CSIS

Center for Strategic and International Studies
1800 K Street N.W.
Washington, DC 20006
(202) 775-3270

Recent Military Developments in the Persian Gulf

Defense Efforts, the Conventional Balance, Weapons of Mass Destruction, and Terrorism

Anthony H. Cordesman

Senior Fellow, CSIS

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Changes in the Military Balance Since the Gulf War

The military balance in the Persian Gulf has changed fundamentally since the Gulf War, and the most striking of these changes have occurred in the Northern Gulf. When Iraq invaded Kuwait, it was dominant regional military power in the Gulf. It had decisively defeated Iran during the spring and summer of 1988, in battles which cost Iran some 45-55% of its inventory of major land force weapons. Furthermore, the US and Britain had inflicted major losses on the Iranian Navy in the "tanker war" of 1987-1988. Iraq had the only modern, combat effective armored and mechanized forces in the Gulf and an air force that was emerging as combat effective for the first time. It had massive missile forces and chemical warfare capabilities, was beginning to deploy large numbers of biological weapons, and was making substantial progress in developing a nuclear capability.

Iraq has rebuilt and reorganized its forces that survived the Gulf War, but it now has only about half the land and air capability it had when the air campaign began. It has not had any significant imports of arms or military technology since the summer of 1990, and has had no real opportunity to react to many of the lessons of the Gulf War. Most of its missile, chemical, biological, and nuclear capabilities have been dismantled by UNSCOM and the IAEA, and its efforts to develop its military industries have been severely limited by the impact of seven years of UN sanctions. Iraq's regime has not changed and it remains a significant threat to all its neighbors. It is likely to be a revanchist state as long as Saddam Hussein is in power, will seek to rebuild its military power as soon as it can do so.

Iran in contrast, has partially recovered from its defeat in the Iran-Iraq War, and is again a major military power by Gulf standards. It is scarcely a modern military power by the standards of the US. Many of its post-Gulf War imports have done little more than offset the steadily greater obsolescence of its Western-supplied equipment, and it has had only limited imports of modern aircraft and armor. Iran has, however, developed carefully focused military capabilities. The

massive infantry-artillery dominated forces of the Iran-Iraq War are being replaced by forces that focus on specific missions. It has developed a substantial capability to threaten shipping through the Straits of Hormuz and the rest of the Gulf, and has developed a substantial capability for unconventional warfare that it can project into the Gulf and throughout the region. It has steadily its missile, chemical, biological warfare capabilities, and is seeking nuclear weapons.

Unlike Iraq, however, Iran is in the middle of considerable political change. The election of President Khatami in May 1997, has revealed a major splits between Iran's "moderates," "traditionalists," extremists. Iran has given its economy a higher priority than arms and has steadily improved its relations with its Southern Gulf neighbors. There is at least some prospect that the US and Iran can reestablish diplomatic relations over the next few year, although no one can predict the future course of the Iranian revolution and how "moderate" Iran will really become.

In contrast, the Southern Gulf forces have tended to maintain the status quo. For all the rhetoric surrounding the Gulf Cooperation Council, the Southern Gulf states remain as divided as at the start of the Gulf War. Their arms purchases reflect the same lack of effective standardization, interoperability, and focus on key missions. Some countries have made significant improvements in individual aspects of their military capabilities, but Southern Gulf military planning remains dominated by politics and petty rivalry, and far too many arms purchases focus on new technology and the "glitter factor," rather than effective war fighting capability. Far too little real progress per dollar has been made in the effective defense of Kuwait and the Saudi border with Iraq, and in dealing with mine warfare and the Iranian naval threat in the lower Gulf. Far too little emphasis has been placed on training and sustainability and many of the arms purchases made since the Gulf War have done little to improve military effectiveness.

There are four other major changes in the military balance that seem likely to affect the Gulf well into the 21st Century:

- The Gulf states have made little progress since the Gulf War in dealing with their structural economic problems and political divisions. Iraq, whose economy had largely collapsed during the Iran-Iraq War, experienced a full collapse in 1991. Its Sunni, Shi'ite, and Kurdish factions are held together by one of the most repressive regimes since Nazi Germany. Iran's per capita income has fallen to the levels Iran had in the mid-1970s, and it is unclear what Iran's long-term prospects for development will be. The Southern Gulf has talked reform, but has failed to act, and its rapid population growth has cut per capita incomes far below the days of the oil boom. Ethnic, political, and economic problems have already helped lead to extremism and violence in Bahrain and Saudi Arabia. If the Gulf states finally act on their promises of reform, there is no reason to assume their current problems will lead to significant civil unrest and violence. If they do not, internal civil conflict may often be as serious a threat as Iran and Iraq.

