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Iran's Evolving Military Forces

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July 2004

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I. Iran and the Gulf Military Balance: The "Four Cornered" Balancing Act

The Gulf military balance has long been a "four cornered" balancing act between Iran, Iraq, Saudi Arabia and the Southern Gulf states, and the power projection forces of the United Kingdom and the United States. Yemen has only limited military power, but is still a significant factor in regional security because of its large population, common borders with Oman and Saudi Arabia, and strategic position at the entrance to the Red Sea.

The Dynamics of the Gulf Military Balance

There have been many tests of this balance. Egypt attempted to dominate North Yemen by intervening in its civil war during the 1960s, and only left in 1967. South Yemen supported Marxists rebels in Oman in what came to be called the "Dhofar Rebellion." Iraq invaded Iran in 1980. the most serious tests, however, have come from two rival Northern Gulf powers – Iran and Iraq – have dominated both regional conflicts and the regional arms race since the 1960s. This rivalry led to a bloody war between them during 1980-1988, followed by an Iraqi victory.

Iraq's status as the dominant power, however, was very short lived. In 1990 Iraq invaded Kuwait, and triggered a war with a UN coalition which not only destroyed much of its military power, but which led to more than a decade of UN sanctions and confrontation with the US and its allies. In 2003, a US and British led coalition invaded Iraq, removed the regime of Saddam Hussein, and effectively destroyed Iraq's armed forces. The end result was to create a major power vacuum in the Gulf whose future impact and implications are now far from clear.

The military balance in the Gulf has always been shaped by players from outside the region. First Britain and then the US have effectively counterbalanced the power of both Iran and Iraq. Britain effectively guaranteed the security of the Southern Gulf states until abandoned its dominant military role in the region between 1966 and 1968. The US then turned to Iran as a "pillar" of regional security until the fall of the Shah in 1979 – which led to the Iranian seizure of US diplomats as hostages and a crisis in US-Iranian relations.

The US and Europe supported Iraq in the Iran-Iraq War after 1982, when Iranian counteroffensives threatened Iraq's survival. Kuwait pressured the US into "reflagging" its tankers in 1986, to protect them from Iranian attacks, which led to a brief "tanker war" between the US and Iran during 1987-1988 which crippled part of the Iranian Navy. This situation changed radically in the summer of 1990, when Iraq invaded Kuwait. The US, Britain, Saudi Arabia, and Egypt led a coalition that liberated Kuwait in 1991, and Iraq was placed under sanctions that continued until 2003 – when the US and Britain led another coalition that invaded Iraq and overthrew the regime of Saddam Hussein.

The Southern Gulf states – Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the UAE – have built up their own military forces. This effort has been led by a massive military investment by Saudi Arabia, the only Southern Gulf state large and wealthy enough to play such a role. Unlike Iran and Iraq, however, the military efforts of the Southern Gulf states were carried out with the knowledge that the US and its allies could provide power projection forces to protect them, and that such protection would almost certainly be forthcoming because of the role the Gulf played in the world's oil exports and the fact it had more than 60% of the world proven oil reserves.

As a result, the military build-up in the Southern Gulf has lacked cooperation and cohesion. Although the Southern Gulf states created a Gulf Cooperation Council (GCC) in 1980 – largely as a reaction to the perceived threat from a revolutionary Iran--the GCC never resulted in more than token military cooperation. Each of the southern Gulf states pursued its own path in creating military forces, often emphasized the purchase of modern major weapons systems that were perceived to provide prestige and a "glitter factor" in terms of regional status. Rivalries and past tensions between the Southern Gulf states prevented serious efforts at developing joint capabilities and interoperability. At the same time, a number of states limited their military efforts because of the fear of coups. The end result was that the Southern Gulf states largely preferred de facto dependence on US and British power projection forces over effective regional and national military efforts.

Other changes are radically affecting this balance. These include the "revolution in military affairs," but the primary factors have been proliferation, asymmetric warfare, and terrorism – driven by Islamic extremism. As this chapter

makes clear, Iraq's defeat and Iran's military weakness have sharply reduced the conventional threat from the Northern Gulf. Iraq is no longer able to proliferate, though a new insurgency since Saddam's fall has shown the ability of asymmetric warfare to challenge even the most effective conventional forces.

Iran has organized its Revolutionary Guards Corps to support asymmetric warfare and has supported violent non-state groups in the struggle against Israel such as the Hezbollah, Hamas, and Palestinian Islamic Jihad. Iran has also had more freedom to acquire weapons of mass destruction, although it has joined the Chemical Weapons Convention and has pledged to destroy its chemical weapons. It also agreed to allow full inspection of its nuclear facilities in 2003, and to permit challenge inspections by the International Atomic Energy Agency (IAEA), after disclosures regarding its covert nuclear programs prompted the threat of UN sanctions.

Developments in the North Gulf

Figure 1.1 sets the stage by showing how Iranian and Iraqi forces compared with those of the Southern Gulf states in 2003, before the Iraq War began. The military build-up in the northern Gulf has long dominated both conflict and perceptions of risk in the Gulf region. This build-up began in the 1960s, and accelerated during the 1970s. It involved an arms race between Iran and Iraq that Iran largely dominated until the fall of the Shah in 1979. Most Western arms shipments halted as a result of both the turmoil that followed and Iran's seizure of US diplomats as hostage. The end result was to deprive Iran of major resupply of its large US and British forces from 1980 to the present – a development that forced Iran to turn to suppliers like Russia, China, North Korea, and Vietnam with limited success.

In 1980, war broke out between Iran and Iraq and continued until 1988 – a conflict which proved to be the bloodiest in the history of the Middle East and the first in which extensive use was made of chemical weapons. Iraqi victories in the spring and summer of 1988 destroyed between 40% and 60% of the inventory. The result was to make Iraq the dominant military power in the Gulf, although Iraq had been largely impoverished by the war. This helped trigger Iraq's invasion of Kuwait in 1990, and the Gulf War that followed. The UN imposed sanctions on any Iraqi import of arms in 1990 that lasted until 2003, and Iraq lost some 30-40% of its military inventory in the Gulf War.

Iraq's military development remained crippled from 1990 to 2003, when a US and British led coalition invaded Iraq, destroyed much of Iraq's remaining military forces and caused the collapse of Saddam Hussein's regime. While Iraq did smuggle in some arms during 1992-2003, such efforts were limited as were its efforts to create the means to deliver weapons of mass destruction.

Iran had a greater ability to import arms after the end of the Gulf War in 1990, but faced major financial problems and could not obtain resupply or new weapons from most Western states. It was able to rebuild some of its conventional capabilities during 1988-2003, and make progress towards acquiring weapons of mass destruction and long-range missiles. In practice, however, its forces had far less war fighting capability than in 1979, the year the Shah fell from power.

As has been discussed earlier, the virtual destruction of Iraq's military forces and capability to deploy or acquire weapons of mass destruction in 2003 has fundamentally changed the Gulf military balance. Yet the longer-term trends described earlier have also had a major effect. While some Southern Gulf states have faced recent problems in recapitalizing their forces, these problems have been far more severe in the case of Iran and Iraq and have affected their military development far longer.

Three other figures help explain the trends involved:

- **Figure 1.2** shows the trends in Iranian and Iraqi military expenditures. While the time scale is altered to highlight key periods, it shows that Iran massively outspent Iraq until the fall of the Shah of Iran in 1979. Iraq was able to dramatically reverse this situation during the Iran-Iraq War, largely as a result of Kuwaiti and Saudi loans and arms sales loans from the FSU and Europe. The Gulf War, however, led to UN sanctions that prevented arms sales to Iraq and created an economic crisis. As a result, Iran sharply outspent Iraq from 1991 onwards -- although any estimates of Iraqi spending after 1991 are highly uncertain.

- **Figure 6.3** shows the long-term trends in Iranian and Iraqi arms orders and deliveries. It shows that Iraq had a massive advantage over Iran in arms orders during the Iran-Iraq War and until its arms imports became subject

to UN sanctions in 1990. From that point onwards, US intelligence estimates Iraq's arms imports at less than $50 million a year. From that point on, Iraq was free to import arms, but Iraq was not. A careful look at Figure 7.1 shows, however, that Iran never came close to importing the same amount of arms after the end of the Iran-Iraq War that it did before the war in spite of its massive equipment losses in 1988. Moreover, the trend in Iranian arms orders as deliveries has moved steadily downwards in each for year period since 1991.

- **Figure 1.4** shows the source of Iranian and Iraqi imports. Neither received significant deliveries of US arms. Iraq had large deliveries of arms from Europe and the FSU before 1990, but only token deliveries from any source between 1991 and the Iraq War, largely from Eastern Europe between 1999 and 2002 – the point at which Iraq's oil exports gave it significant surplus resources for the first time since 1991. Iran depended heavily on Russia before and immediately after the Iran-Iraq War, but placed only limited orders between 1995 and 2002. There are reports of a new one billion dollar plus order from Russia in 2003, but they have not been confirmed. The result of its arms came largely from China and East European suppliers.

Figure 1.1

Gulf Military Forces in 2004

	Iran	Iraq*	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia*	UAE	Yemen
Manpower									
Total Active	540,000	424,000	11,200	15,500	41,700	12,400	124,500	50,500	66,700
Regular	350,000	375,000	11,200	15,500	25,000	12,400	124,500	50,000	66,700
National Guard & Other	120,000	0	0	0	6,400	0	75,000	0	0
Reserve	350,000	650,000	0	23,700	0	0	20,000	0	40,000
Paramilitary	40,000	42,000+	10,160	6,600	4,400	0	15,500+	1,100	70,000
Army and Guard Manpower	540,000*	375,000	8,500	11,000	31,400	8,500	150,000	50,500	60,000
Regular Army Manpower	350,000	375,000	8,500	11,000	25,000	8,500	75,000	50,500	60,000
Reserve	350,000	650,000	0	0	0	0	20,000	0	40,000
Total Main Battle Tanks***	1,565	2,200	140	385	117	30	1,055	439	790
Active Main Battle Tanks	1,565	1,900	140	293	117	30	710	330	790
Active AIFV/Recce, Lt. Tanks	865	1,300	71	355	167	80	1,270+	780(40)	330
Total APCs	670	2,400	235	321	204	190	3,190	620	710
Active APCs	670	1,800	205	281	204	172	2,630	570	240
ATGM Launchers	75	100+	15	118	48	148	480+	305	71
Self Propelled Artillery	310	150	13	68 (18)	24	28	170	181	25
Towed Artillery	2,085	1,900	26	0	108	12	238(58)	90	310
MRLs	889+	200	9	27	?	4	60	72(48)	
164 Mortars	5,000	2,000+	21	78	101	45	400	155	502
SSM Launchers	51	56	0	0	0	0	12	6	28
Light SAM Launchers	?	1,100	78	0	72	0	650	100	800
AA Guns	1,700	6,000	27	0	26	0	10	62	530
Air Force Manpower	52,000	20,000	1,500	2,500	4,100	2,100	18,000	4,000	5,000
Air Defense Manpower	15,000	17,000	0	0	0	0	16,000	0	2,000
Total Combat Aircraft	306	316	34	81	40	18	348	106	76(40)
Bombers	0	6	0	0	0	0	0	0	0
Fighter/Attack	163+	130	12	40	12	18	172	48	40
Fighter/Interceptor	74+	180	22	14	0	0	108	22	30
Recce/FGA Recce	6	5	0	0	12	0	10	8	0
AEW C4I/BM	1	0	0	0	0	0	5	0	
MR/MPA**	5	0	0	0	0	0	0	0	0
OCU/COIN/CCT	0	0	0	28	16	0	14	28	0
Other Combat Trainers	35	157	0	0	0	0	50	0	6
Transport Aircraft****	68	12	4	4	16	6	61	21	18
Tanker Aircraft	4	2	0	0	0	0	16	0	0
Total Helicopters	628	375	47	28	30	23	137	115	25
Armed Helicopters****	104	100	40	20	0	19	21	59	8
Other Helicopters****	524	275	7	8	30	4	116	56	17
Major SAM Launchers	250+	400	15	84	40	9	106	39	57
Light SAM Launchers	?	1,100	-	60	28	90	309	134	120
AA Guns	-	6,000	-	60	-	-	340	-	-

Total Naval Manpower	38,000*	2,000	1,200	2,000	4,200	1,800	15,500	2,500	1,700
Regular Navy	15,400	2,000	1,200	2,000	4,200	1,800	12,500	2,500	1,700
Naval Guards	20,000	0	0	0	0	0	0	0	0
Marines	2,600	-	-	-	-	-	3,000	-	-
Major Surface Combatants									
Missile	3	0	3	0	0	0	8	4	0
Other	0	0	0	0	0	0	0	0	0
Patrol Craft									
Missile	10	1	6	10	6	7	9	8	6
(Revolutionary Guards)	10	-	-	-	-	-	-	-	-
Other	42	5	4	0	7	-	17	8	5
Revolutionary Guards (Boats)	40	-	-	-	-	-	-	-	-
Submarines	3	0	0	0	0	0	0	0	0
Mine Vessels	7	3	0	0	0	0	7	0	6
Amphibious Ships	9	0	0	0	1	0	0	0	1
Landing Craft	9	-	4	2	4	0	8	5	5
Support Ships	23	2	5	4	4	-	7	2	2
Naval Air	2,000	-	-	-	-	-	-	-	-
Naval Aircraft									
Fixed Wing Combat	5	0	0	0	0	0	0	0	0
MR/MPA	10	0	0	0	(7)	0	0	0	0
Armed Helicopters	19	0	0	0	0	0	21	7	0
SAR Helicopters	-	0	0	0	0	0	4	4	0
Mine Warfare Helicopters	3	0	0	0	0	0	0	0	0
Other Helicopters	19	-	2	-	-	-	19	-	

Note: Equipment in storage shown in the higher figure in parenthesis or in range. Air Force totals include all helicopters, including army operated weapons, and all heavy surface-to-air missile launchers.

* Iranian total includes roughly 100,000 Revolutionary Guard actives in land forces and 20,000 in naval forces. Iraqi totals are pre-conflict counts.

** Saudi Totals for reserve include National Guard Tribal Levies. The total for land forces includes active National Guard equipment. These additions total 450 AIFVs, 730(1,540) APCs, and 70 towed artillery weapons.

*** Total tanks include tanks in storage or conversion.

**** Includes navy, army, national guard, and royal flights, but not paramilitary.

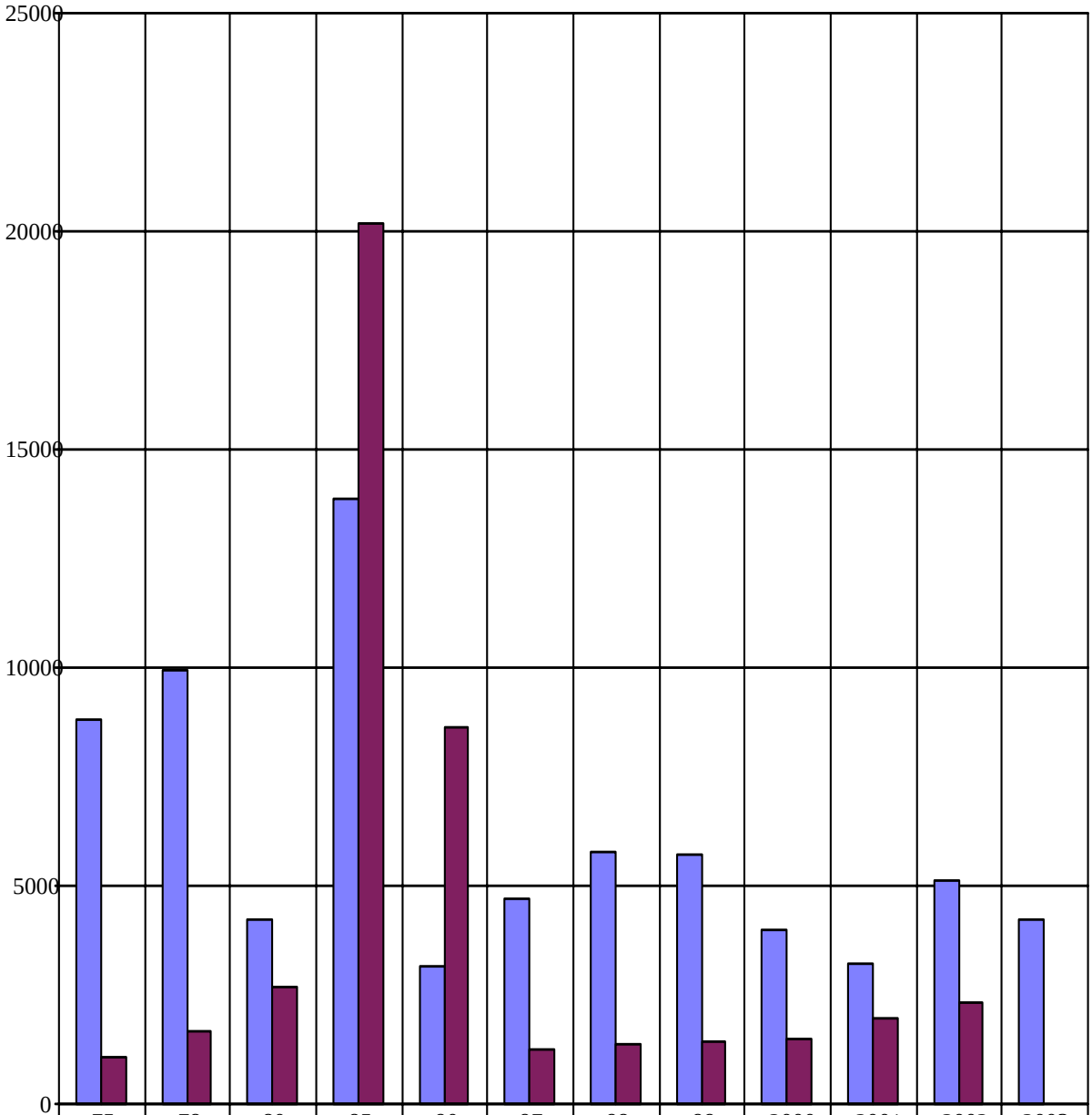
***** Includes in Air Defense Command

Source: Adapted by Anthony H. Cordesman from interviews, International Institute for Strategic Studies, Military Balance (IISS, London); Jane's Sentinel, Periscope; and Jaffee Center for Strategic Studies, The Military Balance in the Middle East (JCSS, Tel Aviv)

Figure 1.2

Northern Gulf Military Expenditures by Country: 1985-2002

(in $US Current Millions)



