missiles, and at least 8-15 launchers on hand in 1997.
- US experts also believe that Iran can now manufacture virtually all of the Scud B, with the possible exception of the most sophisticated components of its guidance system and rocket motors. This makes it difficult to estimate how many missiles Iran has in inventory and can acquire over time, as well as to estimate the precise performance characteristics of Iran's missiles, since it can alter the weight of the warhead and adjust the burn time and improve the efficiency of the rocket motors
- Iran has new long range North Korean Scuds - with ranges near 500 kilometers.
 - The North Korean missile system is often referred to as a "Scud C." Typically, Iran formally denied the fact it had such systems long after the transfer of these missiles became a reality. Hassan Taherian, an Iranian foreign ministry official, stated in February, 1995, "There is no missile cooperation between Iran and North Korea whatsoever. We deny this."
 - In fact, a senior North Korean delegation traveled to Tehran to close the deal on November 29, 1990, and met with Mohsen Rezaei, the former commander of the IRGC. Iran either bought the missile then, or placed its order shortly thereafter. North Korea then exported the missile through its Lyongaksan Import Corporation. Iran imported some of these North Korean missile assemblies using its B-747s, and seems to have used ships to import others.
 - Iran probably had more than 60 of the longer range North Korean missiles by 1998, although other sources report 100, and one source reports 170.
 - Iran may have 5-10 Scud C launchers, each with several missiles. This total seems likely to include four new North Korean TELs received in 1995.

- Iran seems to want enough missiles and launchers to make its missile force highly dispersible.
- Iran may have 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.
- Iran is developing an indigenous missile production capability with both solid and liquid fueled missiles. Seems to be seeking capability to produce MRBMs.
 - 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 be 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 have been reports that Iran ordered the North Korean No Dong missile, which may be able to carry nuclear and biological missile ranges of up to 900 kilometers. This missile could reach virtually any target in Gulf, Turkey, and Israel. The status of the No Dong program is increasingly uncertain, although North Korea had 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 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 question whether a unit this big is practical

- Other reports indicate that Iran is developing two variants of the No Dong for indigenous production:
 - One version is 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.
 - Booster testing is reported to have taken place in 1997.
 - The other missile is 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 have ranged from 1999-2001.
 - These programs are said to have support from North Korea, and both Russian and Chinese firms and technicians. The Chinese firm is said to be Great Wall Industries. The Russian firms are said to 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.
 - The details of these reports may be incorrect, but many US experts believe that Iran tested boosters in 1997 capable of ranges of 1,500 kilometers, and is approaching the point where it will be able to manufacture missiles with much longer ranges than the Scud B. It is unclear when they will be able to bring such programs to the final development stage, carry out suitable test firings, develop effective warheads, and deploy actual units. It is possible, however, that Iran could deploy its first units in three to five years, and by this time it may have much more lethal chemical and biological warheads than Iraq had at the beginning of the Gulf War.
- Iran seems to have been interested in two developmental North Korean IRBMs called the Tapeo Dong 1 and Tapeo Dong 2. It is not clear how these missiles are linked to the earlier reports.
 - 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.
- These reports about transfers of missile technology from North Korea cannot be separated from reports on transfers from China and Russia, and Iran may be obtaining technology from all three countries to support the same programs.
- The reports on China involve the least 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.
- The CIA reported in June 1997 that Iran had obtained new missile technology from Russia and China during 1996. Since that time, there have been many additional reports of technology transfer from Russia.
 - 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.
 - 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.
 - These missiles included the Shihab missiles, with performance similar to those previously identified with Iranian missiles adapted from North Korean designs.