- The Gulf War has triggered a race in tactical technology, based in part on lessons drawn from the rapid US dominance of Iraq, and "revolution in military affairs." It is a race, however, that lacks consistency and cohesion. UN sanctions have limited Iraq's ability to purchase new weapons and advanced technology, and Iran has faced major constraints in terms of resources and access to imports of advanced weapons. The Southern Gulf has so far focused on buying individual weapons with a high "glitter factor," without proper regard for training, sustainability, maneuver capability, and joint warfare. It has stressed the national competition for the most prestigious arms over any aspect of interoperability.. Nevertheless, some Gulf forces are beginning to focus on the "revolution in military affairs" and on acquiring mission-oriented packages of advanced technology, rather than on building up force numbers to the degree they emphasized in the past.

- The Gulf War has left a heritage of Southern Gulf dependence on US power projection capabilities. This dependence is reflected in strengthened US prepositioning, improved deployment facilities, and in a series of bilateral and multilateral training and exercise efforts that are far more advanced than those carried out as part of the Gulf Cooperation Council. This dependence, however, creates growing doubts within the Southern Gulf states as to the cost-effectiveness of national defense efforts and arms purchases. It makes the US a natural target for dissidents and extremists, and has the critical weakness that the US has not been able to preposition land equipment in Saudi Arabia -- the most urgent area in terms of Southern Gulf vulnerability.

- The Gulf War and "dual containment" have slowed the missile race and efforts to acquire weapons of mass destruction. Instead, the Gulf seems locked into a process of "creeping proliferation" in which Iraq attempts to preserve the remnants of its pre-war capabilities, carry out new covert programs, and develop a "break out" capability for the time when UN sanctions are limited. Iran, in contrast, is actively pursuing the development and/or deployment of long range missiles. It is deploying chemical weapons and is carrying out covert biological and nuclear weapons programs, but at a slow and steady pace of development, rather than in the grandiose manner that Iraq pursued before the Gulf War. No Southern Gulf state has followed up Saudi Arabia's purchase of obsolete long-range missiles from China, or shown signs of developing weapons of mass destruction. Several countries are, however, beginning to explore theater missile defense and civil defense options. The US increasingly focuses on counterproliferation, and the "creeping proliferation" in the Gulf inevitably interacts with proliferation in the India-Pakistan arms race, the Arab-Israeli arms race, and the search to find a counterbalance to the conventional technology of the US.

The current military balance in the Gulf is summarized in Table One. The forces in this table are the product of a military build-up that is now well over a quarter of a century old. It is an

arms race that owes its origins to the Cold War, Nasserism, the fall of the Hashemite dynasty in Iraq, the Arab-Israeli War, British withdrawal from the Gulf, the Iran-Iraq War, and the Gulf War, and a host of minor regional quarrels.

It is also an arms race that shows no signs of ending. It is far from clear that the Gulf is headed for war, but it certainly does not face the end of history. At present, US strength and Iranian and Iraqi weakness ensure a relatively stable balance of deterrence in the Gulf that offsets the lack of effective military cooperation between the Gulf states. If the Gulf War did not bring the end of history, it remains a much less threatening place than it did during the worst days of the Iran-Iraq War or at the time the fighting began in 1991.

At the same time, this is no guarantee for the future. New arms purchases ensure a steady flow of new arms and technology. Iran and Iraq retain major warfighting capabilities, and the problem of proliferation not only can reshape the military balance but introduce whole new forms of terrorism. The Southern Gulf states have done little to create effective deterrent and defense capabilities and have pursued their national “glitter factor” over regional cooperation, or if the US and its allies should weaken their presence and power projection capabilities. “Creeping” or not, the problem of proliferation has already arrived.