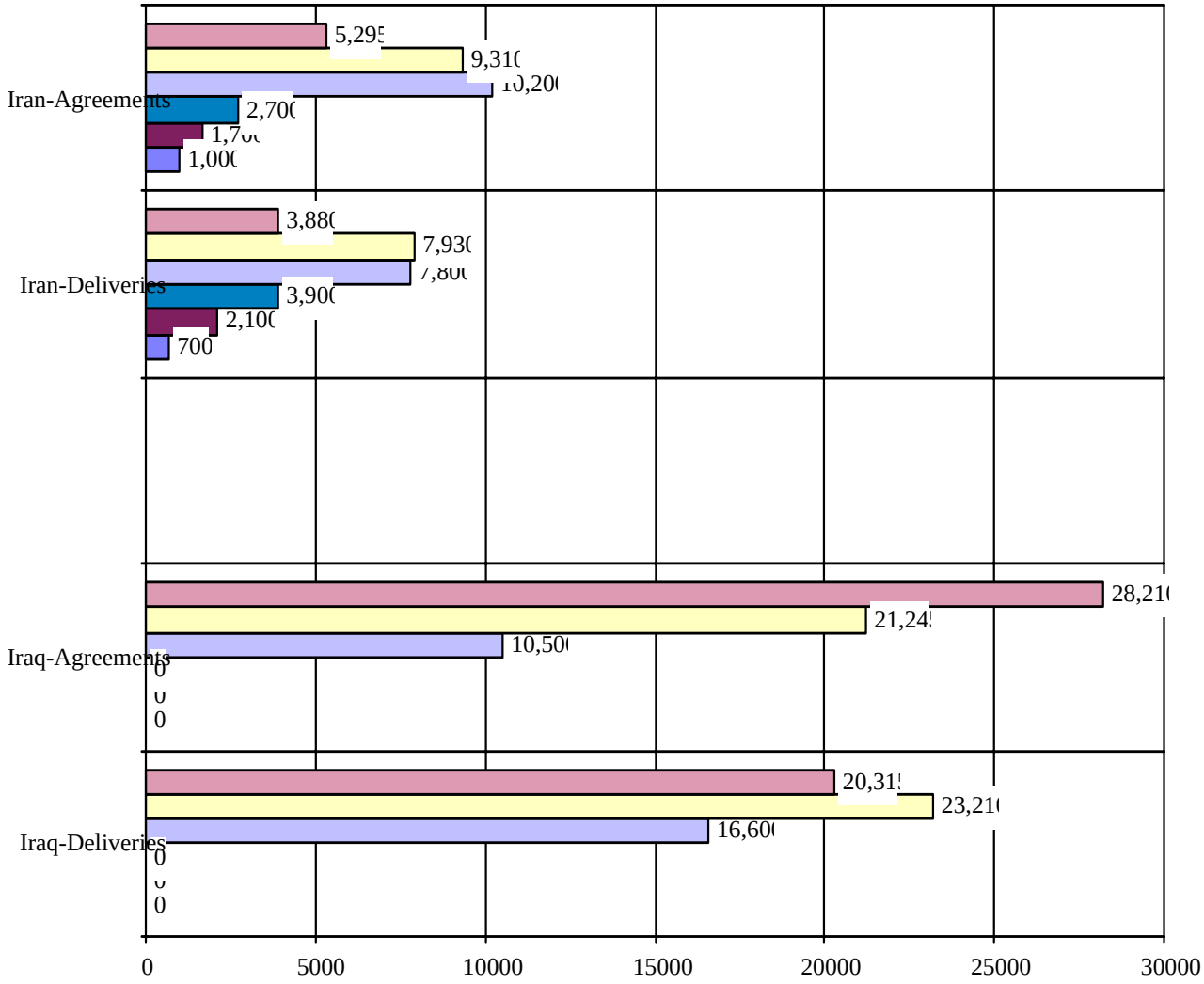
	75	78	80	85	90	97	98	99	2000	2001	2002	2003e
Iran	8800	9942	4200	13,877	3180	4695	5800	5711	4000	3,200	5,100	4,200
Iraq	1064	1695	2700	20,162	8610	1250	1372	1,400	1470	1980	2300	-

Source: International Institute of Strategic Studies, Military Balance, various editions. Figures for Iraq adjusted by the authors.

Figure 1.3

Agreements and Deliveries to Iran and Iraq: 1994-2002

(Arms Agreements and Deliveries in $US Current Millions)



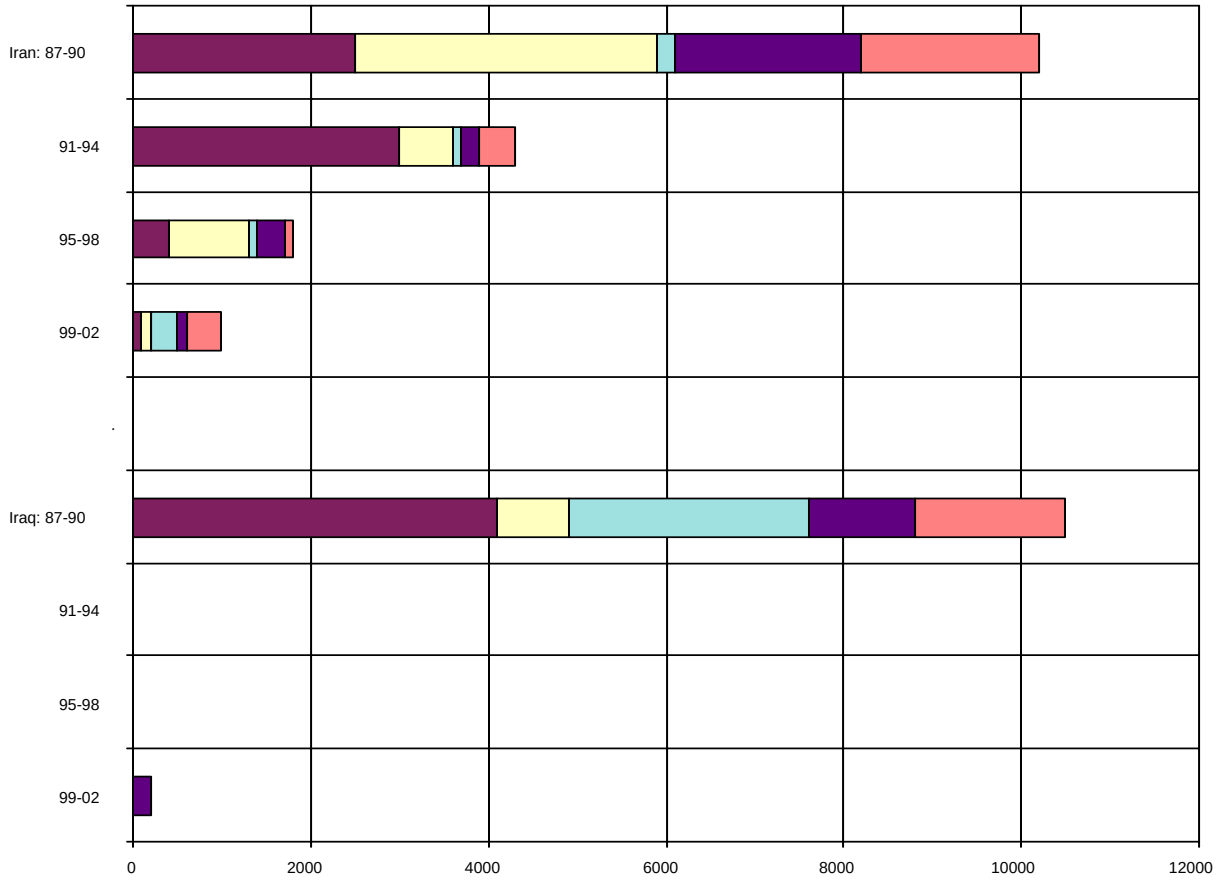
	Iraq-Deliveries	Iraq-Agreements		Iran-Deliveries	Iran-Agreements
80-83	20,315	28,210		3,880	5,295
84-87	23,210	21,245		7,930	9,310
87-90	16,600	10,500		7,800	10,200
91-94	0	0		3,900	2,700
95-98	0	0		2,100	1,700
99-01	0	0		700	1,000

0 = Data less than $50 million or nil. All data rounded to the nearest $100 million.
Source: Richard F. Grimmett, Conventional Arms Transfers to the Developing Nations, Congressional Research Service, various editions.

Figure 1.4

Northern Gulf New Arms Orders by Supplier Country: 1987-2002

(Arms Agreements in $US Current Millions)



	99-02	95-98	91-94	Iraq: 87-90	.	99-02	95-98	91-94	Iran: 87-90
All Others	0	0	0	1700		400	100	400	2000
Other Europe	200	0	0	1200		100	300	200	2100
Major W. Euro	0	0	0	2700		300	100	100	200
China	0	0	0	800		100	900	600	3400
Russia	0	0	0	4100		100	400	3000	2500
US	0	0	0	0		0	0	0	0

0 = less than $50 million or nil, and all data rounded to the nearest $100 million.
Source: Adapted by Anthony H. Cordesman, CSIS, from Richard F. Grimmett, Conventional Arms Transfers to the Developing Nations, Congressional Research Service, various editions.

II. Iran’s Erratic Military Modernization

Iran is still a major military power by Gulf terms. It has active forces of some 540,000 men, although some 220,000 of this total are 18-month conscripts which general receive limited training and have marginal military effectiveness. It also has an army reserve of some 350,000 men, although these reserves receive negligible training and Iran lacks the equipment, supplies, and leadership cadres to make effective use of such reserves without months of reorganization and training.

Iran’s problems in military modernization have been compounded by a number of factors. The combat trained manpower Iran developed during the Iran-Iraq War have virtually all left service. Iran is now a largely conscript force with limited military training and little combat experience. The deep divisions between “moderates” and “hard-liners” in Iran’s government have inevitably politicized the armed forces, which remain under the command of the supreme religious leader, the Ayatollah Khamenei. Iran has also divided armed forces, split between the regular forces that existed under the Shah, and the Revolutionary Guards created under the Ayatollah Khomeini. This split is compounded by a highly bureaucratic force, which has made limited progress in joint warfare.

The Iranian Army

The Iranian Army is still large by regional standards. It has some 350,000 men (20,00+ conscripts), organized into four corps, with four armored divisions, six infantry divisions, two commando brigades, an airborne brigade and other smaller independent formations. It has some 1,565 main battle tanks, although only 480-580 can be described as “modern” be Gulf standards, 865 other armored fighting vehicles, 550-670 armored personnel carriers, 2,085 towed artillery weapons, 310 self-propelled artillery weapons, more than 890 multiple rocket launchers, some 1,700 air defense guns and large numbers of light anti-aircraft missiles, large numbers of anti-tank weapons and guided missiles, and some 50 attack helicopters. This is a large inventory of major weapons, although many are worn and obsolete.

In practice, each Iranian division has a somewhat different organization. For example, only one Iranian division (the 92nd) is equipped well enough in practice to be a true armored division and two of the armored divisions are notably larger than the others. Two of the infantry divisions (28th and 84th) are more heavily mechanized than the others.[1]The lighter and smaller formations in the regular army include the 23rd Special Forces Division, which was formed in 1993-1994, and the 55th paratroop division. According to one source, the 23rd Special Forces Division has 5,000 full-time regulars, and one of the most professional units in the Iranian Army. The airborne and special forces are trained at a facility in Shiraz.[2] The regular army also has a number of independent brigades and groups. These include some small armored units, 1 infantry brigade, 1 airborne and 2-3 special forces brigades, coastal defense units, a growing number of air defense groups, 5 artillery brigades/regiments, 4-6 army aviation units, and a growing number of logistic and supply formations. The land forces have six major garrisons and 13 major casernes. There is a military academy at Tehran, and a signal training center in Shiraz.[3]

Iran has steadily rebuilt its armored strength since the Iran-Iraq War. The IISS estimates that Iran's inventory of 1,565main battle tanks now includes some 150 M-47/M-48 and 150-160 M-60A1, 200 Chieftain Mark 3/5s, 75 T-62s, 400 T-72/T-72S, 250 T-54/T-55, 150-250 T-59s, 50 T-62s, and 150-250 T-69II, and100 Zulfiqars . Other estimates indicate that Iran may have as many as 300 Type 59s. These totals include the remainder of 187 improved FV4030/1 versions of the Mark 5 Chieftain that were delivered to Iran before the fall of the Shah.

Only part of Iran’s tank inventory is fully operational, however, and it is uncertain how many Chieftains and M-47/M-48s are operational. Some experts estimate that Iran's sustainable *operational* tank strength may be fewer than 1,000 tanks. Further, its Chieftains and M-60s are at least 16-20 years old, and the T-72 is Iran’s only tank with advanced fire control systems, sights, and anti-armor ammunition.

Iran’s T-72Ss are export versions of the Soviet T-72B. Some have been built under license in Iran, and are armed with a 125 mm 2A46M smoothbore gun. They have a relatively modern IA40-1 fire control system and computer, a laser range finder, and a night and day image intensifying sighting system. The T-72S is powered by an 840 horsepower V-84MS diesel engine, has an upgrade suspension and mine protection, a combat weight of 44.5 tons. Russian sources indicate that Iran has ordered a total of 1,000 T-72s from Russia.

As has been touched upon earlier, Iran has developed a main battle tank called the Zulfiqar, with a 125 mm smoothbore gun and welded steel turret of Iranian design. According to one report, the Zulfiqar is powered by a V-46-6-12 V-12 diesel engine with 780 horsepower and uses a SPAT 1200 automatic transmission. This engine is used in the Soviet T-72, but the tank transmission design seems to be closer to that of the US M-60. It seems to have a relatively modern fire control system and Iran may have improved its T-72s with a similar upgrade. The Zulfiqar's combat weight is reported to be 36 tons, and it is reported to have a maximum speed of 65 kilometers per hour and a power to weight ratio of 21.7 horsepower per ton. It has a 7.62 mm coaxial and a 12.7 mm roof mounted machine gun. It uses modern Slovenia Fontana EFCS-3 computerized fire control system to provide a fully-stabilized fire on the move capability. It may have a roof-mounted laser warning device and it could use the same reactive armor system discussed earlier. Roughly 100 Zulifqar seem to be in service.

Iran has extended the life of some of its T-54s, T-55s, and T-59s by improving their armor and fire control systems, and by arming them with an Iranian-made M-68 rifled 105 mm gun similar to the one used on the M-60A1. This weapon seems to be made by the Armament Industries Division of the Iranian Defense Industries Organization. The Revolutionary Guard is reported to have a special conversion of the T-54 called the Safir-74. Iran has developed explosive reactive armor add-ons for its tanks, although the effectiveness of such armor and the extent of such uparmoring of any given model of tank is unclear.

Iran's 150 M-47/M-48s include Iran's surviving upgraded M-47Ms. These M-47s were upgraded by the American firm of Bowen-McLaughlin York between 1970-1972, which also built a vehicle manufacturing plant in Iran. They have many of the components of the M-60A1, including the diesel engine, automatic transmission, suspension, gun control and fire components. The conversion extended the operating range of the M-47 from 130 to 600 kilometers, and increased space to hold 79 rounds by eliminating the bow mounted machine gun and reducing the crew to four. A total of about 150 conversions seem to have been delivered to Iran.

In spite of its tank deliveries and production since the Iran-Iraq War, Iran's total operational main battle tank holdings are only sufficient to fully equip 5 to 7 of its divisions by Western standards, and Iran could only sustain about half this force for any period of extended maneuver warfare. At present, however, they are dispersed in relatively small lots among all of its regular Army and some of its IRGC combat units -- all the IRGC units generally only have small tank force cadres and it is unclear how heavy these forces will really be in the future. The 92nd Armored Division is the only Iranian division that has enough tanks to be a true armored division, even by regional standards.

Iran seems to have about 1,000-1,360 armored infantry fighting vehicles (AFVs) and armored personnel carriers (APCs) in its operational inventory, although counts are contradictory and it is difficult to estimate what parts of Iran's holdings are fully operational and/or sustainable for any length of time in combat. The IISS, for example, estimates 515 light tanks and armored infantry fighting vehicles, and 500 APCs. Virtually all estimates indicate, however, that Iran only has about half of the total holdings it would need to fully mechanize its forces.[4] This total compares with around 3,800 such weapons for Iraq and 3,000-3,600 for Saudi Arabia.

Iran appears to retain 70-80 British-supplied Scorpions out of the 250 it received before the fall of the Shah. These are tracked weapons equipped with 76 mm guns. However, the Scorpion is more than 20 years old, and as few as 30 may be fully operational. These problems may explain why Iran has developed a new light tank called the Tosan ("Wild Horse" or "Fury") with a 90 mm gun, some of which may now be in service.

Iran has some 350 BMP-1s and 400 BMP-2 equivalents in service. The BMPs are Soviet-designed systems, but have serious ergonomic and weapons suite problems. They are hard to fight from, hard to exit, and too slow to keep pace with modern tanks. They lack thermal vision systems and modern long-range fire control systems, and their main weapons are hard to operate in combat even from static positions. Nevertheless, many have smooth bore anti-tank guns and anti-tank guided missiles. Iran also has at least 35 EE-9 Cascavel armored reconnaissance vehicles, and one estimate indicates 100. The Cascavel is an acceptable design for Third World combat, although it lacks modern sensors and weapons.

Iranian forces have some 230-240 M-113s and other Western APCs, and a mix of 300-320 BTR-40s, BTR- 50s and BTR-60s. Iran is producing an armored fighting vehicle called the Boragh (Boraq) and a lighter APC called the Cobra or BMT-2, and some 120 may be in service. The Boragh seems to be a copy of a Chinese version of the

BMP-1. It is a fully tracked and amphibious and has a combat weight of 13 tons. It can carry 8-12 people, plus two crew. Reports differ as to its armament -- perhaps reflecting different variants. Initial reports indicated that it has a turret armed with a 73 mm smoothbore gun and anti-tank guided missile launcher. It may, however, lack the commander's position that exists in the BMP-1, and be armed with a 12.7 mm machine gun. Iran has developed an armor package designed to fit over the hull of the Boragh to provide protection against 30mm armor-piercing ammunition.[5] Variants with 120mm mortars, one-man turrets with Iranian-made Toophan ATGMs, and AT-4 ATGMs, and others with 73mm BMP-2 turrets guns also seem to be deploying.

The Cobra or BMT-2 is a low-profile , wheeled troop carrier, which can hold seven personnel Some versions may have twin 23mm AA guns.

Iran has an unknown number of British Chieftain bridging-tanks and a wide range of specialized armored vehicles, and some heavy equipment transporters. Iran is steadily improving its ability to support armored operations in the field, and to provide recovery and field repair capability. However, its exercises reveal that these capabilities are still limited relative to those of US forces and that a lack of recovery and field repair capability, coupled with poor interoperability, will probably seriously limit the cohesion, speed, and sustainability of Iranian armored operations.

Iran's armored warfare doctrine seems to be borrowed from US, British, and Russian sources without achieving any coherent concept of operations. Even so, Iran's armored doctrine is improving more quickly than its organization and exercise performance. Iran's armored forces are very poorly structured, and Iran's equipment pool is dissipated among far too many regular and IRGC units. Iran has only one armored division -- the 92nd Armored Division -- with enough tanks and other armor to be considered a true armored unit.

Iran has large holdings of anti-tank guided weapons and has been manufacturing copies of Soviet-systems, while buying missiles from China, Russia, and the Ukraine. It has approximately 50-75 TOW and 20-30 Dragon anti-tank guided missile launchers that were originally supplied by the US, although the operational status of such systems is uncertain. It has Soviet and Asian versions of the AT-2, AT-3, and AT-. Iran seems to have at least 100-200 AT-4 (9K111) launchers, but it is impossible to make an accurate estimate because Iran is producing its own copies of the AT-3. Iran also has some 750 RPG-7V, RPG-11, and 3.5" rocket launchers, and roughly 150 M-18 57 mm, 200 M-20 75 mm and B-10 82 mm, and 200 M-40 106 mm and B-11 107 mm recoilless guns.

Iran makes a number of anti-tank weapons. These include an improved version of the manportable RPG-7 anti-tank rocket with an 80 mm tandem HEAT warhead instead of the standard 30 mm design, the NAFEZ anti-tank rocket, and a copy of the Soviet SPG-9 73 mm recoilless anti-tank gun. Iran also makes a copy of the Russian AT-3 9M14M (Sagger or Ra'ad) anti-tank guided missile. This system is a crew-operable system with a guidance system that can be linked to a launcher holding up to four missiles. It has a maximum range of 3,000 meters, a minimum range of 500 meters, and a flight speed of 120 meters per second. Iran is also seeking more advanced technology from Russian arms firms. The US maintains that a firm sold Iran Krasnopol artillery shells while the company denies any connection with Iran.[6] Prospective sanctions are likely to deter arms manufacturers from filling the many needs of the Iranian military.