- The Israeli reports indicated that the Shihab 3 was liquid fueled missile with a range of 810 miles (1,200-1,500 kilometers) and a payload of 1,550 pounds (700 kilograms).
 - Israel claimed the Shihab might be ready for deployment as early as 1999 -- and the Shihab 4, with a range of 1,250 miles (some reports say up to 4,000 kilometers) and a payload in excess of one ton.
 - The other two missiles were longer-range systems with a maximum ranges of up to 4,500-55,000 and 10,000 kilometers.
 - US intelligence reports indicate that China has also been helping Iran with some aspects of these missile efforts.
- There have been other reports that Iran might be using Russian technology to develop a very long-range missiles with range of 3,500 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.
- Russia has been a key supplier of missile technology.
- 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 Koptev, the head of the Russian space program, should jointly examine the US intelligence and draft a report on Russian transfers to Iran. This report reached a very different conclusion from President Yeltsin and concluded that Russia had provided such aid to Iran. Further, on October 1, 1997 -- roughly a week after Yeltsin issued his denial -- the Russian security service issued a statement that it had "thwarted" an Iranian attempt to have parts for liquid fuel rocket motors manufactured in Russia, disguised as gas compressors and pumps.
- Russian firms said to be helping Iran included the Russian Central Aerohydrodynamic Institute which developed a special wind tunnel; Rosvoorouzhnie, a major Russian arms-export agency; Kutznetsov (formerly NPO Trud) a rocket motor manufacturer in Samara; a leading research center called the Bauman National Technical University in Moscow, involved in developing rocket propulsion systems; the Tsagi Research Institute for rocket propulsion development; and the Polyus (Northstar) Research Institute in Moscow, a major laser test and manufacturing equipment firm. Iranians were also found to be studying rocket engineering at the Baltic State University in St. Petersburg and the Bauman State University.
- Russia was also found to have sold Iran high strength steel and special foil for its long-range missile program. The Russian Scientific and Production Center Inor concluded an agreement as late as September, 1997 to sell Iran a factory to produce four special metal alloys used in long-range missiles. Inor's director, L. P Chromova worked out a deal with A. Asgharzadeh, the director of an Iranian factory, to sell 620 kilograms of special alloy called 21HKMT, and provide Iran with the capability to thermally treat the alloy for missile bodies. Iran had previously bought 240 kilograms of the alloy. Inor was also selling alloy foils called 49K2F, CUBE2, and 50N in sheets 0.2-0.4 millimeters thick for the outer body of missiles. The alloy 21HKMT was particularly interesting because North Korea also uses it in missile designs. Inor had previously brokered deals with the Shahid Hemat

Industrial Group in Iran to supply maraging steel for missile cases, composite graphite-tungsten material, laser equipment, and special mirrors used in missile tests.

- The result was a new and often tense set of conversations between the US and Russia in January, 1998. The US again sent Ambassador Frank Wisner to Moscow, Vice President Gore called Prime Minister 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.
- 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 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.
- Iran has 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.
- 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.

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 extremely uncertain:
 - US experts believe Iran was beginning to produce significant mustard gas and nerve gas by the time of the August, 1988 cease-fire in the Iran-Iraq War, although its use of chemical weapons remained limited and had little impact on the fighting
 - Iran's efforts to equip plants to produce V-agent nerve gases seem to have been delayed by US, British, and German efforts to limit technology transfers to Iran, but Iran may have acquired the capability to produce persistent nerve gas during the mid 1990s.
 - Production of nerve gas weapons started no later than 1994.
 - Began to stockpile of cyanide (cyanogen chloride), phosgene, and mustard gas weapons after 1985. Recent CIA testimony indicates that production capacity may approach 1,000 tons annually.
- Weapons include bombs and artillery. Shells include 155 mm artillery and mortar rounds. Iran also has chemical bombs and mines. It may have developmental chemical warheads for its Scuds, and may have a chemical package for its 22006 RPV (doubtful).
- There are reports that Iran has deployed chemical weapons on some of its ships.
- Iran has increased chemical defensive and offensive warfare training since 1993.
- Iran is seeking to buy more advanced chemical defense equipment, and has sought to buy specialized equipment on world market to develop indigenous capability to produce advanced feedstocks for nerve weapons.
 - CIA sources indicated in late 1996, that China might have supplied Iran with up to 400 tons of chemicals for the production of nerve gas.
 - One report indicated in 1996, that Iran obtained 400 metric tons of chemical for use in nerve gas weapons from China -- including carbon sulfide.
 - Another report indicated that China supplied Iran with roughly two tons of calcium-hypochlorate in 1996, and loaded another 40,000 barrels in January or February of 1997. Calcium-hypochlorate is used for decontamination in chemical warfare.
 - Iran placed several significant orders from China that were not delivered. Razak Industries in Tehran, and Chemical and Pharmaceutical Industries in Tabriz ordered 49 metric tons of alkyl dimethylamine, a chemical used in making detergents, and 17 tons of sodium sulfide, a chemical used in making mustard gas. The orders were never delivered, but they were brokered by Iran's International 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 used 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 thionyl 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.