Table One

Gulf Military Forces in 1997 - Part One

	Iran	Iraq	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia*	UAE	Yemen
Manpower									
Total Active	545,600	429,000	11,000	15,300	43,500	11,800	161,500	64,500	66,300
Regular	420,600	429,000	11,000	15,300	37,000	11,800	105,500	64,500	66,300
National Guard & Other	125,000	0	0	0	6,500	0	57,000	0	0
Reserve	350,000	650,000	0	23,700	0	0	20,000	0	40,000
Paramilitary	40,000	55,400	9,850	5,000	4,400	0	15,500	2,700	70,000
Army and Guard									
Manpower	450,000*	375,000	8,500	11,000	31,500	8,500	127,000	59,000	61,000
Regular Army Manpower	350,000	375,000	8,500	11,000	25,000	8,500	70,000	59,000	61,000
Reserve	350,000	450,000	0	0	0	0	20,000	0	40,000
Active Main Battle Tanks	1,390	1,900	106	249	117	34	710	231	1,030
Total Main Battle Tanks***	1,410	2,700	106	341	141	34	1,055	231	1,320
Active AIFV/Recce, Lt. Tanks	555	1,600	71	355	46	84	1,655	558-578	650
Active APCs	550	1,800	340	100	96	172	2,580	570	540
Total APCs	550	2,200	340	140	96	172	3,380	570	540
ATGM Launchers	420+	480+	15	118	68	124+	480+	275	71
Self Propelled Artillery	290	150	13	41 (59)	18	28	200	175	30
Towed Artillery	2,170	1,800	36	0	91	12	260-338	46	452
MRLs	764+	150	9	27	0	4	60	42-66	220
Mortars	6,500	2,000+	18	50+	89	39	510+	135	600
SSM Launchers	46	36?	0	0	0	0	10	6	30
Light SAM Launchers	700	1,100	70+	48?	62	58	650	100	700
AA Guns	1,700	5,500	24	0	16	12	10	72	362
Air Force Manpower	28,000	35,000	1,500	2,500	4,100	1,500	18,000	4,000	3,500
Air Defense Manpower	18,000	17,000	0	0	0	0	4,000	0	0
Total Combat Aircraft	307	353	24	76	40	18	432	99	49-89
Bombers	0	6?	0	0	0	0	0	0	0
Fighter/Attack	150	130	12	40	12	18	160	43	27
Fighter/Interceptor	114	180	12	8	0	0	191	22	16
Recce/FGA Recce	8	8	0	0	12	0	10	8	0
AEW C4I/BM	0	0	0	0	0	0	5	0	
MR/MPA**	5	0	0	0	0	0	0	0	0
OCU/COIN/CCT	0	18	0	28	16	0	21	26	0
Other Combat Trainers	25	155	0	0	0	0	50	0	6
Transport Aircraft****	74	34	3	4	21	6	72	22	16
Tanker Aircraft	5	2	0	0	0	0	15	0	0
Total Helicopters	602	500	33	28	31	24	157	97	25
Armed Helicopters****	100	120	24	16	0	18	12	49	8
Other Helicopters****	502	380	7	12	31	6	145	47	17
Major SAM Launchers	204	340	8	40	0	0	128	36	87
Light SAM Launchers	45	200	0	12	28	9	181	31	200
AA Guns	-	-	-	60	-	-	270-420)	-	-

Table One

Gulf Military Forces in 1997 - Part Two

	Iran	Iraq	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia*	UAE	Yemen
Total Naval Manpower	20,600*	2,000	1,000	1,800	4,200	1,800	13,500	1,500	1,800
Major Surface Combatants									
Missile	3	0	3	0	2	0	8	4	0
Other	2	1-2	0	0	0	0	0	0	0
Patrol Craft									
Missile	21	1	4	6	4	3	9	8	7
(Revolutionary Guards)	5	-	-	-	-	-	-	-	-
Other	42	5	6	5	7	4	21	9	8
Revolutionary Guards (Boats)	40	-	-	-	-	-	-	-	-
Submarines	3	0	0	0	0	0	0	0	0
Mine Vessels	7	4	0	0	0	0	6	0	6
Amphibious Ships	9	0	1	0	2	0	0	0	3
Landing Craft	17	-	4	2	4	1	8	5	-
Support Ships	25	3	5	4	5	-	7	3	-
Marines	(5,000)	0	0	0	0	0	(3,000)	0	0
Naval Guards	18,000	0	0	0	0	0	0	0	0
Naval Air	2,000	-	-	-	-	-	-	-	-
Naval Aircraft									
Fixed Wing Combat	0	0	0	0	0	0	0	0	0
MR/MPA	8	0	0	0	(7)	0	0	0	0
Armed Helicopters	9	(6)	0	0	0	0	21	(5)	0
SAR Helicopters		0	0	0	0	0	4	(6)	0
Mine Warfare Helicopters	2	0	0	0	0	0	0	0	0
Other Helicopters	-	-	2	-	-	-	6	-	-

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.