The Iranian copy of the AT-3 is made by the Shahid Shah Abaday Industrial Group in Tehran, and seems to be an early version of the missile which lacks semi-automatic guidance that allows the operator to simply sight the target, rather than use a joystick to guide the missile to the target by using the light from the missile to track the missile. The Iranian version also seems to have a maximum armored penetration capability of 500 mm, which is not enough to penetrate the forward armor of the latest Western and Russian main battle tanks. Russia has, however, refitted most of its systems to semi-automatic line of sight guidance and warheads capable of penetrating 800 mm. Iran may have or be acquiring such capability, and it would significantly improve the lethality of its anti-armor forces.

Iran has some 3,000-3,200 operational medium and heavy artillery weapons and multiple rocket launchers. This total is very high by regional standards, and reflects Iran's continuing effort to build-up artillery strength that began during the Iran-Iraq War. Iran used artillery to support its infantry and Islamic Revolutionary Guards Corps in their attacks on Iraqi forces. Iran had to use artillery as a substitute for armor and air power during much of the Iran-Iraq War, and generally used relatively static massed fires.

Some 2,085 of Iran's weapons are towed tube artillery weapons, versus 310 self-propelled tube weapons, and 889 vehicle mounted or towed multiple rocket launchers. The Falaq 1 and 2 series are examples of some of the vehicle mounted unguided rocket systems in the Iranian arsenal. The Falaq 1 fires a 240mm rocket with 50kg of explosives, and can reach a target up to 10 km away. The Falaq 2 is slightly larger, carries ten more kg of explosives, and flies almost a full kilometer further.[7] Iran's reliance on towed artillery and slow moving multiple rocket launchers limits Iran's combined arms maneuver capabilities, and Iran has failed to develop effective night and beyond-visual-range targeting capability. Iran's holdings of self-propelled weapons still appear to include a substantial number of US-supplied systems, including 25-30 M-110 203 mm howitzers, 20-30 M-107 175 mm guns, and 130-150 M-109 155 mm howitzers. These US-supplied weapons are worn, have not been modernized in over 15 years, and lack modern fire control systems and artillery radars. Many lack sustainability, and a number may not be operational.

Iran understands that it has less than a quarter of the self-propelled artillery it needs to properly support its present force structure, and that maneuverable artillery is critical to success in dealing with Iraqi and other maneuver forces. It is attempting to compensate for the resulting lack of modern artillery and artillery mobility by replacing its US self-propelled weapons with other self-propelled systems. Iran has purchased 60-80 Soviet 2S1 122 mm self-propelled howitzers, has developed an Iranian-made designs called the Raad (Thunder)1 and Raad (Thunder 2). The Thunder 1 is a 122mm weapon similar to Russian designs. The Thunder 2 is a "rapid fire" 155 mm self-propelled weapon. Both systems are now in deployment.

Iran bought large numbers of mortars during the Iran-Iraq War for the same reasons it bought large numbers of towed tube artillery weapons. Iran has some 5,000 weapon. These include 107 mm and 120 mm heavy mortars and 800-900 were 81 mm and 82 mm mortars. Iran mounts at least several hundred of its heavy mortars in armored vehicles.

Iran's emphasis on massed, static area fire is also indicated by the fact it has 700-900 multiple rocket launchers, It is difficult to estimate Iran's inventory, but its holdings include roughly 10 M-1989 240 mm multiple rocket launchers, 500-700 Chinese Type 63 and Iranian Haseb and Fadjir-1 107 mm multiple rocket launchers, and 100+ Soviet BM-21, Soviet BM-11 122, mm launchers. Iran has produced its own multiple rocket launchers. These include some 50 122mm, 40 round Hadid rocket launcher systems. In addition, Iran is producing variants of Chinese and Russian 122 mm rockets called the Arash and Noor Iran has produced some 10 large 240mm artillery rockets with a range of up to 40-43 kilometers called the Fadjr 3. The Iranian state television announced the production of the DM-3b seeker for the Noor. The DM-3b is an active radar sensor that is used in the final stages of flight to acquire and home on to ship targets. A joint program between Iran's Aerospace Industries Organisation (AID) and the China Aerospace Science and Industry Corp developed Noor. [8]Iran's land forces operate a number of long-range unguided rockets, including the Shahin 1 and 2, Oghab, and Nazeat. The key longer-range systems seem to include: [9]

- The Shahin 1 (sometimes called the Fadjr 4) is a trailer-launched 333 mm caliber unguided artillery rocket. Two rockets are normally mounted on each trailer, and they have with a solid propelled rocket motor, a maximum range of 75 kilometers, and a 175 kilogram conventional or chemical warhead. The Shahin evidently can be equipped with three types of warheads: a 180 kilogram high explosive warhead, a warhead using high explosive submunitions, and a warhead that uses chemical weapons. There is a truck mounted version, called the Fajr 5, with a rack of four rockets. A larger Shanin 2, with a range of 20 kilometers, is also deployed.

- The Fadjr-3 is a truck mounted system with a 12 round launcher for 240mm rockets. It has a maximum range of 43 kilometers, and a 45 kg payload in its warhead.

- The Fadjr 5 is truck mounted 333 mm caliber unguided artillery rocket with a solid propelled rocket motor, a maximum range of 75 kilometers, and a 175 kilogram conventional or chemical warhead. It carries four rockets, and they can evidently be equipped with three types of warheads: a kilogram high explosive warhead, a warhead using high explosive submunitions, and a warhead that uses chemical weapons.

- The Oghab is a 320 mm caliber unguided artillery rocket that is spin stabilized in flight, has a maximum range of 34 kilometers, and a 70 kilogram HE fragmentation warhead -- although chemical warheads may be available. While it may have a chemical warhead, it has an operational CEP that has proved to be

in excess of 500 meters at maximum range. Further, Iran has no way to target accurately the Oghab or any other long range missile against mobile or point targets at long ranges, other than a limited ability to use RPVs.

- The Nazeat is a TEL launched system with conventional and possibly chemical and biological warheads. The full details of this system remain unclear, but it seems to be based on Chinese technology and uses a solid fuel rocket, with a simple inertial guidance system. Nazeat units are equipped with communications vans, meteorological vans, and a global positioning system for surveying the launch site. Some reports indicate there are two variants of the Nazeat solid-fueled rocket system -- a 355.6 mm caliber rocket with 105 kilometers range and a 150 kilogram warhead, and a 450 mm caliber rocket with a reported range of 130-150 kilometers and a 250 kilogram warhead. Both systems have maximum closing velocities of Mach 4-5, but both also appear to suffer from poor reliability and accuracy. Other reports indicate all Nazeats are 335.6mm and there are four versions of progressively larger size, with ranges from 80 to 120 kilometers. It is claimed to have a CEP within 5% of its range.

- The Zelzal 2 is a 610mm long-range rocket, with a warhead with a 600 kilogram payload and a maximum range of up to 210 kilometers. A single rocket is mounted on a launcher on a truck. It is unguided, but is spin stabilized, and is claimed to have a CEP within 5% of its range.

- The Fateh A-110 is a developmental system believed to by similar to the Chinese CSS-8, which is a surface-to-surface system derived from the Russian SA-2 surface-to-air missile.

Iran has only limited artillery fire control and battle management systems, counter-battery radar capability, and long-range target acquisition capability (although it does have some RPVs) to support its self-propelled weapons. Iran has actively sought more modern fire control and targeting systems since the mid-1980s. It has had some success in deploying and testing RPVs as targeting systems, and has obtained some additional counterbattery radars, but it is unclear how many it obtained or put in service.

Iranian land forces have a total of some 1,700 anti-aircraft guns, including 14.5 mm ZPU-2/4s, 23 mm ZSU-23-4s and ZU-23s, 35 mm M-1939s, 37 mm Type 55s, and 57 mm ZSU-57-2s. Iran also has 100-180 Bofors L/70 40 mm guns, and moderate numbers of Skyguard 35 mm twin anti-aircraft guns (many of which may not be operational). Its largest holdings consist of unguided ZU-23-2s (which it can manufacture) and M-1939s. It is unclear how many of these systems are really operational as air defense weapons and most would have to be used to provide very short-range “curtain fire” defense of small point targets. They would not be lethal against a modern aircraft using an air-to-ground missile or laser guided weapon. The only notable exception is the ZSU-23-4 radar guided anti-aircraft gun. Iran has 50-100 fully operational ZSU-23-4s. The weapon is short-ranged, and vulnerable to electronic counter-measures (ECM), but is far more lethal than Iran’s unguided guns.

Iran has large numbers of SA-7 (Strela 2M), and SA-14 (Strela) manportable surface-to-air missiles. Iran also has some RBS-70 low-level surface-to-air missiles and large numbers of HN-5 manportable surface-to-air missiles. It has some US-made Stinger manportable surface-to-air missiles it bought from Afghan rebels. Iran seems to be producing some version of the SA-7, perhaps with Chinese assistance. It is not clear whether Iran can do this in any numbers. Iran’s land-based air defense forces are also acquiring growing numbers of Chinese FM-80s, a Chinese variant of the French-designed Crotale.

In June 2003 development of the Shahab-3 was completed. It is understood to have a range of 1,300 km- enough to hit Israel- and capable of carrying a 1,000 kg. warhead. The Shahab-3 underwent nine tests, and only four of them could be considered successful. A CIA report to congress on 10 November 2003 indicated that upgrading the Shahab-3 was underway. It reported that the Islamic Republic was developing a ‘Shahab-4’ ballistic missile with a range of 2,000 km. The Iranian government has repeatedly denied that it is upgrading the Shahab-3. Iran claimed that the program what the West refers to as ‘Shahab-4’ is a program aiming to develop a booster rocket for launching satellites into space. On January 2004, Iran’s Defence minister claimed that Iran would launch a domestically built satellite within 18 months.[10]

Iran pioneered the use of army aviation and attack helicopters during the time of the Shah, but built up its holdings of helicopters far more quickly than it expanded its training and maintenance capability. As a result, it had a hollow

force at the time the Shah fell, and its inability to obtain adequate spare parts and help in modernizing the aircraft means Iranian operational helicopter holdings have become uncertain. The Iranian Army seems to retains 50 AH-1J Sea Cobra attack helicopters, and 20 CH-47C, 110-130 Bell-214A, 30-35 AB-214C, 35-40 AB-205A, 10 AB-206, and 25 Mi-8/Mi-27 transport and utility helicopters. Iran's Western-supplied transport and support helicopters have low operational readiness , and they have little sustained sortie capability. Iran is also seeking to create a significant RPV force that borrows in many ways from Israeli technical developments and doctrine. It has produced some such RPVs and several exercise reports refer to their use. However, insufficient data are available to assess this aspect of Iranian capabilities.

Iranian Army communications have improved, as have Iranian battle management and communications exercises. They are now capable of better coordination between branches, the density of communications equipment has improved, and the functional lines of communication and command now place more emphasis on maneuver, quick reaction, and combined arms. However, Iranian battle management and communications capabilities seem to remain relatively limited. Iran's holdings still consist largely of aging VHF radio with some HF and UHF capability. This equipment cannot handle high traffic densities and secure communications are poor. Iran still relies heavily on analogue data handling and manually switched telephone systems. It is, however, acquiring a steadily growing number of Chinese and Western encryption systems and some digital voice, fax, and telex encryption capability.

Iran's Army has improved its organization, doctrine, training, and equipment for land force operations. Iran still, however, is a slow moving force with limited armored maneuver capability and artillery forces better suited to static defense and the use of mass fires that the efficient use of rapidly switched and well targeted fire. Sustainability is limited, as is field recovery and repair capability. Overall manpower quality is mediocre because of a lack of adequate realistic training and a heavy reliance on conscripts.

The Islamic Revolutionary Guards Corps (Pasdaran)

The Iranian Revolutionary Guards add some 120,000 additional men to Iran's forces. Roughly 100,000 are ground forces, including many conscripts. Some 20,000 are in the naval branch, and there is a small air force. Estimates of its fighting strength are highly uncertain. The IISS estimates that it has some 470 tanks, 620 APCs, 360 artillery weapons, 40 multiple rocket launchers, and 150 air defense guns. The naval branch has at least 40 light patrol boats, 10 Houdong guided missile patrol boats armed with C-802 antiship missiles, and a battery of HY-2 Seersucker land-based anti-ship missiles. The air branch is believed to operate Iran's three Shahab-3 IRBM units, and may have had custody of its chemical and any biological weapons. Iran's supreme leader, Ayatollah Ali Khamenei, announced that Shahab-3 missiles had been delivered to the Islamic Revolutionary Guards Corps. In addition, six Shahab-3s were displayed in Tehran during a military parade in September 2003.[11] According to the IISS, the IRGC now has command of Iran's Marine Brigade of some 5,000 men. Other sources show this force subordinated to the Navy.

Sources differ sharply on the organization of the IRGC, and its combat formations seem to be much smaller than the title implies, and to differ sharply from unit to unit. The IISS reports a strength of 2 armored, 5 mechanized, 10 infantry, and one special forces division, plus 15-20 independent brigades, including some armed and paratroop units. In practice, its manning would support 3-5 real divisions, and many of its divisions have an active strength equivalent to large brigades.

The IRGC has a complex structure that is both political and military. It has separate organizational elements for its land, naval, and air units, which include both military and paramilitary units. The Basij and the tribal units of the Pasdaran are subordinated to its land unit command, although the commander of the Basij often seems to report directly to the commander-in-chief and Minister of the Pasdaran and through him to the Leader of the Islamic Revolution.. The IRGC has close ties to the foreign operations branch of the Iranian Ministry of Intelligence and Security (MOIS), particularly through the IRGC's Qods force. The Ministry of Intelligence and Security was established in 1983, and has an extensive network of offices in Iranian embassies. It is often difficult to separate the activities of the IRGC, VEVAK, and Foreign Ministry and many seem to be integrated operations managed by a ministerial committee called the "Special Operations Council" that includes the Leader of the Islamic Revolution, President, Minister of Intelligence and Security and other members of the Supreme Council for National Defense.[12]

The IRGC's growing involvement in Iran's military industries, and its lead role in Iran's efforts to acquire surface-to-surface missiles and weapons of mass destruction, give it growing experience with advanced military technology.

As a result, the IRGC is believed to be the branch of Iran's forces that plays the largest role in Iran's military industries.[13] It also operates all of Iran's Scuds, controls most its chemical and biological weapons, and provides the military leadership for missile production and the production of all weapons of mass destruction.

The IRGC plays a major role in internal security. Nevertheless, it seems best to treat the IRGC primarily as a military land force which parallels the Iranian regular army, and which would operate with it in most contingencies. As has been discussed earlier, the IRGC has been placed under an integrated command with Iran's regular armed forces at the General staff level. It retains an independent command chain below this level, however, and generally continues to exercise as an independent force. It rarely exercises with the regular Iranian army -- and then usually in large, set piece exercises which do not require close cooperation.[14]

It is difficult to estimate the proficiency of IRGC units. It seems likely, however, that they vary sharply by unit and that only a portion of the IRGC land forces are intended to participate in joint operations with the regular army in regular combat. These forces seem to have improved steadily in their training, organization, and discipline since the early 1990s, and have also expanded their joint training with the regular army, navy, and air force.

The Quds (Qods) Forces

The IRGC has a large component for intelligence operations and unconventional warfare. Roughly 5,000 of the men in the IRGC are assigned to the unconventional warfare mission. The IRGC has the equivalent of one special forces "division," plus additional smaller formations, and these forces are given special priority in terms of training and equipment. In addition, the IRGC has a special Quds force which plays a major role in giving Iran the ability to conduct unconventional warfare overseas using various foreign movements as proxies. This force is under the command of General Ahmad Vahidi (Wahidi), who used to head the information department in the IRGC General Command and had the mission of exporting the revolution.[15]

The budget for this part of the force is a classified budget directly controlled by Khamenei, and is not reflected in the Iranian general budget. It operates primarily outside Iran's borders, although it has bases inside and outside of Iran. The Quds troops are divided into specific groups or "corps" for each country or area in which they operate.. There are Directorates for Iraq; Lebanon, Palestine, and Jordan; Afghanistan, Pakistan, and India; Turkey, the Arabian Peninsula; the Asiatic republics of the FSU, Western Nations (Europe and North America) and North Africa (Egypt, Tunisia, Algeria, Sudan, and Morocco.

The Quds has offices or "sections" in many Iranian embassies, which operate as closed sections. It is not clear whether these are integrated with Iranian intelligence operations, or that the ambassador in such embassies has control of, or detailed knowledge of, operations by the Quds staff. However, there are indications that most operations are coordinated between the IRGC and offices within the Iranian Foreign Ministry and Ministry of Intelligence and Security (MOIS). There are separate operational organizations in Lebanon, Turkey, Pakistan, and several North African countries. There also indications that such elements may have participated in the bombings of the Israeli Embassy in Argentina in 1992, and the Jewish Community Center in Buenos Aires in 1994 -- although Iran has strongly denied this.[16]

The Quds force seems to control many of Iran's training camps for unconventional warfare, extremists, and terrorists in Iran and countries like the Sudan and Lebanon. It has at least four major training facilities in Iran. The Quds forces has a main training center at Imam Ali University that is based in the Sa'dabad Palace in Northern Tehran. Troops are trained to carry out military and terrorist operations, and are indoctrinated in ideology.. There are other training camps in the Qom, Tabriz, and Mashhad governates, and in Lebanon and the Sudan. These include the Al Nasr camp for training Iraqi Shi'ites and Iraqi and Turkish Kurds in northwest Iran, and a camp near Mashhad for training Afghan and Tajik revolutionaries. The Quds seems to help operate the Manzariyah training center near Qom, which recruits from foreign students in the religious seminary and which seems to have trained some Bahraini extremists. Some foreigners are reported to have received training in demolition and sabotage at an IRGC facility near Isfahan, in airport infiltration at a facilities near Mashad and Shiraz, and in underwater warfare at an IRGC facility at Bandar Abbas.[17]

The Basij and Other Paramilitary Forces

The rest of Iran's paramilitary and internal security forces seem to have relatively little warfighting capability. The Basij (Mobilization of the Oppressed) is a popular reserve force of about 90,000 men with an active and reserve strength of up to 300,000 and a mobilization capacity of nearly 1,000,000 men. It is controlled by the Islamic Revolutionary Guards Corps, and consists largely of youths, men who have completed military service, and the elderly. It has up to 740 regional battalions with about 300-350 men each, which are composed of three companies or four platoons plus support. These include the former tribal levies, and are largely regional in character. Many have little or no real military training and active full time active manning, however, Iran has used the Basij to provide local security ever since the popular riots of 1994. It called up over 100,000 men in 19 regions in September 1994, and began far more extensive training for riot control and internal security missions. It also introduced a formal rank structure, and a more conventional system of command and discipline, and created specialized Ashura battalions for internal security missions. Some reports indicate that 36 of these battalions were established in 1994. The primary mission of the Basij now seems to be internal security, monitoring the activities of Iranian citizens, acting as replacements for the military services, and serving as a static militia force tied to local defense missions.

Iran also has 45,000-60,000 men in the Ministry of Interior serving as police and border guards, with light utility vehicles, light patrol aircraft (Cessna 185/310 and AB-205 and AB-206s), 90 coastal patrol craft, and 40 harbor patrol craft.