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.

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 seem 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 their 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 Shahrda 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. They 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 Kazakhstan. The US paid between \$20 million and \$30 million to buy 1,300 pounds of highly enriched uranium from the Ust-Kamenogorsk facility in Kazakhstan that Iran may have sought to acquire in 1992. A total of 120 pounds of the material -- enough for two bombs -- cannot be fully accounted for.
 - Iran has imported maraging steel, sometimes used for centrifuges, by smuggling it in through dummy fronts. Britain intercepted 110 pound (50 kilo) shipment in August, 1996. Seems to have centrifuge research program at Sharif University of Technology in Tehran. IAEA "visit" did not confirm.
 - Those aspects of Iran's program that are visible indicate that Iran has had only uncertain success. Argentina agreed to train Iranian technicians at its Jose Balaseiro Nuclear Institute, and sold Iran \$5.5 million worth of uranium for its small Amirabad Nuclear Research Center reactor in May 1987. A CENA team visited Iran in late 1987 and early 1988, and seems to have discussed selling Iran the technology necessary to operate its reactor with 20% enriched uranium as a substitute for the highly enriched core provided by the US, and possibly uranium enrichment and plutonium reprocessing technology as well. Changes in Argentina's government, however, made it much less willing to support proliferation. The Argentine government announced in February, 1992, that it was canceling an \$18 million nuclear technology sale to Iran because it had not signed a nuclear safeguards arrangement. Argentine press sources suggested, however, that Argentina was reacting to US pressure.
 - In February, 1990 a Spanish paper reported that Associated Enterprises of Spain was negotiating the completion of the two nuclear power plants at Bushehr. Another Spanish firm called ENUSA (National Uranium Enterprises) was to provide the fuel, and Kraftwerke Union (KWU) would be involved. Later reports indicated that a 10 man delegation from Iran's

Ministry of Industry was in Madrid negotiating with the Director of Associated Enterprises, Adolfo Garcia Rodriguez.