** 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); various data available from Jane's, Military Technology, World Defense Almanac; and Jaffee Center for Strategic Studies, The Military Balance in the Middle East (JCSS, Tel Aviv)

The Impact of Arms Transfers Since the Gulf War

The flow of arms to the Gulf has scarcely ended. However, the end of the Iran-Iraq War, the Gulf War, UN sanctions against Iraq, and "dual containment" have had a major impact on the nature of military expenditures and arms imports. Iraq has lost the ability to recapitalize its military forces, much less modernize them effectively. Iran is spending far less on both its total military forces and arms than during the Iran-Iraq War. Contrary to conventional wisdom, Southern Gulf military expenditures and arms transfers have also dropped significantly. At the same time, the Gulf tendency to buy a "dog's breakfast" of different arms from different sources has not changed at all.

Military Expenditures and Arms Transfers in Constant Dollars

Table Two summarizes the recent trends in the regional military efforts, showing both the value of military expenditures and arms imports in constant 1994 dollars. While declassified US intelligence data are only available through 1994, an examination of other sources indicates that the trends shown in this table are still valid.

The data in Table Two indicate that:

- Iranian military expenditures have dropped to about one-third of their Iran-Iraq War level, as measured in constant dollars. Iranian arms imports have dropped to about one-fifth to one-fourth of their Iran-Iran War level.

- Iraqi military expenditures have dropped to about one-tenth of their Iran-Iraq War level, as measured in constant dollars. Iraqi has had no major arms imports since 1990.

- Southern Gulf military expenditures are now at somewhat lower levels than their average before the Gulf War. Southern Gulf arms imports now average about half of their pre-Gulf War level in constant dollars. These purchases are now driven largely by the purchases of Kuwait, Saudi Arabia, and the UAE.

New Arms Agreements and Arms Deliveries

Table Three summarizes the recent trends in new arms purchases and in actual deliveries before and after the Gulf War. These estimates are made in current dollars, but it is again clear that new agreements in the Northern Gulf have fallen precipitously since the Gulf War, and that new agreements in the Southern Gulf are reaching average levels far lower than those made during a similar period before the Gulf War.

The data on deliveries show that the momentum of Iran's orders during the Iran-Iraq War, and during the immediate crisis following its defeat in 1988, have led to sustained deliveries at higher rates than new orders. At the same time, the extraordinary volume of deliveries to Iraq before the Gulf War -- some $16.6 billion worth of deliveries during 1987-1990 -- helps explain why it has been able to sustain its reduced military force posture in spite of a cut off of arms imports since 1990.

The data for the Southern Gulf reflect the fact that Saudi Arabia is the region's largest arms buyer. At the same time, they reflect the fact that Saudi Arabia's economic and budget deficit problems led to significant cuts in the rate of new arms orders in spite of the Gulf War. Saudi new arms agreements dropped from $45.7 billion during 1987-1990 to $30.2 billion in 1991-1994, and $14.1 billion in 1994-1997. Once again, the scale of these cuts in Saudi new orders has often been disguised in media reporting by the momentum of deliveries from past orders. Saudi arms deliveries totaled $26.3 billion during 1987-1990 and 27.9 billion in 1991-1994, and then leaped to $36.4 billion in 1994-1997 as deliveries caught up with the backlog of past orders. Similar trends affected Kuwait, which ordered $5.0 billion worth of arms during 1990-1993, and only $2.3 billion during 1994-1997, but which saw its deliveries rise from $2.4 billion in 1990-1993 to $4.5 billion in 1994-1997. Bahrain and Qatar also followed in Kuwait's pattern, although the UAE has emerged a major sustained buyer. It ordered $5.3 billion worth of arms during 1990-1993, and $5.1 billion during 1994-1997. Most of these arms are still to be

delivered; the UAE took delivery on $2.6 billion worth of arms in 1990-1993 and $2,4 billion in 1994-1997 .

The “Dog’s Breakfast” in the Southern Gulf.

It is impossible to discuss all of the qualitative problems accompanying the arms purchases currently being made in the Gulf. It is all too clear, however, far too many Southern Gulf countries buy arms without a consistent strategy, proper regard for coalition warfare, or meaningful mission priorities. A review of the land force buys since 1991 reveals far too many types of different weapons from different countries both between Southern Gulf states, and often within their force structures. If one looks through both the naval order of battle in the Gulf, and the performance characteristics of the ships purchased since 1991, many naval purchases seem to reflect a contest as to which country can buy the most complex frigate or corvette.