The Iranian Navy

The Iranian Navy has some 18,000 men, and is based at Bandar-e Abbas, Bushehr, Kharg Island, Bander- e Anzelli, Chah Bahar, Bander-e Mahshahar, and Bander-e Khomeini. It has 3 submarines, 3 frigates, 2 corvettes, 10 missile patrol craft, 7 mine warfare ships, 44 coastal and inshore patrol craft, and 9 amphibious ships. Its naval aviation branch is one of the few air elements in any Gulf Navy, and has 5 maritime patrol aircraft, and 19 armed helicopters. It has a two brigade marine force of some 2,600 men and a 2,000-man naval aviation force. In addition, the IRGC has some 20,000 men in its naval branch, trained in asymmetric warfare, including a 5,000-man marine branch. It is equipped with 10 Hudong missile patrol boats with C-802 anti-ship missiles, 40 Boghammer patrol boats, and numerous patrol craft. It has bases on islands and coastal areas in the Gulf like Al-Farisyah, Sirrir, Abu Musa, Khorramshahr, Larak, and Bandar-e Abbas, and on Halul (an offshore oil platform. It also controls Iran’s coastal defense forces, including naval guns and an HY-3 Seersucker land-based anti-ship missile unit deployed in 5-7 sites along the Gulf coast.

Iran has given the modernization of its naval forces high priority. Since the end of the Iran-Iraq War, Iran has obtained new anti-ship missiles and missile patrol craft from China, midget submarines from North Korea, submarines from Russia, and modern mines. Iran has expanded the capabilities of the naval branch of the IRGC, acquired additional mine warfare capability, and upgraded some of its older surface ships. Iran’s exercises have included a growing number of joint and combined arms exercises with the land forces and air force. Iran has also improved its ports and strengthened its air defenses, while obtaining some logistic and technical support from nations like India and Pakistan. In August 2000, the Islamic Republic announced that it had launched its first domestically-produced light submarine, which is called the Al-Sabiha 15. It can be used for reconnaissance and laying mines.[18]

Iran’s ability to compensate for the weaknesses of its surface missiles depends heavily on its ability to use anti-ship missiles to make up for its lack of airpower. Iran’s Western-supplied missiles are now all beyond their shelf life and their operational status is uncertain. Iranian forces are now operating four systems that Iran has obtained from China:

- *The Seersucker* is a long-range, mobile anti-ship missile, which is designated the HY-2 or Sea Eagle-2 by the People's Republic of China. It is a large missile with a 0.76 meter diameter and a weight of 3,000 kilograms. It has an 80-90 kilometer range and a 450 kilogram warhead. There are two variants. One uses radar active homing at ranges from the target of eight kilometers (4.5 nautical miles). The other is set to use passive IR homing and a radar altimeter to keep it at a constant height over the water;

- *The CS-801* anti-ship missile, also called the Yinji (Hawk) missile, is a solid fueled missile. It can be launched from land and ships. It has a range of approximately 74 kilometers in the surface-to-surface mode,

and uses J-Band active radar guidance. It has a 512 kilogram warhead and cruises at an altitude of 20-30 meters;

- *The CS-802* is an upgraded CS-801. It uses a turbojet propulsion system with a rocket booster instead of the solid fueled booster in the CS-801. It has a range of 70-75 miles, has a warhead of up to 363 pounds, and can be targeted by a radar deployed on a smaller ship or aircraft operating over the radar horizon of the launching vessel.[19]

- *The CS-801K* is a Chinese-supplied, air-launched anti-ship missile and variant of the CS-801. It too is a sea-skimming, high-subsonic cruise missile and has a range in excess of 20 nautical miles). It has been test fired by Iran's F-4Es, but Iran may be able to use other launch aircraft. This air delivery capability gives Iran what some analysts have called a "360 degree" attack capability, since aircraft can rapidly maneuver to far less predictable launch points than Iranian combat ships.[20]

Iran has sought to buy advanced anti-ship missiles from Russia, North Korea and China, to buy anti-ship missile production facilities, and possibly even Chinese-made missile armed frigates. Some sources have claimed that Iran has bought eight Soviet-made SS-N-22 "Sunburn" or "Sunburst" anti-ship missile launch units from Ukraine, and has deployed them near the Straits of Hormuz. However, US experts have seen no evidence of such a purchase and doubt that Iran has any operational holdings of such systems. The "SS-N-22" is a title that actually applies to two different modern long-range supersonic sea skimming systems -- the P-270 Moskit (also called the Kh-15 or 3M80) and P80 or P-100 Zubi/Onika.

Iran's main launch platforms for anti-ship missiles include three British-supplied Vosper Mark 5 Sa'am-class frigates -- called the *Alvand*, *Alborz*, and *Sabalan* -- each is a 1,100-ton frigate with a crew of 125-146 and maximum speeds of 39 knots. Each was originally armed with one five-missile Sea Killer Mark II surface-to-surface missile launcher and one Mark 8 4.5" gun mount. They have since had their Sea Killer's replaced with C-802 anti-ship missiles and new fire control radars. The Sea Killer has a relatively effective beam-riding missile with radio command or optical guidance, a maximum range of 25 kilometers. All are active, but the Sabalan took serious damage from the US Navy during the tanker war of 1997-1998. The ASW capabilities of these ships seem to be limited. Iran has two US PF-103 (Bayandor-class) corvettes called the *Bayandor* and the *Naghdi*. These ships are 900-ton vessels, with crews of 140, two 76 mm guns and a maximum speed of 18 knots. They were laid down in 1962, and delivered in 1964. The *Bayandor* and the *Naghdi* are probably the most active large surface ships in the Iranian navy. However, neither is equipped with anti-ship and anti-air missiles, sophisticated weapons systems, sonars, or advanced electronic warfare equipment and sensors.

The rest of Iran's major surface vessels consist of missile patrol boats. These include 10 68-ton Chinese Hudong (Hudong)-class fast attack craft or missile patrol boats. The Hudong (Hudong)-class fast attack craft are equipped with I-band search and navigation radars, but do not have a major anti-air missile system. Iran ordered these ships for the naval branch of its Iranian Revolutionary Guards Corps in 1992, and all 10 were delivered to Iran by March 1996. The vessels have a crew of 28. They carry four anti-ship missiles, and are armed with the CS-801 and CS-802 missile. Iran now has at least 100 CS-801s and CS-802s. Iran's missile patrol boats also include 10 275-ton French-made Combattante II (Kaman-class) fast attack boats, out of an original total of twelve. These boats armed with anti-ship missiles; and one 76 mm gun, and have maximum speeds of 37.5 knots. They were originally armed with four US Harpoon missiles, but their Harpoons may no longer be operational. At least five had been successfully converted with launchers that can carry two to four CS-801/CS-802s.

Iran has a number of large patrol craft and fast attack craft. The operational ships of this type include: three North Korean-supplied 82-ton Zafar-class (Chaho-class) fast attack craft with I-band search radars and armed with 23 mm guns and a BM-21 multiple rocket launcher; two Kavian-class (US Cape-class) 148 ton patrol craft armed with 40 mm and 23 mm guns; and three Improved PGM-71 Parvin-class 98-ton patrol craft supplied in the late 1960s, and armed with 40 mm and 20 mm guns. There are some 35 other small patrol boats plus large numbers of small boats operated by the IRGC. Most of these craft are operational and can be effective in patrol missions. They lack, however, sophisticated weapons systems or air defenses, other than machine guns and SA-7s and SA-14s. Iran has 5-6 BH-7 and 7-8 SRN-6 Hovercraft, believed to be operated by the IRGC. About half of these Hovercraft may be operational. They are capable of speeds of up to 60-70 knots. They are lightly armed and vulnerable, but their high

speed makes them useful for many reconnaissance and unconventional warfare missions, and they can rapidly land troops on suitable beaches.,.

Mine warfare, amphibious warfare, anti-ship missiles, and unconventional warfare offer Iran other ways of compensating for the weakness of its conventional air and naval forces. Iran's mine warfare vessels include 2-3 Shahrock-class MSC-292/268 coastal minesweepers (1 used for training in the Caspian Sea). Two of these three ships, the *Shahrock* and *Karkas* , are known to be operational. They are 378-ton sweepers that can be used to lay mines as well as sweep, but their radars and sonars date back to the late 1950s and are obsolete in sweeping and countermeasure activity against modern mines. Iran has 1-2 Cape-class (Riazzi-class) 239-ton inshore minesweepers; and seems to have converted two of its Iran Ajar-class LSTs for mine warfare purposes. Many of its small boats and craft can also lay mines. Both the Iranian Navy and the naval branch of the IRGC are expanding their capability for mine warfare. While Iran has only a limited number of specialized mine vessels, it can also use small craft, LSTs, Boghammers, helicopters, and submarines to lay mines. As a result, it is impossible to determine how many ships Iran would employ to plant or lay mines in a given contingency, and some of its mines might be air dropped or laid by commercial vessels, including dhows.

Iran has a range of Soviet, Western, and Iranian-made moored and drifting contact mines, and US experts estimate that Iran has at least 2,000 mines. Iran has significant stocks of anti-ship mines, and has bought Chinese-made and North Korean-made versions of the Soviet mines. It has claimed to be making its own non-magnetic, acoustic, free-floating and remote controlled mines, and has had Chinese assistance in developing the production facilities for such mines. It may have acquired significant stocks of non-magnetic mines, influence mines, and mines with sophisticated timing devices from other countries. [21] There also are reports that Iran has negotiated with China to buy the EM-52 or MN-52 rocket-propelled mine. The EM-52 is a mine that rests on the bottom until it senses a ship passing over it, and then uses a rocket to hit the target. The maximum depth of the Straits of Hormuz is 80 meters (264 feet), although currents are strong enough to displace all but firmly moored mines.[22] Combined with modern submarine laid mines and anti-ship missile systems like the CS-801/802, and SS-N-22, the EM-52 would give Iran considerable capability to harass Gulf shipping and even the potential capability to close the Gulf until US naval and air power could clear the mines and destroy the missile launchers and submarines. Even obsolete moored mines have proven difficult to detect and sweep when intelligence does not detect the original laying and size of the minefield, and free floating mines can be used to present a constant hazard to shipping. Bottom-influence mines can use acoustic, magnetic, or pressure sensors to detect ships passing overhead. They can use multiple types of sensor/actuators to make it hard to deceive the mines and force them to release, can be set to release only after a given number of ships pass, and some can be set to attack only ships of a given size or noise profile. Such mines are extremely difficult to detect and sweep, particularly when they are spaced at wide intervals in shipping lanes.

Iran has significant amphibious assets by Gulf standards, and the regular Navy and naval branch of the IRGC have independent marine forces. These assets are large enough to move a battalion-sized force relatively rapidly, and include: Four Hengam-class (Larak-class) LST amphibious support ships (displacement of 2,940-tons loaded that can carry up to six tanks, 600 tons of cargo, and 227 troops; and three Iran Hormuz-class (South Korean) LSTs (2,014-tons loaded) that can carry up 9 tanks and berth 140 troops.. They also include 3 Hormuz-21 class 1,80-ton LSTs and 3 Fouque class 176-ton LSLs. Iran’s amphibious ships give it the theoretical capability to deploy about 1,000 troops, and theoretically about 30-40 tanks in an amphibious assault – but Iran has never demonstrated that it has an effective over-the-shore capability. Iran might use commercial ferries and roll on-roll off ships if it felt they could survive. Iran has also built up its capability to hide or shelter small ships in facilities on its islands and coastline along the Gulf, and the ability to provide them with defensive cover from anti-air and anti-ship missiles. However, all of Iran’s training to date has focused on amphibious raiding and not on operations using heavy weapons or larger operations. Iran lacks the air and surface power to move its amphibious forces across the Gulf in the face of significant air/sea defenses, or to support a landing in a defended area.

Iran has support ships, but these are generally insufficient to sustain "blue water" operations and support an amphibious task force. It has one Kharg-class 33,014 ton replenishment ship, two Bandar Abbas-class 4,673 ton fleet supply ships and oilers, one 14,410 ton repair ship, two 12,000 ton water tankers, seven 1,300 ton Delva-class support ships, 5-6 Hendijan-class support vessels, two floating dry-docks and 20 tugs, tenders, and utility craft to help support a large naval or amphibious operation.

The Iranian Navy's air capability consists of two to three operational P-3F Orion maritime patrol aircraft out of an original inventory of five. According to reports from the Gulf, none of the surviving P-3Fs have fully operational radars and their crews often use binoculars. It also has up to 12 Sikorsky SH-3D ASW helicopters, two RH-53D mine laying helicopters, and seven Agusta-Bell AB-212 helicopters. It uses air force AH-1J attack helicopters, equipped with French AS.12 missiles, in naval missions, and has adapted Hercules C-130 and Fokker Friendship aircraft for mine laying and patrol missions. The most significant recent development in Iran's capabilities to use airpower to attack naval targets has been the acquisition of the CS-801K for its regular air force.

Iran has attempted to offset the weakness of its major surface forces by obtaining three Type 877 EKM Kilo-class submarines. The Kilo is a relatively modern and quiet submarine that first became operational in 1980. The Iranian Kilos are Type 877EKM export versions that are about 10 meters longer than the original Kilos and are equipped with advanced command and control systems. Each Type 877EKM has a teardrop hull coated with anechoic tiles to reduce noise. It displaces approximately 3,076 tons when submerged and 2,325 tons when surfaced. It is 72.6 meters long, 9.9 meters in beam, has a draught of 6.6 meters, and is powered by three 1,895 HP generator sets, one 5,900 SHP electric motor and one six-bladed propeller. It has a complement of 52 men and an endurance of 45 days. Its maximum submerged speed is 17 knots and its maximum surface speed is 10 knots.

Each Kilo has six 530 mm torpedo tubes, including two wired guided torpedo tubes. Only one torpedo can be wire-guided at a time. The Kilo can carry a mix of 18 homing and wire guided torpedoes or 24 mines. Russian torpedoes are available with ranges of 15-19 kilometers, speeds of 29-40 knots, and warheads with 100, 205, and 305-kilogram weights. Their guidance systems include active sonar homing, passive homing, wire guidance, and active homing. Some reports indicate that Iran bought over 1,000 modern Soviet mines with the Kilos, and that the mines were equipped with modern magnetic, acoustic, and pressure sensors. The Kilo has a remote anti-aircraft launcher with one pre-loaded missile in the sail and Soviet versions have 6 SA-N-5 (Igla/SA-16) surface-to-air missiles stored inside. However, Russia only supplied Iran with the SA-14 (Strela). The Kilo has a maximum surface speed of 10 knots, a maximum submerged speed of about 17 knots, a minimum submerged operating depth of about 30 meters, an operational diving depth of 240 meters, and a maximum diving depth of 300 meters. The submarine also has a surface cruise range of 3,000-6,000 nautical miles and a submerged cruise range of 400 nautical miles -- depending on speed and combat conditions.[23]

Iran's ability to use its submarines to deliver mines and fire long-range wake-homing torpedoes give it a potential capability to strike in ways that make it difficult to detect or attack the submarine. Mines can be laid covertly in critical areas before a conflict, and the mines can be set to activate and de-activate at pre-determined intervals in ways that make mining difficult to detect and sweep. Long-range homing torpedoes can be used against tanker-sized targets at ranges in excess of 10 kilometers, and to attack slow-moving combat ships that are not on alert and/or which lack sonars and countermeasures. At the same time, many Third World countries have found submarines to be difficult to operate. For example, Russia delivered the first two Kilos with two 120-cell batteries designed for rapid power surges, rather than power over long periods. They proved to last only 1-2 years in warm waters versus 5-7 years for similar batteries from India and the UK. Iran had to turn to India for help in developing batteries that are reliable in the warm waters of the Gulf. Iran has also had problems with the air conditioning in the ships, and their serviceability has been erratic. There are serious questions about crew capability and readiness, and all three submarines already need significant refits.

Iran faces significant operational problems in using its submarines in local waters. Many areas of the Gulf do not favor submarine operations. The Gulf is about 241,000 square kilometers in area, and stretches 990 kilometers from the Shatt al-Arab to the Straits of Hormuz. It is about 340 kilometers wide at is maximum width, and about 225 kilometers wide for most of its length. While heat patterns disturb surface sonars, they also disturb submarine sonars, and the advantage seems to be slightly in favor of sophisticated surface ships and maritime patrol aircraft. The deeper parts of the Gulf are noisy enough to make ASW operations difficult, but large parts of the Gulf -- including much of the Southern Gulf on a line from Al Jubail across the tip of Qatar to about half way up the UAE -- are less than 20 meters deep. The water is deeper on the Iranian side, but the maximum depth of the Gulf -- located about 30 kilometers south of Qeys Island -- is still only 88 meters. This means that no point in the Gulf is deeper than the length of an SN-688 nuclear submarine. The keel to tower height of such a submarine alone is 16 meters. Even smaller coastal submarines have maneuver and bottom suction problems, and cannot hide in thermoclines, or take advantage of diving for concealment or self-protection.

The Straits of Hormuz are about 180 kilometers long, but have a minimum width of 39 kilometers, and only the two deep water channels are suitable for major surface ship or submarine operations. Each of these channels is only about 2 kilometers wide. Further, a limited flow of fresh water and high evaporation makes the Gulf extremely saline. This creates complex underwater currents in the main channels at the Straits of Hormuz and complicates both submarine operations, and submarine detection. There are some areas with considerable noise, but not of a type that masks submarine noise from sophisticated ASW detection systems of the kind operated by the US and UK. Further, the minimum operating depth of the Kilo is 45 meters, and the limited depth of the area around the Straits can make submarine operations difficult. Submarines are easier to operate in the Gulf of Oman, which is noisy enough to make ASW operations difficult, but such deployments would expose the Kilos to operations by US and British nuclear attack submarines. It is unlikely that Iran's Kilos could survive for any length of time if hunted by a US or British navy air-surface-SSN hunter-killer team.[24]

In any case, the effectiveness of the Iran's submarines is likely to depend heavily on the degree of Western involvement in any ASW operation. If the Kilos did not face the US or British ASW forces, the Iranian Kilos could operate in or near the Gulf with considerable impunity. If they did face US and British forces, they might be able to attack a few tankers or conduct some mining efforts, but are unlikely to survive extended combat. This makes the Kilos a weapon that may be more effective in threatening Gulf shipping, or as a remote minelayer, than in naval combat. Certainly, Iran's purchase of the Kilos has already received close attention from the Southern Gulf states and convinced them that they must take Iran more seriously.

Finally, Iran's unconventional warfare capabilities include the naval branch of the Islamic Revolutionary Guards Corps operates Iran's land-based anti-ship missiles and coastal defense artillery. In addition to its land and sea-based anti-ship missile forces, the naval guards can use large numbers of small patrol boats equipped with heavy machine guns, grenade launchers, anti-tank guided weapons, manportable surface-to-air missies, and 106 mm recoilless rifles. The IRGC also uses small launches and at least 30 Zodiak rubber dinghies to practice rocket, small arms, and recoilless rifle attacks. Its other small craft were armed with a mix of machine guns, recoilless rifles, and man and crew-portable anti-tank guided missiles. This vessels are difficult to detect by radar in anything but the calmest sea state. Iran bases them at a number of offshore islands and oil platforms, and they can strike quickly and with limited warning. The Naval Branch of the IRGC also has naval artillery, divers, and mine-laying units. It had extensive stocks of Scuba equipment, and an underwater combat center at Bandar Abbas.[25] Iran is also improving the defenses and port capabilities of its islands in the Gulf, adding covered moorings, more advanced sensors, and better air defenses.