- Iran negotiated with Kraftwerke Union and CENA of Germany in the late 1980s and early 1990s. Iran attempted to import reactor parts from Siemens in Germany and Skoda in Czechoslovakia. None of these efforts solved Iran's problems in rebuilding its reactor program, but all demonstrate the depth of its interest.
- Iran took other measures to strengthen its nuclear program during the early 1990s. It installed a cyclotron from Ion Beam Applications in Belgium at a facility in Karzaj in 1991.
- Iran conducted experiments in uranium enrichment and centrifuge technology at its Sharif University of Technology in Tehran. Sharif University was also linked to efforts to import cylinders of fluorine suitable for processing enriched material, and attempts to import specialized magnets that can be used for centrifuges, from Thyssen in Germany in 1991.
- 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 Daryae);
 - 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 Mikhailiov, 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.
 - China is reported to have agreed to provide significant nuclear technology transfer and possible sale of two 300 megawatt pressurized water reactors in the early 1990s, but then to have agreed to halt nuclear assistance to Iran after pressure from the US.
 - Iran signed an agreement with China's Commission on Science, Technology, and Industry for National Defense on January 21, 1991, to build a small 27-kilowatt research reactor at Iran's nuclear weapons research facility at Isfahan. On November 4, 1991, China stated that it had signed commercial cooperation agreements with Iran in 1989 and 1991, and that it would transfer an electromagnetic isotope separator (Calutron) and a smaller nuclear reactor, for "peaceful and commercial" purposes.
 - The Chinese reactor and Calutron were small research-scale systems and had no direct value in producing fissile material. They did, however, give Iran more knowledge of reactor and enrichment technology, and US experts believe that China provided Iran with additional data on chemical separation, other enrichment technology, the design for facilities to convert uranium to uranium hexafluoride to make reactor fuel, and help in processing yellowcake.
 - The US put intense pressure on China to halt such transfers. President Clinton and Chinese President Jiang Zemin reached an agreement at an October, 1997 summit. China strengthened this pledge in negotiations with the US in February, 1998.
 - In March, 1998, the US found that the China Nuclear Energy Corporation was negotiating to sell Iran several hundred tons of anhydrous hydrogen fluoride (AHF) to Isfahan Nuclear Research Corporation in central Iran, a site where some experts believe Iran is working on the development of nuclear weapons. AHF can be used to separate plutonium, help refine yellow cake into uranium hexafluoride to produce U-235, and as a feedstock for Sarin. It is on two nuclear control lists. China agreed to halt the sale.
 - Iran denied that China had halted nuclear cooperation on March 15, 1998.
 - Even so, the US acting Under Secretary of State for Arms Control and International Security Affairs stated that China was keeping its pledge not to aid Iran on March 26, 1998.
 - US estimates of Iran's progress in acquiring nuclear weapons have become more conservative with 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.
- 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.
- The control of fissile material in the FSU remains a major problem:
 - US estimates indicate the FSU left a legacy of some 1,485 tons of nuclear material. This include 770 tons in some 27,000 weapons, including 816 strategic bombs, 5,434 missile warheads, and about 20,000 theater and tactical weapons. In addition, there were 715 tons of fissile or near-fissile material in eight countries of the FSU in over 50 sites: enough to make 35,000-40,000 bombs.
 - There are large numbers of experienced FSU technicians, including those at the Russian weapons design center at Arzamas, and at nuclear production complexes at Chelyabinsk, Krasnoyarsk, and Tomsk.
 - These factors led the US to conduct Operation Sapphire in 1994, where the US removed 600 kilograms of highly enriched uranium from the Ulba Metallurgy Plant in Kazakhstan at a time Iran was negotiating for the material.
 - They also led to Britain and the US cooperating in Auburn Endeavor, and airlifting fissile material out of a nuclear research facility in Tbilisi, Georgia. There were 10 pounds of material at the institute, and 8.8 pounds were HEU. (It takes about 35 pounds to make a bomb.) This operation was reported in the New York Times on April 21, 1998. The British government confirmed it took place, but would not give the date.
- The Jerusalem Post reported on April 9, 1998 that Iran had purchased four tactical nuclear weapons from Russian smugglers for \$25 million in the early 1990s, that the weapons had been obtained from Kazakhstan in 1991, and that Argentine technicians were helping to activate the weapon.
 - It quoted what it claimed was an Iranian report, dated December 26, 1991, of a meeting between Brigadier General Rahim Safavi, the Deputy Commander of the Revolutionary Guards and Reza Amrohalli, then head of the Iranian atomic energy organization.
 - It also quoted a second document -- dated January 2, 1992 --- saying the Iranians were awaiting the arrival of Russian technicians to show them how to disarm the protection systems that would otherwise inactivate the weapons if anyone attempted to use them.
 - The documents implied the weapons were flawed by did not indicate whether Iran had succeeded in activating them.
 - The US intelligence community denied any evidence that such a transfer had taken place.

- The most detailed reports of Iran's nuclear weapons program are the least reliable and come from the People's Mujahideen, a violent, anti-regime, terrorist group. Its claims 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. Kellogg was building at Borujerd in Khorassan province, near the border with Turkestan, might be adapted to produce heavy water.
 - The Amir Kabir 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, Ghods Research Center, Iran Argham Co., Iran Electronic Industries, Iranian Research Organization, Ministry of Sepah, Research and Development Group, Sezeman Sanaye Defa, the Sharif University of Technology, Taradis Iran Computer Company, and Zakaria Al-Razi Chemical Company are all participants in the Iranian nuclear weapons effort.
 - Other sources based on opposition data have listed the Atomic Energy Organization of Iran, the Laser Research Center and Ibn-e Heysam Research and Laboratory Complex, the Bonab Atomic Energy Research Center (East Azerbaijan), the Imam Hussein University of the Revolutionary Guards, the Jabit bin al-Hayyan Laboratory, the Khoshomi uranium mine (Yazd), a possible site at Moallem Kalayeh, the Nuclear Research Center at Tehran University, the Nuclear Research Center for Agriculture and Medicine (Karaj), the Nuclear Research Center of Technology (Isfahan), the Saghand Uranium mine (Yazd), the Sharif University (Tehran) and its Physics Research Center.