The problems in air orders of battle and land-based air defenses are less obvious, but there are far too many types of aircraft and short-ranged air defense systems that are not integrated into a common and fully computerized southern-Gulf wide system or concept of air operations. Only Saudi Arabia has fully integrated airborne sensor and battle management systems into its concept of air operations. Purchases for offensive air operations reflect a lack of meaningful reconnaissance and targeting capabilities, a failure to integrate battle damage assessment into the loop, and a lack of integrated concepts of joint warfare.

This is not to say that individual countries have not made major progress in some areas, but the fact remains that the Southern Gulf is one of the major threats to the Southern Gulf. This is summarized in crude terms in Table Four, which shows the source of recent arms purchases by Gulf country. This table sharply understates the problem because it does not break out individual national suppliers in detail, show what is being purchased, or count purchases of less than $50 million. Nevertheless, one does not have to be a military expert to realize that buying radically different mixes of equipment from a wide range of different suppliers presents major problems in terms of interoperability and standardization.

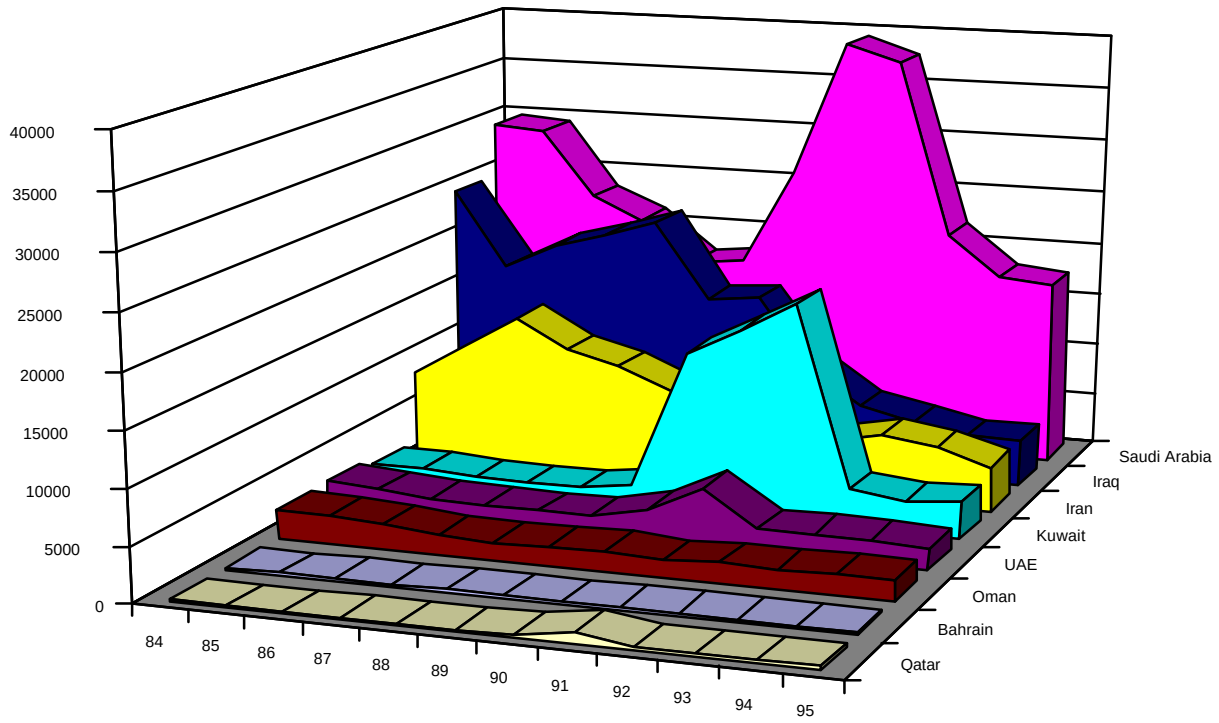
It is not coincidental that the last two USCENTCOM annual seminars dealing with security assistance have focused on the need to provide for adequate training, infrastructure, and sustainability, and have stressed the fact that Southern Gulf states are buying too many major weapons too quickly. The issue is not "buy American," since Europe and Russia are perfectly capable of supplying excellent systems, many of which are better suited to Gulf needs than US systems designed for long range and global deployment. The Southern Gulf should not to cease modernization or seeking an edge over Iran and Iraq. It should buy wisely and at the proper rate.