Iran can use IRGC forces to conduct the kind of low-intensity/guerrilla warfare that can only be defeated by direct engagement with land forces, and filter substantial reinforcements into a coastal area on foot or with light vehicles, making such reinforcement difficult to attack. Iran can use virtually any surviving small craft to lay mines, and to place unmoored mines in shipping lanes. Its IRGC forces can use small craft to attack offshore facilities and raid coastal targets. Finally, the US did not successfully destroy a single land-based Iraqi anti-ship missile launcher during the Gulf War, and the IRGC now has many dispersal launch sites and storage areas over a much longer coast. It also has a growing number of caves, shelters, and small hardened facilities. Such targets are sometimes difficult to detect until they are used, and present added problems because they usually are too small and too numerous to attack with high cost ordnance until it is clear they have valuable enough contents to merit such attack.

The main forces of the Iranian navy are concentrated in the Gulf. Iran gives more importance to the security of its territorial sea in the Gulf area since in this direction it has highly complicated relations with various Arab nations, United States, and Israel. After the collapse of the Soviet Union, however, Iran's policy towards the Caspian has changed. According to the contracts between the Soviet Union and Iran, Tehran was not allowed to hold its navy in the Caspian Sea. After the disintegration of the USSR, however, the 4th naval region forces started representing Iranian navy in the Caspian. [26]

The Islamic Republic has almost 3,000 personnel in the Caspian. The forces include up to 50 fighting ships and support vessels, the Marine Corps, coastal guard forces, and the sea aircraft. There are also training vessels in the fleet, including one Shahrokh MSC minesweeper, 2 Hamzeh ships and others. Currently, Iran has the second largest fleet in Caspian after Russia. The fleet, however, is outdated. This is why Tehran has been trying to strengthen its naval forces in the Caspian through various programs. It is reported that, the government has numerous plans to

modernize its fleet. According to these projects, the future fleet will include several divisions and sperate battalions of ships and submarines. [27]

In summary, Iran's efforts have steadily improved Iran's capabilities to threaten Gulf shipping and offshore oil facilities, its capability to support unconventional warfare, and its ability to defend Iran's off-shore facilities, islands, and coastline. They have not, however, done much to help Iran to act as an effective "blue water" navy. Iranian naval forces still have many limitations, but the military capability of Iranian naval forces should not be measured in terms of the ability to win a battle for sea control against US and British naval forces, or any combination of Southern Gulf states supported by US and British forces. For the foreseeable future, Iran's forces are likely to lose any such battle in a matter of days. As a result, it is Iran's ability to conduct limited or unconventional warfare, or to threaten traffic through the Gulf, that gives Iran the potential ability to threaten or intimidate its neighbors.

The Iranian Air Force

The Iranian Air Force has some 15,000 men and over 300 combat aircraft in its inventory (The IISS estimates 306). Many of these aircraft, however, are either not operational or cannot be sustained in air combat. This includes 50-60% of Iran's US and French supplied aircraft and some 30-40% of its Russian and Chinese supplied aircraft. It has nine fighter-ground attack squadrons with 162-186 aircraft; seven fighter squadrons, with 70-74 aircraft, a reconnaissance unit with 4-8 aircraft, and a number of transport aircraft, helicopters, and special purpose aircraft. It operates most of Iraq's land-based air defenses, including some 150 IHawks, 45 HQ-21s, 10 SA-5sm 30 Rapiers, and additional forces equipped with light surface-to-air missiles.

The Iranian air force is headquartered in Teheran with training, administration, and logistics branches, and a major central Air Defense Operations Center. It has a political directorate and a small naval coordination staff. It has three major regional headquarters: Northern Zone (Badl Sar), Central Zone (Hamaden), and Southern Zone (Bushehr). Each regional zone seems to control a major air defense sector with subordinate air bases and facilities. The key air defense sub-zones and related bases in the Northern Zone are at Badl Sar, Mashhad, and Shahabad Kord. The sub-zones and bases in the Central Zone are at Hamadan and Dezful, and the sub-zones and bases in the Southern Zone are at Bushehr, Bandar Abbas, and Jask. Iran has large combat air bases at Mehrabad, Tabriz, Hamadan, Dezful, Bushehr, Shiraz, Isfahan, and Bandar Abbas. It has smaller bases at least eleven other locations. Shiraz provides interceptor training and is the main base for transport aircraft.

As is the case with most aspects of Iranian military forces, estimates differ by source. The IISS estimates the air force has 18 main combat squadrons. These include nine fighter ground-attack squadrons, with 4/55-65 US-supplied F-4D/E and 4/55-65 F-5E/FII, and 1/27-30 Soviet-supplied Su-24. Iran had 7 Su-25K and 24 Mirage F-1 Iraqi aircraft it seized during the Gulf War, and some may be operational. Iran had seven air defense squadrons, with 2/20-25, -60 US-supplied F-14, 2/25-30 Russian/Iraqi-supplied MiG-29, and 1/25-35 Chinese supplied F-7M.[28] The Iranian air force had a small reconnaissance squadron with 3-8 RF-4E. It 5 C-130H MP maritime reconnaissance aircraft, 1 RC-130 and other intelligence/reconnaissance aircraft, together with large numbers of transports and helicopters. Most Iranian squadrons could perform both air defense and attack missions, regardless of their principal mission -- although this was not true of Iran's F-14 (air defense) and Su-24s (strike/attack) units. Iran's F-14s have not been able to use their Phoenix air-to-air missiles since the early 1980s. Iran has claimed that it is modernizing its F-14s by equipping them with I-Hawk missiles adapted to the air-to-air role, but it is far from clear that this is the case or that such adaptations can have more than limited effectiveness. [29]

Russian firms and the Iranian government tried to reach an agreement over license-production of the MiG-29, but repeated attempts have failed. Likely due to the difficulty the regime has had in procuring new aircraft, Iran has been developing three new attack aircraft. The indigenous design and specifics of one of the fighters in development, the Shafagh, were unveiled at the Iran Airshow in 2002. Engineers hope to have a prototype by 2008, though it is unclear what the production numbers will be and what the timetable for deployment may be. Little is known about the other two fighters in development, the Saeghe and the Azarakhsh, other than they have been reportedly derived from the F-5.[30]

Iran has moderate airlift capabilities for a regional power. The Iranian air force's air transport assets included 3 B-707 and 1 B-747 tanker transports, and five transport squadrons with 4 B-747Fs, 1 B-727, 18C-130E/Hs, 3 Commander 690s, 10 F-27s, 1 Falcon 20A, and 2 Jetstars. Iran will have 14 Xian Y-7 transports by 2006.[31] Its

helicopter strength includes 2 AB-206As, 27-30 Bell 214Cs, and 2 CH-47, 30 Mi-17 and Iranian-made Shabaviz 206-1 and 2-75 transport helicopters..

The IRGC also has some air elements. It is not clear what combat formations exist within the IRGC, but the IRGC may operate Iran's 10 EMB-312 Tucanos.[32] It seems to operate many of Iran's 45 PC-7 trainers, as well as some Pakistani-made trainers at a training school near Mushhak, but this school may be run by the regular air force. It has also claimed to manufacture gliders for use in unconventional warfare. The IRGC has not recently expanded its combat air capabilities.[33]

Iran seems to have assigned about 12,000-15,000 men in its air force to land-based air defense functions, including at least 8,000 regulars and 4,000 IRGC personnel. It is not possible to distinguish clearly between the major air defense weapons holdings of the regular air force and IRGC, but the air force appeared to operate most major surface-to-air missile systems. Total holdings seem to include 30 Improved Hawk fire units (12 battalions/150+ launchers), 45-55 SA-2 and HQ-2J/23 (CSA-1) launchers (Chinese-made equivalents of the SA-2), and possibly 25 SA-6 launchers. The air force also had three Soviet-made long-range SA-5 units with a total of 10-15 launchers -- enough for six sites. Iran has developed and deployed its own domestically manufactured SAM dubbed the Shahab Thaqeb. The SAM requires a four-wheeled trailer for deploymentand and closely resembles the R440 SAM.[34]

Iran's holdings of lighter air defense weapons include five Rapier squadrons with 30 Rapier fire units, 5-10 Chinese FM-80 launchers, 10-15 Tigercat fire units, and a few RBS-70s. Iran also hold large numbers of man-portable SA-7s, HN-5s, and SA-14s, plus about 2,000 anti-aircraft guns -- including some Vulcans and 50-60 radar-guided and self propelled ZSU-23-4 weapons.[35] It is not clear which of these lighter air defense weapons were operated by the army, the IRGC, or the air force. The IRGC clearly had larger numbers of manportable surface-to-air launchers, including some Stingers that it had obtained from Afghanistan. It almost certainly had a number of other light air defense guns as well.

There are no authoritative data on how Iran deploys air defenses, but Iran seems to have deployed its new SA-5s to cover its major ports, oil facilities, and Tehran. It seems to have concentrated its Improved Hawks and Soviet and Chinese-made SA-2s around Tehran, Isfahan, Shiraz, Bandar Abbas, Kharg Island, Bushehr, Bandar Khomeini, Ahwaz, Dezful, Kermanshah, Hamadan, and Tabriz. Iran's air defense forces are too widely spaced to provide more than limited air defense for key bases and facilities, and many lack the missile launcher strength to be fully effective. This is particularly true of Iran's SA-5 sites, which provide long-range medium-to-high altitude coverage of key coastal installations. Too few launchers are scattered over too wide an area to prevent relatively rapid suppression. Iran also lacks the low altitude radar coverage, overall radar net, command and control assets, sensors, resistance to sophisticated jamming and electronic countermeasures, and systems integration capability necessary to create an effective air defense net. Its land-based air defenses must operate largely in the point defense mode, and Iran lacks the battle management systems and data links are not fast and effective enough to allow it to take maximum advantage of the overlapping coverage of some of its missile systems -- a problem further complicated by the problems in trying to net different systems supplied by Britain, China, Russia, and the US. Iran's missiles and sensors are most effective at high-to-medium altitudes against aircraft with limited penetrating and jamming capability.

In spite of Iran's efforts, readiness and force quality remain major issues. The Iranian air force still has many qualitative weaknesses, and it is far from clear that its current rate of modernization can offset the aging of its Western-supplied aircraft and the qualitative improvements in US and Southern Gulf forces. The air force also faces serious problems in terms of sustainment, command and control, and training. Iran has a pilot quality problem. Many of its US-trained pilots were purged at some point during the Revolution. Its other US-trained pilots and ground-crew technicians are aging to the point where many should soon retire from service, and have not had advanced air-to-air combat and air attack training for more than 15 years. While Iran practices realistic individual intercept training, it fails to practice effective unit or force-wide tactics and has shown only limited capability to fly large numbers of sorties with its US supplied aircraft on even a surge basis. It has limited refueling capabilities -- although it has four B-707 tanker/transports and may have converted other transports. The Iranian air force lacks advanced training facilities, and has only limited capability to conduct realistic training for beyond-visual-range combat and stand-off attacks with air-to-surface munitions. Ground crew training and proficiency generally seem mediocre -- although the layout of Iranian air bases, aircraft storage and parking, the deployment of equipment for maintenance cycles, and the other physical signs of air unit activity are generally better organized than those of most Middle Eastern air forces.

The Iranian air force must also deal with the fact that its primary challenge now consists of the US, British, and Saudi air forces. There are high technology air forces that operate the AWACS airborne control system, have some of the most advanced electronic warfare and targeting systems in the world, and have full refueling capability. They use sophisticated, computer-aided aggressor training and have all of the range and training facilities for beyond-visual-range combat and stand-off attacks with air-to-surface munitions. Iran has no airborne control system, although it may be able to use the radars on its F-14s to support other aircraft from the rear. Its overall C^4I system is a totally inadequate mix of different sensors, communications, and data processing systems. It has limited electronic warfare capabilities by US standards, although it may be seeking to acquire two Beriev A-50 Mainstay AEW aircraft, and has converted some aircraft to provide a limited ELINT/SIGINT capability.

Iran is slowly improving its capability for joint land-air, and air sea operations. Iranian exercises and statements provide strong indications that Iran would like to develop an advanced air defense systems, the ability to operate effectively in long-range maritime patrol and attack missions, effective joint warfare capabilities, and strike/attack forces with the ability to penetrate deep into Iraq, the southern Gulf states, and other neighboring powers. Iran's exercises, military literature, and procurement efforts also make it clear that its air planners understand the value of airborne early warning and C4I systems, the value of airborne intelligence and electronic warfare platforms, the value of RPVs, and the value of airborne refueling. Iran has even sought to create its own satellite program.[36] Further, the air force's efforts at sheltering and dispersal indicate that it understands the vulnerability of modern air facilities and the stand-off attack capabilities of advanced air forces like those of the United States.

Detailed Trends in Iranian Forces

The following figures illustrate the factors driving Iranian military developments and modernization in more depth:

- **Figure 2.1** provides a general overview of military developments in Iran, now the only remaining Gulf military power with a history of hostility to the US and its neighbors.

- **Figure 2.2** shows the long-term trend in arms deliveries to Iran. It is important to note that more recent data from a different source indicates that the downward trend from 1986-1999 has been arrested – although arms deliveries only average $175 million a year during 1999-2002.

- **Figure 2.3** discusses key Iranian equipment developments since 1990, but many of these developments consist of plans for equipment product and new orders that have not yet materialized. In general, the pace of Iranian land force modernization has been very slow, while it has made little real progress in modernizing its air forces and land-based air defense forces.

- **Figure 2.4** shows that Iran remains acutely dependent on worn, aging, and obsolescent Western weapons systems delivered during the time of the Shah.

- **Figure 2.5** summarizes the current uncertainties surrounding Iran’s ability to substitute for arms imports by producing modern combat equipment. Iran does seem to be making progress in producing armor and artillery, but its progress in aircraft and naval systems is slower.

Figure 2.1

Iran - Overview

- Iran is still a much poorer nation in terms of export earnings than it was at the time of the Shah, with only about two-thirds of the real export earning it had in the early 1980s. This limits its ability to import arms.

- Iran's military effort is only a small fraction of the share of GNP that Iran spent during the Iran-Iraq War, and Iran's increasing GDP is steadily reducing the impact of its military effort on its economy.

- Although Iran is often said to be involved in a major military build-up, comparisons of the trends in total central government expenditures, military expenditures, arms imports, and export earnings show that Iran has devoted a steadily dropping percentage of its available resources to military spending and arms imports. The IISS estimates that Iran spent $7.9 billion on military forces in 1985, or 7.7% of its GNP. It spent $3.128 billion in 2001 (3.8% of GNP) and $4.9 billion in 2002 (4.6% of GNP). According to a report released by Forecast International, Iran's defence spending will be about $4.5 billion by 2007.[37] These are not inconsiderable defense expenditures, but they represent roughly half the defense effort Iran made during the Iran-Iraq War and time of the Shah, and to put them in perspective, a minor Gulf military power like Kuwait spent $$3.3 billion on military forces in 2002.

- At the same time, the data in the CIA World Factbook reveals that Iran's domestic government expenditures have been allowed to rise sharply and that imports have been allowed to exceed exports. Iran has clearly emphasized public spending on civil programs at the expense of both military spending and private investment.

- Iran's economy is under acute pressure in terms of per capita income and relative wealth. Iran's population increased from 38.2 million in 1980 to over 68 million in 2002. Real per capita income is now about half what it was at the time of the Iranian revolution — a key indicator of the pressures Iran faces to limit military spending.

- As Figure 7.1 shows, major cuts have taken place in both Iran's arms orders and arms deliveries since 1990, and new orders have dropped faster than deliveries. Iran is spending about 25-35% of what it would need to modernize and recapitalize the force levels in had under the Shah.

    - Iran has received no arms transfer from the US since 1980, and received only $100 million worth of arms from any major West European power during 1985-2002. It received only $1.2 billion worth of arms from Russia, $400 million from other European powers during this period, and only $400 million worth of arms from either source during 1999-2002. As a result, Iran has had only limited access to any source of modern arms.

    - Iran does have more arms in the pipeline. It ordered $1.7 billion worth of arms during 1995-1998, and $800 million of this total will come from Russia, the major West European powers, and other European states. It ordered $.1.0 billion worth of arms during 1995-1998, and $500 million of this total will come from Russia, the major West European powers, and other European states

    - Recent Iranian arms sales agreements do not reflect Iran a high dependence on Russia, relative to Europe ($400 million vs. $800 million in 1995-1998 and $100 million versus $400 million in 1999-2002.

- Iran has made important and potentially destabilizing purchases of arms whose content seems targeted at strengthening its air defenses along its Gulf coast, and improving its anti-ship and unconventional warfare capabilities to threaten Gulf shipping and attack targets in the Southern Gulf.

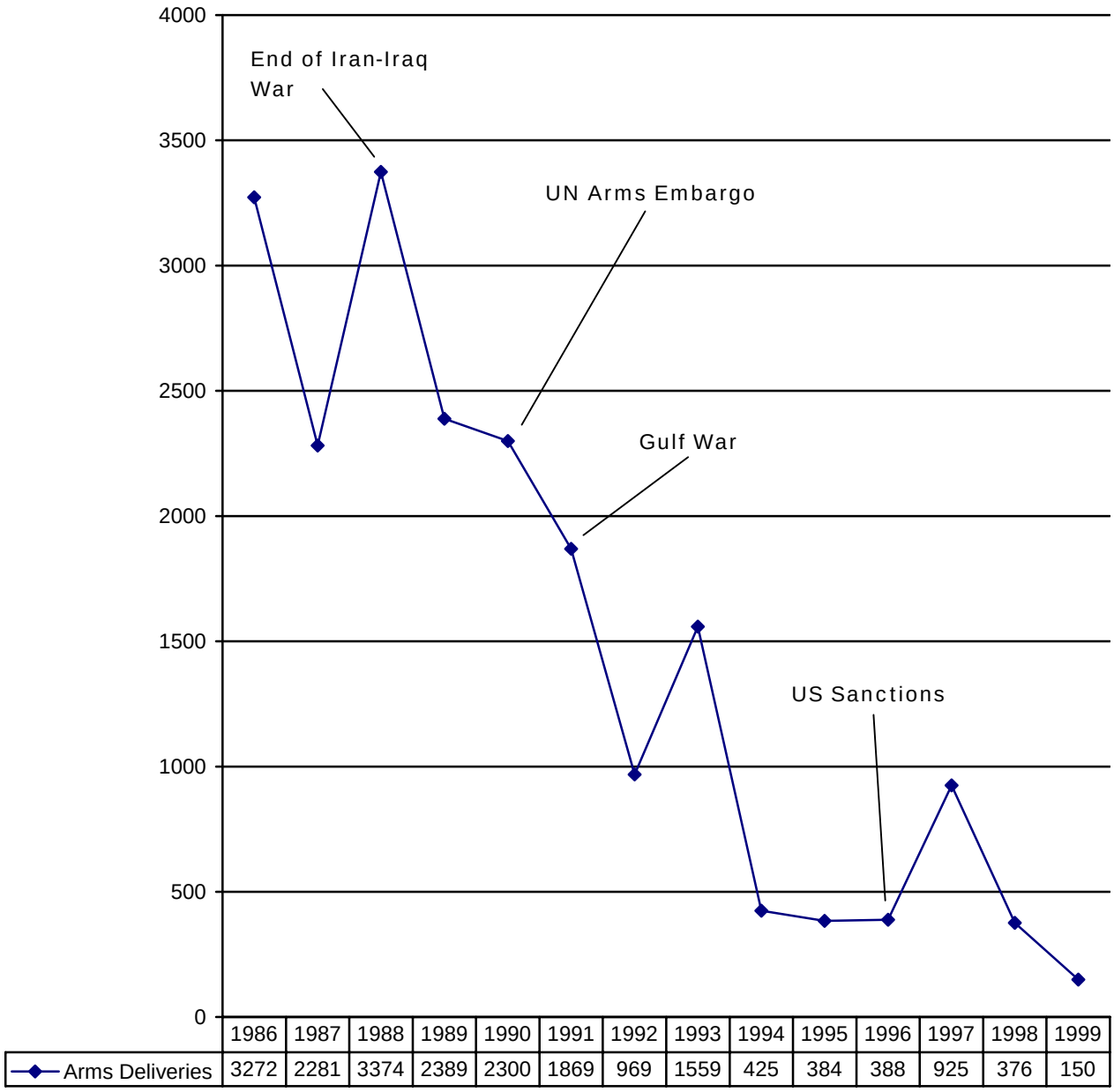
- At the same time, Iran has a massive inventory of worn and decaying obsolete or obsolescent Western-supplied equipment and low performance Chinese and North Korean-supplied systems.

- Iran seems to have placed more emphasis on the acquisition of weapons of mass destruction and new long-range missiles than on obtaining modern conventional weapons and equipment.

Figure 2.2

Value of Iranian Arms Deliveries

(Constant $US 1999 millions)



	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Arms Deliveries	3272	2281	3374	2389	2300	1869	969	1559	425	384	388	925	376	150

Source: Adapted by Anthony H. Cordesman from US State Department, World Military Expenditures and Arms Transfers, various editions.

Figure 2.3

Key Iranian Equipment Developments

LAND

- Russian, and Polish T-72 Exports. Reports indicate Iran has procured about 380 T-72Ss from Russia (100 of which are kits for local assembly), and 100 T-72M1s from Poland since 1990. This gives Iran an inventory of about 480 T-72s – now its only truly modern tank and one where it has only taken delivery of 13 such tanks since 1995
- Claims to be producing the Iranian-made Zolfaqar (Zulfiqar) MBT, an M-48/M-60-like tank, but no more than 100 have been produced.
- Has upgraded to T-54/T-54 called "Safir-74. Claims to have upgraded Iraqi T-54s captured in Iran-Iraq War. Has 400 T-54/55 in inventory. Number of upgrades unknown.
- Purchased Russian BMPs. Inventory of 350 BMP-1s and 400 BMP-2s out a total of 865 armored infantry fighting vehicles and light tanks. .
- Russia may be licensing Iranian production of T-72 (100 units) and BMP-2 (200 units).
- Claims domestic production of a Chinese version of the BMP called the Boragh. May have an inventory of 120.
- Claims domestic production of an APC called the BMT-2 or Cobra.
- Possible purchase of 100 M-46 and 300 D-30 artillery weapons from Russia.
- Claims deployment of locally manufactured 122 mm and 155 mm self-propelled guns called Thunder-1 and Thunder –2, respectively. Some seem to be deployed but numbers are not available. Has 60 2S1 122mm and 180 M-109 155mm self-propelled weapon and some estimates indicate the Thunder-series weapons are with these units.
- May have 15+ Chinese and North Korean 146 mm self-propelled weapons
- Has 60 Russian 2S1 122 mm self-propelled howitzers in inventory.
- Growing numbers of BM-24 240 mm, BM-21 122 mm and Chinese Type 63 107 mm MRLs
- Iranian Hadid 122 mm - 40 round MRL
- Manufacturing Iranian Arash and Noor rockets (variants of Chinese and Russian 122 mm rockets)
- Manufacturing Iranian Haseb rockets (variants of Chinese 107 mm rocket)
- Manufacturing Iranian Shahin 1 and 2, Oghab, Nazeat 5 and 10 (may be additional versions), and Fajr battlefield rockets.
- Has shown a modified heavy equipment transporter called the "Babr 400."
- Russian and Asian AT-2, AT-3, AT-4, and AT-5 anti-tank guided weapons. Reports of 100 Chinese Red Arrows seem incorrect.
- Claims to have developed the Saeque-1 ATGW.
- Possible installation of a Russian T-72S main battle tank crew-training center.
- The Shebab-3 MRBM is assessed to enter its early operational status and it is estimated that Iran has some 20 missiles.
- Iran renewed its negotiation with Russia in early 2002 for large weapons deals. None, however, have materialzed.

AIR/AIR DEFENSE

- Keeping up to 115 combat aircraft that Iraq sent to Iran during Gulf War. Seem to include 24 Su-24s and four MiG-29s.
- Has 25 MiG-29s with air-to-air refueling capability in inventory. Reports may be receiving 15-20 more from Russia, but no confirmation.
- Has 30 Su-24s in inventory (Su-24MK). reports may be receiving 6 to 9 more from Russia. But no confirmation.
- Has purchased AS-10, AS-11, AS-12, AS-14/16s from Russia
- Has 7 Su-25Ks (formerly Iraqi), although has not deployed.
- Reports may be trying to purchase more Su-25s, as well as MiG-31s, Su-27s and Tu-22Ms
- Considering imports of Chinese F-8 fighter and Jian Hong bomber
- Has 24 Chinese F-7M fighters with PL2A, and PL-7 AAMs.
- Has purchased 15 Brazilian Tucano trainers and 22 Pakistani MiG-17 trainers.
- Has bought 12 Italian AB-212, 20 German BK-117A-3, and 2 Russian Mi-17 support and utility helicopters (30 Mi-17 to be delivered by the end of 2003).
- Iran claims to have fitted F-14s with I-Hawk missiles adapted to the air-to-air role
- Claims to produce advanced electronic warfare systems.
- IRGC claims to be ready to mass produce gliders.
- The first Iran-140 transport aircraft assembled under a joint program with Ukrain. Iran is planning to develop two versions of this aircraft for military use.
- The Iranian industry announced that it is planning to move the Azarakhsh combat aircraft and Shabaviz helicopters program into serial production.

20 Shahed-5 helicopter gunships in production. F-5 derived indigenous attack aircraft in development

LAND-BASED AIR DEFENSE

- Most systems now aging or obsolescent in spite of some modifications.
- May be negotiating purchase of S-300 and more SA-14/16s from Russia
- Has acquired four HQ-23/2B (CSA-1) launchers and 45-48 missiles, plus 25 SA-6, and 10 SA-5 launchers.
- Has acquired Chinese FM-80 launchers and a few RBS-70s
- More SA-7s and HN-5s man-portable missiles; may have acquired 100-200 Strelas.
- Reports is seeking to modernize Rapier and 10-15 Tigercat fire units
- May be modifying and/or producing ZSU-23-4 radar-guided anti-aircraft guns.
- Claims to produce advanced electronic warfare systems.

SEA

- Claims will soon start producing 3 corvettes.
- Has taken delivery on three Russian Type 877EKM Kilo-class submarines, possibly with 1,000 modern magnetic, acoustic, and pressure sensitive mines.
- Reports of North Korean midget submarines have never been confirmed. Has produced small swimmer delivery vehicles called the Al-Sabehat 15 mini-sub.
- Main surface ships are 3 Alvan (Vosper 5) class frigates dating back to late 1960s and early 1970s, and two Bayandor-class frigates from early 1980s.
- Obtained 10 Hudong-class Chinese missile patrol boats with CS-802 during early to mid-1990s. Has 10 Kaman class missile patrol boats from late 1970s, early 1980s.
- US Mark 65 and Russian AND 500, AMAG-1, KRAB anti-ship mines
- Reported that Iran is negotiating to buy Chinese EM-52 rocket-propelled mine
- Iran claims to be developing non-magnetic, acoustic, free-floating and remote controlled mines. It may have also acquired non-magnetic mines, influence mines and mines with sophisticated timing devices.
- Wake-homing and wire-guided Russian torpedoes
- Seersucker (HY-2) sites with 50-60 missiles - Iran working to extend range to 400 km.
- Has 60-100 Chinese CS-801(Ying Jai-1 SY-2) and CS-802 (YF-6) SSMs.
- Iran is developing FL-10 anti-ship cruise missile which is copy of Chinese FL-2 or FL-7.
- Boghammer fast interceptor craft
- The Iranian navy received fast patrol boats and C-701 ship-borne missiles from China.
- Iran received 15 small patrol boats from North Korea.

MISSILES

- Obtained up to 300 Scud Bs with 17 launchers
- Some 175 Chinese CSS-8 surface-to-surface missiles with 25-30 launchers.
- Reports that China is giving Iran technology to produce long-range solid fuel missiles
- Mushak –90, -120, -160, -200 missiles based on the Chinese CSS-8.
- Has bought North Korean Scud Cs with 5-14 launchers. South Korea reports Iran has bought total of 100 Scud Bs and 100 Scud Cs from North Korea.
- May be developing the Zelzal-3 missile with a range of 900 kilometers with Chinese and North Korean support.
- Iran has tested the Shahab-3 (which may have a 1,500 km range and is based on the North Korean No-dong 1) and may have started production.
- Iran may be planning to purchase North Korean No-Dong 1/2s
- Has shown interest in technology for interested in North Korea's developmental Tapeo Dong 1 or Tapeo Dong 2.
- Claims will launch its first experimental satellite by 2000 with Russian aid.
- Reports of tunnels for hardened deployment of Scuds and SAMs.
- Possible deployment of locally produced Nazeat series missiles, based on Russian FROG missiles.

CBW

- Chemical weapons (sulfur mustard gas, hydrogen cyanide, phosgene and/or chlorine; possibly Sarin and Tabun).
- Biological weapons (possibly Anthrax, hoof and mouth disease, and other biotoxins).
- Nuclear weapons development (Russian and Chinese reactors).

Source: Based on interviews, reporting in various defense journals, Jane's Fighting Ships the IISS, The Military Balance, various editions, and JCSS's The Middle East Military Balance.

Figure 2.4

Iranian Dependence on Decaying Western Supplied Major Weapons

Military Service	Weapon Type	Quantity	Comments
Land Forces			
	Chieftain tank	140-200	Worn, under-armored, underarmed, and underpowered. Fire control and sighting system now obsolete. Cooling problems.
	M-47/M-48	150	Worn, under-armored, underarmed, and underpowered. Fire control and sighting system now obsolete.
	M-60A1	150-160	Worn, under-armored, underarmed, and underpowered. Fire control and sighting system now obsolete.
	Scorpion AFV	70-80	Worn, light armor, underarmed, and underpowered.
	M-114s	70-80	Worn, light armor, underarmed, and underpowered
	M-109 155 mm SP	150-160	Worn, fire control system now obsolete. Growing reliability problems due to lack of updates and parts.
	M-107 175 mm SP	20-30	Worn, fire control system now obsolete. Growing reliability problems due to lack of parts.
	M-110 203 mm SP	25-30	Worn, fire control system now obsolete. Growing reliability problems due to lack of parts.
	AH-1J Attack heli.	50	Worn, avionics and weapons suite now obsolete. Growing reliability problems due to lack of updates and parts.
	CH-47 Trans. heli.	20-25	Worn, avionics now obsolete. Growing reliability problems due to lack of updates and parts.
	Bell, Hughes, Boeing, Augusta, Sikorsky helicopters	145-185	Worn, Growing reliability problems due to lack of updates and parts.
Air Force			
	F-4D/E FGA	35-65	Worn, avionics now obsolete. Critical problems due to lack of updates and parts.
	F-5E/F FGA	50-60	Worn, avionics now obsolete. Serious problems due to lack of updates and parts.
	F-5A/B	10-20	Worn, avionics now obsolete. Serious problems due to lack of updates and parts.
	RF-4E	5-6	Worn, avionics now obsolete. Serious problems due to lack of updates and parts.
	RF-5E	0-5	Worn, avionics now obsolete. Serious problems due to lack of updates and parts. (May be in storage)
	F-14 AWX	25	Worn, avionics now obsolete. Critical problems due to lack of updates and parts. Cannot operate some radars at long ranges. Phoenix missile capability cannot be used.
	P-3F MPA	5	Worn, avionics and sensors now obsolete. Many sensors and weapons cannot be used. Critical problems due to lack of updates and parts.
	Key PGMs	-	Remaining Mavericks, Aim-7s, Aim-9s, Aim-54s are all long past rated shelf life. Many or most are unreliable or inoperable.
	I-Hawk SAM	150	Worn, electronics, software, and some aspects of sensors now obsolete. Critical problems due to lack of updates and parts.

	Rapier SAM	30	Worn, electronics, software, and some aspects of sensors now obsolete. Critical problems due to lack of updates and parts.
	Tigercat SAM	15	Worn, electronics, software, and some aspects of sensors now obsolete. Critical problems due to lack of updates and parts.
Navy			
	Alvand FFG	3	Worn, weapons and electronics suite obsolete, many systems inoperable or partly dysfunctional due to Critical problems due to lack of updates and parts.
	Bayandor FF	2	Obsolete. Critical problems due to lack of updates and parts.
	Hengeman LST	4	Worn, needs full-scale refit.

Source: Estimate made by Anthony H. Cordesman based on the equipment counts in IISS, The Military Balance, and discussions with US experts. Note that different equipment estimates are used later in the text. The IISS figures are used throughout this chart to preserve statistical consistency.

Figure 2.5

Can Iran Mass Produce Major New Weapons Systems?

LAND

- Can produce nearly 50 types of munitions, including tank rounds, artillery shells, and rockets. Probably meets between 50% and 75% of Iran's needs in a major regional contingency and their output is steadily building up Iran's reserves.
- Manufacturers most of Iran's assault rifles, mortars up though 120 mm in caliber, and anti-tank rocket launchers
- Showed prototype of a main battle tank called the Zulfiqar (Zolfaqar) in 1994. Tank has undergone field trials ever since the Velayat military exercises of May 1996. Its drive train and suspension seems to be modeled on the US-designed M-48A5 and M-60A1 series of tanks and to have either a 105 mm or 125mm rifled gun. Reports differ as to the Zulfiqar's production status. One report indicates that Iran announced on July 8, 1997, that President Rafsanjani opened the "first phase" of a plant to produce the tank in Dorud, some 300 kilometers southwest of Tehran. Another report indicates that it is produced at the Shahdid Industrial Complex. Up to 100 may have been produced.
- T-72S (Shilden) tanks being assembled under license.
- Upgrading T-54s, T-55s, T-59s with 105 mm gun made in Iran and new fire control system.
- Claims ready to produce light tank for "unconventional warfare" called the Towan (Wild Horse) with 90 mm gun.
- Developed Iranian-made modification of the Chinese Type WZ 501/503 armored infantry fighting vehicle that Iran calls the Boragh. The WZ 501/503 is itself a Chinese copy of the Russian BMP, and is 30-year old technology. Up to 120 may be in inventory.
- Displayed APC called the Cobra or BMT-2, which seems to be an indigenous design armed with a 30 mm gun or the ZU-23-2 anti-aircraft gun — a light automatic weapons system that Iran has been manufacturing for some years. Like the Zulfiqar, the Cobra has been undergoing field trials in Iranian military exercises since May, 1996.
- Iran now makes a number of anti-tank weapons. These include an improved version of the man-portable RPG-7 anti-tank rocket with an 80 mm tandem HEAT warhead instead of the standard 30 mm design, the NAFEZ anti-tank rocket, and a copy of the Soviet SPG-9 73 mm recoilless anti-tank gun. Iran also makes a copy of the Russian AT-3 9M14M (Sagger or Ra'ad) anti-tank guided missile.
- Claimed in May 1996, to have produced a self-propelled version of a Russian 122 mm gun that it called the Thunder-1, with a firing range of 15,200 meters and a road speed of 65 kilometers per hour.[38] It may use the Boragh chassis for this weapon. It also claimed to have tested a "rapid fire" 155 mm self-propelled weapon in September, 1997, called the Thunder 2. some seem to have been deployed.
- Makes military radios and low-technology RPVs like the 22006, Baz, and Shahin.
- Has developed tactical radios ART 2000, VHF frequency-hopping radio with a range of 30-88 MHz, and the PRC-110 HF fixed-frequency manpack radio, which covers the 1.6-29.999 H MHz band in 100Hz steps. (JIDR 6/1998: 22)
- Has developed low-drag 155mm high explosive base-bleed projectile. The 155BB HE-TNT incorporates a 16kg TNT and has a range of 35km when fired with an M11 top charge from a 45-caliber gun. Range is 17km without base bleed. A new low-drag HE projectile for 120mm smoothbore mortars with a range of 13.2 km. (JIDR 6/1998: 22)

AIR/AIR DEFENSE

- Necessary technical sophistication to rebuild the jet engines for many of its American fighters and helicopters.
- Produce parts and modifications for some of its radars, missile systems, avionics, ships, and armored personnel carriers
- Claims to have built its first Iranian-designed helicopter, and to have tested a locally-built fighter plane. Brigadier General Arasteh, a deputy head of the General Staff of the Armed Forces (serving under Major General Ali Shahbazi, the joint chief of staff) stated in April, 1997 that the "production line of this aircraft will begin work in the near future."
- Chinese F-7 assembled in Iran
- Defense Industries Organization claimed that Iran was soon going to start producing two trainers, a jet-powered Dorna (Lark) and propeller-driven Partsu (Swallow).
- There had been reports in 1996 that Iran had obtained Ukrainian aid in producing the Antonov An-140 at a factory in Isfahan. In September, 1997, Iran indicated that it had signed a contract to buy 10 Antonov An-74 transport jets, and reports surfaced that it might co-produce the An-T74T-200. In November, 1998, it was reported that the first of the 52-seat An-140 will roll off the assembly line next year. (JDW 4 November 1998: 20)

- Iran has upgraded some of its F-4s, F-14s, and C-130s
- Iranian military claimed that Iran has begun mass production of a jet strike aircraft, the Azarakhsh (Lightning), which reportedly resembles the F-4 Phantom (JDW 4 November 1998: 20)
- Iranian Air Force claims that it is developing two combat aircraft based on the F-5 and a third indigenously designed (JDW 20 November 2002: 15)
- Armed Forces Air Industries Organization was discussing in November 1998, a deal with Ukraine's Aviant Aviatsiny Zavod, co-producer of the new Tupolev-334, to build the planes in Iran. The deal would be for the production of 100 of the 100-seat aircraft over 15 years. (JDW 4 November 1998: 20; Reuters 12 October 1998)
- Iran has reportedly developed a TV-guided missile for carriage on F-4 Phantoms
- Iran claims to have deployed an air-to-air adapted variant of the SM1 Standard missile for its fleet of F-4D/E Phantom II fighter bombers. (JDW 29 April 1998: 17)

LAND-BASED AIR DEFENSE

- President Rafsanjani announced on October 11, 1997, that Iran had test-launched a major new surface-to-air missile system with a range of 250 kilometers, although he gave no further details. The description of the missile sounded vaguely like the Russian SA-5, which is deployed in Iran. Reports has acquired four HQ-23/2B (CSA-1) launchers and 45-48 missiles, plus 25 SA-6, and 10-15 SA-5 launchers.
- May be modifying and/or producing ZSU-23-4 radar-guided anti-aircraft guns.
- Claims to produce advanced electronic warfare systems.

SEA

- Claims will soon start producing 6 multi-purpose destroyers, with initial production run of three.
- Constructing small submarine?
- Iran claims to be developing non-magnetic, acoustic, free-floating and remote controlled mines. It may have also acquired non-magnetic mines, influence mines and mines with sophisticated timing devices.
- Wake-homing and wire-guided Russian torpedoes
- Iran is developing FL-10 anti-ship cruise missile that is copy of Chinese FL-2 or FL-7.
- Reportedly assembled domestic variants the YJ-1 (C-801) solid-propellant anti-ship missile under the local name of Karus, and the YJ-2 (C-802) turbojet-powered anti-ship missile under the local name of Tondar (JDW 9 December 1998)
- Boghammer fast interceptor craft

MISSILES

- Iranian made IRAN 130 rocket with 150+ kilometers range.
- Iranian Oghab (Eagle) rocket with 40+ kilometers range.
- ·New SSM with 125 mile range may be in production, but could be modified FROG.
- Developing the Zelzal-3 missile with a range of 900 kilometers with Chinese and North Korean support.
- Claims that Russia is helping Iran develop four missiles. These missiles include:
- Shahab 3— a liquid fueled missile with a range of 810 miles (1,200-1,500 kilometers) and a payload of 1550 pounds, based on North Korean Nodong missile. Israel claims the Shahab might be ready for deployment as early as 1999.
- Shahab 4, with a range of 1,250 miles (1,995 kilometers) and a payload in excess of one ton, based on the Russian R-12, may be in service in 2001. However, the Ministry of Defense released a statement declaring that Iran had no intention of building the Shahab 4 and would continue to rely on the Shahab 3 and potential future variants.[39]
- Other two missiles are longer-range systems with a maximum ranges of 4,500 and 10,000 kilometers.
- Iran is reportedly receiving or trying to receive steel from China and Russia for the production of missiles.
- Has tested Iranian made Fajr-4 ballistic missiles and new version of Fajr-3 missile, with a range of 28 miles (45 kilometers)
- Has developed solid-propellant surface-to-surface missiles: the Zelzal 2, Nazeat and Shahin
- Reports of tunnels for hardened deployment of Scuds and SAMs.

- Experimenting with cruise missile development, although no links as yet to the employment of such missiles with warheads using weapons of mass destruction.

CBW

- Chemical weapons (sulfur mustard gas, hydrogen cyanide, phosgene and/or chlorine; possibly Sarin and Tabun).
- Biological weapons (possibly Anthrax, hoof and mouth disease, and other biotoxins).
- Nuclear weapons development (Russian and Chinese reactors).

Source: Based on interviews, reporting in various defense journals, and the IISS, The Military Balance, various editions.

III. Iran and Proliferation

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 Tikrit, 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 fact. 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 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 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 can now assemble Scud B and Scud C missiles using foreign-made components. It may soon be able to make entire missile systems and warhead packages in Iran.
- Iran seems to want enough missiles and launchers to make its missile force highly dispersible.
- 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 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 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 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.

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

- Recent reports and tests have provided more detail on the Shahab system:
  - Some US experts believe that Iran tested booster engines in 1997 capable of driving a missile to 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.
  - It is less clear when Iran will be able to bring such programs to the final development stage, carry out a full range of suitable test firings, develop highly lethal warheads, and deploy actual units. Much may still depend on the level of foreign assistance.
  - 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 Shahab 3.
  - Iran conducted further tests of the Shahab 3.
    - Tests on July 15, 2000 and May 23, 2003 were successful.

- An additional test on September 21, 2000 was claimed to be successful test launch by Iran, although US officials claim that the missile exploded shortly after launch.
- A July 2002 test was also determined to be unsuccessful. On whole, test firings of the Shahab 3 series have met with success in approximately half of all launches.

- Sources quote unconfirmed reports by Turkish intelligence that the Shahab 3 is now in production. Additionally, Israeli intelligence is quoted as saying that Iran may have as many as 20 missiles.[40]
- On July 4, 2000, Iran's Islamic Revolutionary Guards Corps claimed to have formed five new missile units, apparently to be equipped with Shahab 3 missiles.[41]

- 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.
  - There have been growing reports that Iran might be using Russian technology to develop long-range missiles with ranges from 2,000 to 6,250 kilometers.
- 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. The US Assistant Secretary for Near East Affairs testified on July 28, 1998, that the US estimated that the system still needed added foreign assistance to improve its motors and guidance system.
  - Some reports indicate that the Shahab 4 is based on the Soviet SS-4 missile. Others that there is a longer range Shahab 5, based on the SS-4 or Tapeo Dong missile. Reports saying the Shahab is based on the SS-4 say it has a range of up to 4,000 kilometers and a payload in excess of one ton.)
  - Iran may have two other missile programs include longer-range systems, variously reported as having maximum ranges of 3,650, 4,500-5,000, 6,250, or 10,000 kilometers.
  - 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 design 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 throw weight and range would allow Iran to use a relatively unsophisticated nuclear device or biological warhead. As a result, an updated version of the SS-4 might be a suitable design for a developing country.
- Iran is reported to have carried out the test of a sea-launched ballistic missile in 1998.
- Russia has been a key supplier of missile technology.
  - 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-coated graphite material, and maraging steel for missile development and production. They could play a major role in help Iran develop long range versions of the Scud B and C, and more accurate variations of a missile similar to the No Dong.

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

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

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

- Russian firms said to be helping Iran included the Russian Central Aerohydrodynamic Institute which developed a special wind tunnel; Rosvoorouzhenie, a major Russian arms-export agency; 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.

- 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.
  - China has delivered approximately 150 of 400 C-802 missiles ordered by Iran.[42]
  - A number of reports claim that Chinese companies have provided extensive technical assistance to Iranian cruise missile efforts, in engineering, production assistance, critical materials and equipment upgrades.
- 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.
- 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 between 2005 and 2010, 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 CIA reported in November 20003 that, "Ballistic missile-related cooperation from entities in the former Soviet Union, North Korea, and China over the years has helped Iran move toward its goal of becoming self-sufficient in the production of ballistic missiles. Such assistance during the first half of 2003 continued to include equipment, technology, and expertise. Iran's ballistic missile inventory is among the largest in the Middle East and includes some 1,300-km-range Shahab-3 medium-range ballistic missiles (MRBMs) and a few hundred short-range ballistic missiles (SRBMs)—including the Shahab-1 (Scud-B), Shahab-2 (Scud C), and Tondar-69 (CSS-8)—as well as a variety of large unguided rockets. Already producing Scud SRBMs, Iran announced that it had begun production of the Shahab-3 MRBM and a new solid-propellant SRBM, the Fateh-110. In addition, Iran publicly acknowledged the development of follow-on versions of the Shahab-3. It originally said that another version, the Shahab-4, was a more capable ballistic missile than its predecessor but later characterized it as solely a space launch vehicle with no military applications. Iran is also pursuing longer-range ballistic missiles."

- The Center for Nonproliferation Studies at the Monterey Institute of International Studies has compiled a chronology of North Korean assistance to Iran through 2003[43]:

Date	Item(s)	Remarks
1980s	About 100 Scud missile launchers	
Late 1984-Early 1985	Technical assistance for Scud-B production facility	In October 1983 Iran and North Korea reach agreement for assistance in setting up missile production capability.
1987-88	100 modified Scud-B missiles and 12 TELs	
1987	Technical assistance for modified Scud-B production	
1987-88	Unknown number of HY-2 Silkworm anti-ship missiles	Agreement signed in 1986; some believe that the missiles were supplied by China, but Beijing insists Pyongyang was supplier.
1987-92	200-300 Scud-B missiles	
1988 Early	40 Scud-B missiles	Probably part of the 100 Scuds reportedly shipped in 1987-1988.
1988 January	four Styx anti-ship missiles and at least one HY-2 Silkworm anti-ship missile	
1988 February	80 HY-2 Silkworm anti ship missiles and 40 Scud-B missiles	Report says missiles came from both China and North Korea.
1990 Early	20 Scud-B missiles	
1990 December	Missile technicians	North Korean technicians arrive in eastern Iran to convert a missile maintenance facility into a missile production plant.
1991	170 Scud-C missiles	Uncertain; Iran probably had not received all 170

		missiles by 1991 because, according to estimates, North Korea would not have been able to produce 170 Scud-C missiles by this time.
1992 March	Unknown; suspected Scud-B missiles	US officials suspect Iranian ship with Scud missiles travels from Singapore to the Iranian port of Char Bahar.
1992 Second Half	A few No Dong-1 prototypes	
1992 October	100 Scud-C missiles	Half of the Scud-C shipment possibly transferred to Syria.
1993	Unknown number of Scud-C missiles	Possibly the same shipment of 100 Scud-Cs reported in late October 1992.
1994 Mid to Late	No Dong-1 components or a small number of complete missiles	In April 1993 North Korea reportedly agreed to sell 150 No Dongs to Iran in exchange for access to test facilities and financial support.
Late 1994-Early 1995	At least four Scud-C TELs and possibly a No Dong MEL	
1995 Early	At least 12 No Dong missiles	Based on an Israeli intelligence report; in April 1996, *Jane's Defense Weekly* reports that North Korea may have exported as many as 20 No Dongs.
1997	Unknown missile components	
1997 Early	Computer software for No Dong production	
1999 November	12-20 No Dong engines	
2001 March	Engines and airframes; unspecified number of missile components	US reconnaissance satellite detects missile components being loaded onto an Iranian Il-76 transport plane at Sunan International Airport near Pyongyang.

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.
- On August 2, 2002, the NSC's Director for the Near East indicated that Iran is producing and stockpiling blister, blood and choking agents.
- The Defense Department's 2001 Report "Proliferation: Threat and Response" suggests that Iran, in addition to producing and stockpiling blister, blood and choking agents, has weaponized these agents for use with artillery shells, mortars, rockets and bombs. The report also states that Iran is continuing its research into nerve agents.
- 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. Training for Iranian naval forces suggests that they are preparing for the possibility of operating in a contaminated environment.
- 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 chemicals 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 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.

- 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.
- There exists a large number of sites in Iran that are alleged to be related to Iran's chemical warfare effort[44]:
  - Abu Musa Island: Suspected site of a large number of chemical weapons, principally 155mm artillery shells, in addition to some weaponized biological agents.
  - Bandar Khomeni: Allegedly the location of a chemical weapons facility, run by the Razi chemical corporation, established during the Iran-Iraq war to manufacture chemical weapons.
  - Damghan: Either a chemical weapons plant or warhead assembly facility. Primarily involved in 155mm artillery shells and Scudwarheads.
  - Isfahan: Suspected location of a chemical weapons facility, possibly operated by the Poly-Acryl Corporation.
  - Karaj: Located about 14km of Tehran, this is the site of an alleged storage and manufacturing facility for chemical weapons. Reports suggest that this facility was built with Chinese assistance.
  - Marvdasht: The Chemical Fertilizers Company is suspected to have been a manufacturing facility for mustard agents during the Iran-Iraq War.
  - Parchin: The location of at least one munitions factory and is suspected of being a major chemical weapons production facility. Reports of uncertain reliability indicate that the plant was in operation no later than March 1988. In April 1997, a German newspaper reported that, according to the German Federal Intelligence Service, the factories at Parchin were producing primary products for chemical warfare agents.
  - Qazvin: A large pesticide plant at this location is widely believed to produce nerve gas.
  - Mashar: Iranian opposition groups have made allegations, of uncertain reliability, that a warhead filling facility is operated at this location.
- A number of reports indicate that China has provided Iran with the ability to manufacture chemical weapons indigenously as well as providing precursors since at least 1996.[45]
- The CIA reported in November 2003 that, "Iran is a party to the Chemical Weapons Convention (CWC). Nevertheless, during the reporting period it continued to seek production technology, training, and expertise from Chinese entities that could further Tehran's efforts to achieve an indigenous capability to produce nerve agents. Iran likely has already stockpiled blister, blood, choking, and probably nerve agents—and the bombs and artillery shells to deliver them—which it previously had manufactured."

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.
- The CIA reported in November 2003 that, “Even though Iran is part of the Biological Weapons Convention (BWC), Tehran probably maintained an offensive BW program. Iran continued to seek dual-use biotechnical materials, equipment, and expertise. While such materials had legitimate uses, Iran's biological warfare (BW) program also could have benefited from them. It is likely that Iran has capabilities to produce small quantities of BW agents, but has a limited ability to weaponize them.”

- 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.

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 yellowcake 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 the Yazd area. It may have had a uranium-ore concentration facility at University of Tehran, but status unclear.
- Some experts suspect 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 yellowcake 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 yellowcake, 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 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. These 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.
- The IAEA has inspected the uranium enrichment facility at Natanz, although it is unclear what kind of future inspection regime will be put in place.
- Despite agreeing to discuss concluding an Additional Protocol for inspections with the IAEA, during a March 13, 2003 interview with *Le Monde*, the Iranian Vice President Gholamreza Aghazadeh indicated that Iran would not sign such a protocol unless the United States lifted economic sanctions.

- 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 a 110-pound (50 kilogram) 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 the 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, however, 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 agreements made in 1989-1990."
- The same day, Vice Minister Ilya Klebanov met with Hassan Rowhani, and announced that Iran might order three additional Russian reactors.
- The CIA warned in January 2000 that Russia might have sold Iran heavy water and graphite technology.

- China is reported to have agreed to provide significant nuclear technology transfer and possible sale of two 300 megawatt pressurized water reactors in the early 1990s, but then 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.
- 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 yellowcake 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 during the first half of 1998, China continued to take steps to strengthen its control over nuclear exports. China promulgated new export control regulations in June 1998 that cover the sale of dual-use nuclear equipment. This follows on the heels of the September 1997 promulgation of controls covering the export of equipment and materials associated exclusively with nuclear applications. These export controls should give the Chinese Government greater accounting and control of the transfer of equipment, materials, and technology to nuclear programs in countries of concern.
- China pledged in late 1997 not to engage in any new nuclear cooperation with Iran and to complete work on two remaining nuclear projects—a small research reactor and a zirconium production facility—in a relatively short period of time. During the first half of 1998, Beijing appears to have implemented this pledge. The intelligence community will continue to monitor carefully Chinese nuclear cooperation with Iran.
- During the reporting period, Chinese entities provided a variety of missile-related items and assistance to several countries of proliferation concern. China also was an important supplier of ACW to Iran through the first half of 1998.

- The control of fissile material in the FSU remains a major problem:
  - US estimates indicate the FSU left a legacy of some 1,485 tons of nuclear material. This includes 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 could not find 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), 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.
- Iran actively sought relevant production technology to lessen its dependence on foreign sources.
- 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.

- The completion date of the light-water reactor at Bushehr has been moved forward from 2005 to the end of 2003.
- Russia has indicated that it would provide fuel for the reactor, in a bid to decouple the construction of the reactor from the Iranian fuel production program.
- Russia has agreed to provide fuel only if Iran returns the spent fuel to Russia. This is intended to deny Iran the fuel rods needed for plutonium production.

- Russia has committed to observe certain limits on its nuclear cooperation with Iran. For example, President Yeltsin has stated publicly that Russia will not provide militarily useful nuclear technology to Iran. Beginning in January this year, the Russian Government has taken a number of steps. For example, in May 1998, Russia announced a decree intended to strengthen compliance of Russian businesses with existing export controls on proliferation-related items.
- China continued to work on one of its two remaining projects—to supply Iran's civil nuclear program with a zirconium production facility. This facility will be used by Iran to produce cladding for reactor fuel. As a party to the Nuclear Nonproliferation Treaty, Iran is required to apply IAEA safeguards to nuclear fuel, but safeguards are not required for the zirconium plant or its products. During the US-China October 1997 Summit, China pledged not to engage in any new nuclear cooperation with Iran and to complete cooperation on two ongoing nuclear projects in a relatively short time. This pledge appears to be holding. In addition, China promulgated new export regulations in June 1998 that cover the sale of dual-use nuclear equipment. The regulations took effect immediately and were intended to strengthen control over equipment and material that would contribute to proliferation. Institution of these regulations fulfills Jiang Zemin's commitment to the United States last fall to implement such controls by the middle of 1998.
- Iran claims to desire the establishment of a complete nuclear fuel cycle for its civilian energy program. In that guise, it seeks to obtain whole facilities, such as a uranium conversion facility, that, in fact, could be used in any number of ways in support of efforts to produce fissile material needed for a nuclear weapon. Despite outside efforts to curtail the flow of critical technologies and equipment, Tehran continues to seek fissile material and technology for weapons development and has set up an elaborate system of military and civilian organizations to support its effort.
- 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*s reported that the CIA had warned that Iran might now be able to make a nuclear weapon. The assessment stated that the CIA could not monitor Iran closely enough to be certain whether Iran had acquired fissile material from an outside source.
  - US experts increasingly refer to Iran's efforts as "creeping proliferation" and there is no way to tell when or if Iranian current efforts will produce a weapon, and unclassified lists of potential facilities have little credibility.
  - Timing of weapons acquisition depends heavily on whether Iran can buy fissile material — if so it has the design capability and can produce weapons in 1-2 years — or must develop the capability to process plutonium or enrich uranium — in which case, it is likely to be 5-10 years.

- On August 14, 2002, the representative office of the National Council of Resistance of Iran (NCRI), an Iranian opposition group which includes the People's Mujahideen, held a press briefing in which they released information about Iran's nuclear program.
  - The construction of a large site in Natanz which, according to the allegations, is to have been completed by March 2003.
  - The construction of a heavy water production facility at Arak.
  - Additional nuclear projects at a number of facilities:
    - The Bushehr power reactor complex.
    - The Nuclear Fuel Center in Isfahan.
    - The Nuclear Research Center at Karaj.
    - Research Center of Bonab.
    - Saghand Research Center of Yazd.
    - Amirabad Research and Reactor Center in Tehran.
- The Natanz site was previously unknown. By late 2002, the facility had been identified as a uranium enrichment facility.
  - In September 2002, Iran informed the IAEA of the existence of the facility. In a March 17, 2003 report the IAEA had confirmed their February 21, 2002 inspection of the facility.
  - At the time of the inspection, the IAEA Director General Mohamed El Baradei observed approximately 164 gas centrifuges operating at a pilot plant, with parts for perhaps an additional 1,000 centrifuges. When the IAEA delegation visited the facility, no uranium was in any of the centrifuges.
    - The Iranian government has stated that uranium hexaflouride will be produced at Isfahan and then shipped to Natanz for separation and processing. A March 14, 2003 Iranian state television broadcast indicated that on March 3, 2003, the Secretary of the Supreme National Security Council stated that the Isfahan facility for converting yellowcake into uranium hexaflouride was complete.
  - News stories quoting government sources, independent analysis of commercially-available satellite imagery and reports from the NCRI all note that the two main halls are quite large (between 25,000 m^2 and 32,000 m^2), are several meters underground and have walls in excess of two meters thick.
    - The size of the halls tends to suggest that the total number of centrifuges may total roughly 50,000 or more – contradicting recent media reports which claim that Natanz is intended only to house 5,000 centrifuges.[46] This number may merely reflect an interim goal for the site.
    - Previously the Iranian government had announced that it intended to achieve complete self-sufficiency throughout the entire fuel cycle for a projected generation capacity of 6,000 megawatts over the next 20 years.
    - The total capacity of the Natanz facility depends on the efficiency of the centrifuges. At the low end, a complex housing 50,000 centrifuges would produce a quarter of the fuel need for the Bushehr reactor – which is only about 4 percent of the total stated goal of the Iranian nuclear program. At the high end, 50,000 centrifuges could produce 25% more than the amount called for in publicly stated nuclear program objectives.
      - The throughput of the centrifuges depends on the quality of the materials used in manufacturing the centrifuges, as well as their design.
      - Unconfirmed reports quoting western governmental sources suggest that the Iranian centrifuges may tend towards the upper bounds of the range of production capabilities.
    - The amount of separation capacity needed to meet the stated goals of providing sufficient fuel for 6,000 MW is sufficient to produce enough highly-enriched uranium for 180 weapons annually.

- It is uncertain what portion, if any, of the separation capacity at Natanz will be dedicated to producing highly-enriched, weapons-grade uranium versus low-enriched uranium for use in power reactors.
- More significantly, the ability to construct a plant of this scale suggests that there may exist ample capacity to produce separation equipment for use in a weapons program. Such equipment could be located at other, unknown, sites.

- National Council of Resistance of Iran (NCRI) also released information about a heavy water production facility at Arak during it's August 14, 2002, press briefing.
  - The construction of a heavy-water production facility is puzzling to many observers, as Iran has no reactor that utilizes heavy water.
    - Heavy water can be used in a reactor that uses natural uranium fuel.
    - Analysts note that heavy water is a key material used in plutonium production.
- On February 9, 2003, Iranian President Khatami made a televised speech on Iran's nuclear program in which a number of pronouncements were made indicating the scope and scale of the Iranian nuclear program.
  - Iran has started mining uranium near the city of Yazd.
  - A facility for converting ore into yellowcake has been built in the same province as the mines.
  - Iran is building or operating uranium mines, uranium concentration and conversion facilities and fuel fabrication plants.
  - A statement made the next day by the head of Iran's Atomic Energy Organization, stated that the Isfahan facility would convert yellowcake into uranium oxide, uranium hexaflouride and uranium metal.
  - Uranium metal has very few civil uses, but is a key to the construction of nuclear weapons.
  - On March 3, 2003, the state-run Islamic Republic News Agency reported that the Isfahan facility was completed and would begin operation.
- Statements made over the last few months by the Iranian government regarding fuel-cycle self-sufficiency had troubled some observers, including the US State Department, as these statements could be interpreted to mean that Iran is pursuing the ability to reprocess spent fuel.
  - Reprocessing of spent fuel produces plutonium.
  - Russia's earlier agreements regarding the construction of the reactor at Bushehr included an agreement for Russia to provide reactor fuel. This agreement was contingent on Iran returning spent fuel rods to Russia.
- On December 13, 2002, IAEA Director General Mohammed El-Baradei indicated that the reports by Iranian opposition groups and Western governments on Iranian nuclear facilities at Natanz and Arak was not a surprise, citing discussions with Iranian authorities over the last 6 months.
  - On February 22, 2003, Iran permitted three IAEA personnel to visit the Natanz enrichment facility. More detailed inspections began on March 10, 2003.
  - During the visit, personnel observed between 160-200 active centrifuges at the Natanz pilot plant. However, none of these centrifuges appeared to have contained uranium hexaflouride. It is possible that some UF_6 has been processed somewhere in Iran, at least on a trial basis.
  - Inspectors also observed parts for about an additional 1,000 centrifuges.
  - Iranian authorities promised to provide information on centrifuge design no later than 60 days before the start of processing of uranium hexaflouride. Under existing agreements, Iran would also be required to provide IAEA with data covering the number of centrifuges installed as well as the total facility throughput.

- The United States and other western governments have pressured the IAEA to more aggressively monitor the Iranian nuclear program and have encouraged the IAEA to seek additional, more comprehensive, inspection agreements. Iran originally indicated some willingness to make such an agreement, although recently they appear to be more inclined to extract concessions in exchange for further inspections.

- The CIA reported in November 2003 that, "The United States remains convinced that Tehran has been pursuing a clandestine nuclear weapons program, in violation of its obligations as a party to the Nuclear Nonproliferation Treaty (NPT). To bolster its efforts to establish domestic nuclear fuel-cycle capabilities, Iran sought technology that can support fissile material production for a nuclear weapons program.

  - Iran tried to use its civilian nuclear energy program to justify its efforts to establish domestically or otherwise acquire assorted nuclear fuel-cycle capabilities. In August 2002, an Iranian opposition group disclosed that Iran was secretly building a heavy water production plant and a "nuclear fuel" plant. Press reports later in the year confirmed these two facilities using commercial imagery and clarified that the "fuel" plant was most likely a large uranium centrifuge enrichment facility located at Natanz. Commercial imagery showed that Iran was burying the enrichment facility presumably to hide it and harden it against military attack. Following the press disclosures, Iran announced at the International Atomic Energy Agency (IAEA) September 2002 General Conference that it had "ambitious" nuclear fuel cycle plans and intended to develop all aspects of the entire fuel cycle.

  - By the end of 2002, the IAEA had requested access to the enrichment facility at Natanz, and the IAEA Director General (DG) for the first time visited the facility in February 2003. The IAEA is investigating the newly disclosed facilities, and previously undisclosed nuclear material imports to determine whether Iran has violated its NPT-required IAEA safeguards agreement in developing these facilities and their related technologies. At the June 2003 Board of Governors meeting, the IAEA DG presented a report on the Iranian program noting Tehran had failed to meet its safeguards obligations in a number of areas. The DG's report described a pattern of Iranian safeguards failures related to the undeclared import and processing of uranium compounds in the early 1990s, expressed concern over the lack of cooperation from Iran with IAEA inspections, and identified a number of unresolved concerns in Iran's program that the IAEA will continue to investigate. The IAEA Board on 19 June welcomed the report and called on Iran to answer all IAEA questions, cooperate fully with IAEA inspectors, and sign and implement an Additional Protocol immediately and unconditionally.

  - Although Iran claims that its nascent enrichment plant is to produce fuel for the Russian-assisted construction projects at Bushehr and other possible future power reactors, we remain concerned that Iran is developing enrichment technology to produce fissile material for nuclear weapons under the cover of legitimate fuel cycle activities. Iran appears to be embarking on acquiring nuclear weapons material via both acquisition paths—highly enriched uranium and low burn-up plutonium. Even with intrusive IAEA safeguards inspections at Natanz, there is a serious risk that Iran could use its enrichment technology in covert activities. Of specific proliferation concern are the uranium centrifuges discovered at Natanz, which are capable of enriching uranium for use in nuclear weapons. Iran claims its heavy water plant is for peaceful purposes. In June, Iran informed the IAEA that it is pursuing a heavy water research reactor that we believe could produce plutonium for nuclear weapons. We also suspect that Tehran is interested in acquiring fissile material and technology from foreign suppliers to support its overall nuclear weapons program."

- Iran agreed to sign the NNPT protocol allowing full IAEA challenge inspections, and to IAEA inspections of suspect nuclear facilities in late 2003, after the discovery of undeclared centrifuge and heavy water facilities, and the IAEA discovered it was conducting a variety of activities illegal under the NNPT. It did so in the face of UN condemnation and possible sanctions.

- The IAEA, in early 2004, found traces of highly enriched uranium at an Iranian nuclear facility. The uranium, the uncommon 235 isotope, had been refined to 90 percent, making it of a quality usually used in a nuclear bomb.

- Iran claimed that its equipment must have been contaminated by uranium while being shipped to its facilities. Iran stated that the exact time and location of the contamination was impossible to determine due to the fact that the parts had been shipped through five different countries.

- The IAEA suggested that the contamination may have occurred in Pakistan as a result of the alleged collusion between Iranian officials and the Pakistani scientist, Abdul Qadeer Kahn. The IAEA requested that Pakistan allow the organization to take samples from its enrichment sites to determine whether or not the contamination occurred in Pakistan.

- The Iranian Defense Minister, Ali Shamkhani, admitted that centrifuge production had taken place under military supervision and were designed to enrich uranium. These centrifuges, he maintained, were solely for use in civilian power plants. Kamal Kharrazi, the Foreign Minister, accused the US of using every opportunity to pressure Iran and indicated that the actions of the US could "complicate" Iran's cooperation with the IAEA. Kharrazi insisted that Iran would resume enriching uranium for "peaceful purposes" after the IAEA was satisfied with Iran's compliance.[47]

- The US has threatened to refer Iran to the UN Security Council if the country refused to reveal or tried to conceal developments in its nuclear research. The European nations have been reluctant to support such a measure, believing that it would rule out further Iranian cooperation with the IAEA. The revelation of highly enriched uranium and the Iranians' decision to suspend further IAEA inspections until April on March 11, 2004, however, has caused them to reevaluate their positions with regard to Iran.

- On March 13, 2004, the IAEA passed a resolution that criticized Iran for failing to reveal all aspects of its nascent nuclear weapons program. In response, Iran suspended IAEA inspections indefinitely. The IAEA's main concerns were[48]:

  - Iran had failed to reveal the full extent of its past and current nuclear program as requested by the IAEA in November.

  - Iran had signed the Additional Protocol but had failed to ratify it as the IAEA called for in November.

  - The IAEA found additional equipment and designs not disclosed by Iran. They included a more advanced centrifuge design, centrifuge research, centrifuge testing, and centrifuge manufacture. The IAEA found the designs for two hot cells at the Arak heavy water research reactor and two mass spectrometers for the laser enrichment process. Iran has not provided the IAEA with the reason for the planned construction of a second heavy-water reactor. These issues require greater investigation but are consistent with an active nuclear weapons research program.

  - Iran failed to show the extent of its research and development in uranium enrichment. Iran failed to provide the IAEA with the source of the uranium contamination.

  - No sufficient explanation has been given for Iran's experiments with polonium-210.

Missile Defenses

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

[1] IISS, The Military Balance, 1997-1998; Jane's Sentinel: The Gulf States, 1997, p. 24.
[2] There are reports that the lighter and smaller formations in the regular army include an Airmobile Forces group created since the Iran-Iraq War, and which includes the 29th Special Forces Division, which was formed in 1993-1994, and the 55th paratroop division. There are also reports that the regular army and IRGC commando forces are loosely integrated into a corps of up to 30,000 men with integrated helicopter lift and air assault capabilities. The airborne and special forces are trained at a facility in Shiraz. These reports are not correct. Note that detailed unit identifications for Iranian forces differ sharply from source to source. It is unclear that such identifications are accurate, and now dated wartime titles and numbers are often published, sometimes confusing brigade numbers with division numbers.
[3] No reliable data exist on the size and number of Iran's smaller independent formations.
[4] The estimates of Iran's AFV and APC strength are based on interviews with Israeli, British and US civilian experts, and the IISS, Military Balance, "Iran"; Jane's Sentinel: The Gulf States, "Iran."
[5] Foss, Christopher, "Iran Reveals Up-Armoured Boraq Carrier," Jane's Defence Weekly, April 9, 2003, http://jdw.janes.com, Accessed January 8, 2004. Labeled 42.
[6] Pronina, Lyubov, "U.S. Sanctions Russian Firm for Alleged Iran Sales," Defense News, September 22, 2003, p. 12. Labeled 43.
[7] Jane's Defence Weekly, January 15, 2003, http://jdw.janes.com, Accessed January 8, 2004.Labeled 45.

[8] Jane's Missiles and Rockets, "Iran's Raad Cruise Missile Enters Production", by Dough Richardson.
[9] International Defense Review, 7/1996, pp. 23-26; Anthony H. Cordesman, Iran's Weapons of Mass Destruction, CSIS, April, 1997.

[10] Jane's Missiles and Rockets, "Iran Enhances Existing Weaponry by Optimising Shahab-3 Ballistic Misslile", January 20, 2004.

[11] Ibid
[12] See Time, March 21, 1994, pp. 50-54, November 11, 1996, pp. 78-82. Also see Washington Post, November 21, 1993, p. A-1, August 22, 1994, p. A-17; October 28, 1994, p. A-17, November 27, 1994, p. A-30, April 11, 1997, p. A-1, April 14, 1997, p. A-1; Los Angeles Times, November 3, 1994, pp. A-1, A-12; Deutsche Presse-Agentur, April 17, 1997, 11:02; Reuters, April 16, 1997, BC cycle, April 17, 1997, BC cycle; The European, April 17, 1997, p. 13; The Guardian, October 30, 1993, p. 13, August 24, 1996, p. 16 April 16, 1997, p. 10; New York Times, April 11, 1997, p. A1; Associated Press, April 14, 1997, 18:37.
Jane's Defense Weekly, June 5, 1996, p. 15; Agence France Press, April 15, 1997, 15:13; BBC, April 14, 1997, ME/D2892/MED; Deustcher Depeschen via ADN, April 12, 1997, 0743; Washington Times, April 11, 1997, p. A22..
[13] For typical reporting by officers of the IRGC on this issue, see the comments of its acting commander in chief, Brigadier General Seyyed Rahim Safavi, speaking to reporters during IRGC week (December 20-26, 1995). FBIS-NES-95-250, December 25, 1995, IRNA 1406 GMT.
[14] Interviews and Washington Times, May 12, 1997, p. A-13, October 11, 1997, p. A-6; Jane's Defense Weekly, June 25, 1997, p. 14, October 1, 1997, p. 19; Reuters, July 3, 1997, 0452, July 9, 1997, 1655, September 28, 1997, 0417, October 6, 1997, 1600..
[15]. The reader should be aware that much of the information relating to the Quds is highly uncertain and is drawn from Israeli sources. Also, however, see the article from the Jordanian publication Al-Hadath in FBIS-NES-96-108, May 27, 1996, p. 9, and in Al-Sharq Al-Awsat, FBIS-NES-96-110, June 5, 1996, pp. 1,4; A J Venter, "Iran Still Exporting Terrorism," Jane's Intelligence Review, November, 1997, pp. 511-516.
[16] New York Times, May 17, 1998, p. A-15; Washington Times, May 17, 1998, p. A-13; Washington Post, May 21, 1998, p. A-29.
[17] A J Venter, "Iran Still Exporting Terrorism," Jane's Intelligence Review, November, 1997, pp. 511-516.

[18] Jane's, "Iran", 29 October 2001.
[19] World Missiles Briefing, Teal Group Corporation.
[20] Jane's Defense Weekly, June 25, 1997, p. 3; Associated Press, June 17, 1997, 1751; United Press, June 17, 1997, 0428; International Defense Review, 6/1996, p. 17.
[21] Washington Times, March 27, 1996, p. A-1.
[22]Defense News, January 17, 1994, pp. 1, 29.
[23] Only two torpedo tubes can fire wire guided torpedoes. Defense News, January 17, 1994, pp. 1, 29.

[24] See David Miller, "Submarines in the Gulf," Military Technology, 6/93, pp. 42-45 David Markov, "More Details Surface of Rubin's 'Kilo' Plans," Jane's Intelligence Review, May 1997, pp. 209-215.
[25] In addition to the sources listed at the start of this section, these assessments are based on various interviews, prior editions of the IISS Military Balance; the Jaffee Center Middle East Military Balance, Jane's Sentinel: The Gulf States, "Iran;" and Jane's Defense Weekly, July 11, 1987, p. 15.

[26] Central Asia's Affairs, No: 3, "The Military Political Situation in the Caspian Region", by A. Kozhikhov, D. Kaliyeva

[27] ibid
[28] The range of aircraft numbers shown reflects the broad uncertainties affecting the number of Iran's aircraft which are operational in any realistic sense. Many aircraft counted, however, cannot engage in sustained combat sorties in an extended air campaign. The numbers are drawn largely from interviews; Jane's Intelligence Review, Special Report No. 6, May, 1995; Jane's Sentinel - The Gulf Staffs, 1997, "Iran," the IISS, Military Balance, 1997-1998, "Iran;" Andrew Rathmell, The Changing Balance in the Gulf, London, Royal United Services Institute, Whitehall Papers 38, 1996; Dr. Andrew Rathmell, "Iran's Rearmament: How Great a Threat?," Jane's Intelligence Review, July, 1994, pp. 317-322; Jane's World Air Forces (CD-ROM).
[29] Wall Street Journal, February 10, 1995, p. 19; Washington Times, February 10, 1995, p. A-19.
[30] Hewson, Robert, "Iran's New Combat Aircraft Waits in the Wings," Jane's Defence Weekly, November 20, 2002, p. 15. Labeled 43.
[31] Periscope, Nations/Alliances/Geographic Regions/Middle East/North Africa, Plans and Programs. Labeled 69.
[32] Reports that the IRGC is operating F-7 fighters do not seem to be correct.
[33] Reuters, June 12, 1996, 17:33.
[34] Jane's Defence Weekly, "Iran Reveals Shahab Thaqeb SAM Details," September 4, 2002, http://jdw.janes.com, Accessed Januray 9, 2004. Labeled 44.
[35] Based on interviews with British, Israeli, and US experts, and Anthony H. Cordesman, Iran and Iraq: The Threat from the Northern Gulf, Boulder, Westview, 1994; Anthony H. Cordesman and Ahmed S. Hashim, Iran: the Dilemmas of Dual Containment, Boulder, Westview, 1997; IISS, Military Balance, 1997-1998, "Iran"; Jane's Sentinel: The Gulf States, 1997, "Iran;" USNI Data Base; Anoushiravan Ehteshami, "Iran's National Strategy," International Defense Review, 4/1994, pp. 29-37; Military Technology, World Defense Almanac: The Balance of Military Power, Vol. XVII, Issue 1-1993, ISSN 0722-3226, pp. 139-142; and working data from the Jaffee Center for Strategic Studies; Dr. Andrew Rathmell, "Iran's Rearmament: How Great a Threat?," Jane's Intelligence Review, July, 1994, pp. 317-322; Ahmed Hashim, "The Crisis of the Iranian State," Adelphi Paper 296, London, IISS, Oxford, July 1995, pp. 7-30 and 50-70; Andrew Rathmell, The Changing Military Balance in the Gulf, London, RUSI, Whitehall Series, 1996, pp. 9-23; Michael Eisenstadt, Iranian Military Power, Capabilities and Intentions, Washington, Washington Institute, 1996, pp. 9-65; and Anoushiravan Enreshami, "Iran Strives to Regain Military Might," International Defense Review, 7/1996, pp. 22-26.
[36] Jane's Defense Weekly, September 4, 1996, p. 4.

[37] Forecast International Inc, "Annual Military Spending in Middle East Projected to Rise to $55 billion" , http:www.forecast1.com/press/press99.htm , November 20, 2003.
[38] Jane's Defense Weekly, June 5, 1996, p. 15.

[39] Robin Hughes, "Iran Denies Shahab 4 Development," Jane's Defence Weekly, November 12, 2003, http://jdw.janes.com, Accessed January 8, 2004. Labeled 46.
[40] www.globalsecurity.org
[41] Ed Blanche, "Iran Forms Five Units for Shahab Ballistic Missiles," Jane's Defense Weekly, July 12, 2000, pp 16.
[42] John Mintz, "Tracking Arms: a Study in Smoke; Ambiguity Clouds French Role in China-Iran Deal," Washington Post, April 3, 1999, pg A03.
[43] Center for Nonproliferation Studies, Monterey Institute of International Studies, "North Korean Missile Exports and Technical Assistance to Iran," http://www.nti.org/db/profiles/dprk/msl/ie/NKM_EeiranGO.html, accessed April 2003.
[44] Merav Zafary, "Iranian Biological and Chemical Weapons Profile Study," Center for Nonproliferation Studies, Moneterey Institute of International Studies, February 2001.
[45] Shirly Kan, "China's Proliferation of Weapons of Mass Destruction," Congressional Research Service, March 1, 2002, CRS IB 9256.

[46] David Albright and Corey Hinderstein, "The Iranian Gas Centrifuge Uranium Enrichment Plant at Natanz: Drawing From Commercial Satellite Images," The Institute for Science and International Security, March 14, 2003.

[47] Craig S. Smith, "Alarm Raised Over Quality of Uranium Found in Iran," New York Times March 11, 2004 pg. A11.

[48] International Atomic Energy Agency, Board of Governors, "Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran," March 13, 2004 http://www.iaea.org/Publications/Documents/Board/2004/gov2004-21.pdf