Unfortunately, the cuts in oil export revenues and growing budget deficits make this even more unlikely than in the past, and there is no unifying threat serious enough to catalyze collective action. Furthermore, each Gulf state still has a large backlog on undelivered arms orders which were placed with limited regard to mission priorities, interoperability, and collective defense. This backlog ensures that many problems will get worse over the next few years and not better.

Table Two

Gulf Country Military Expenditures - 1984-1995

(Constant $1995 Millions)



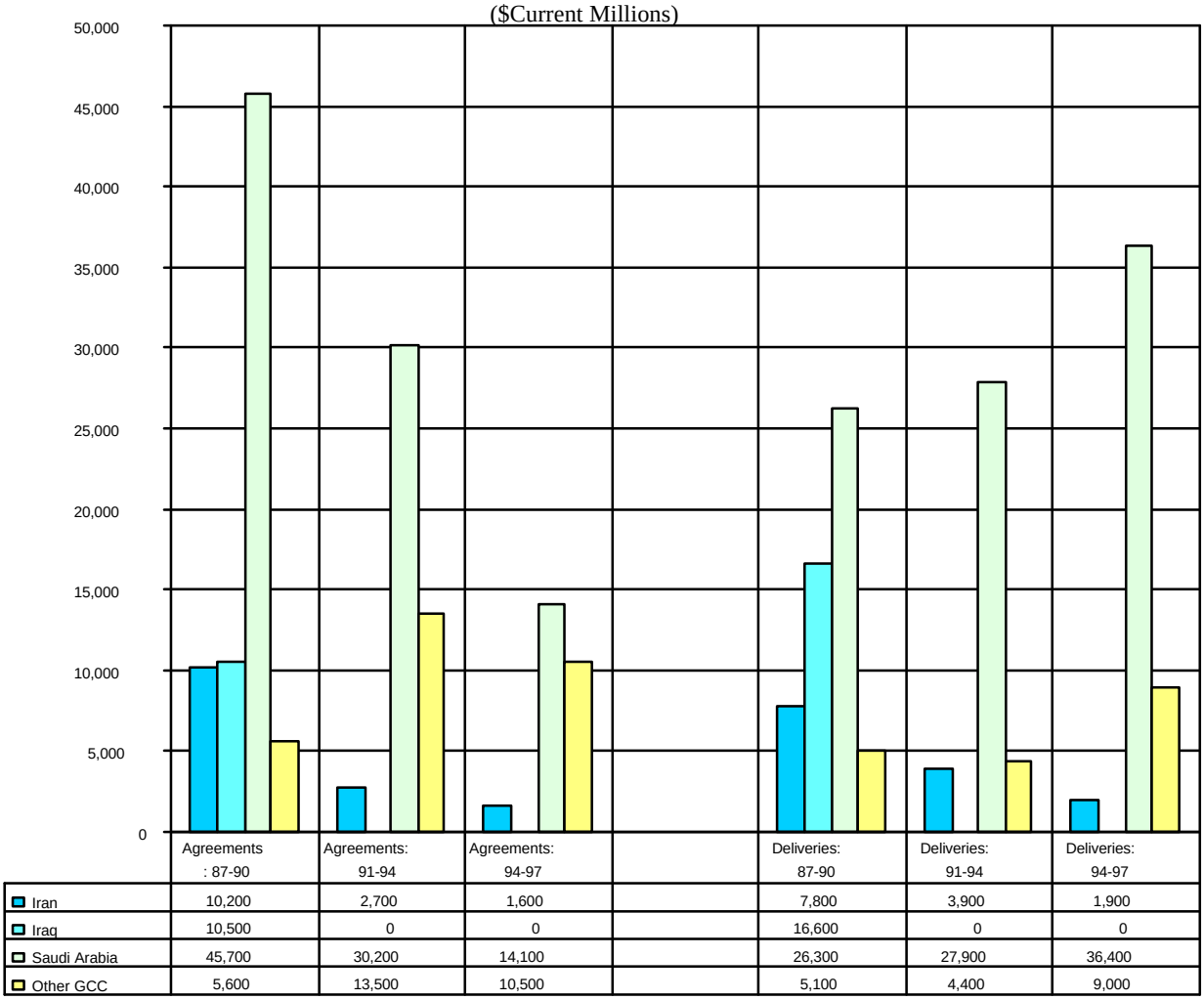
	84	85	86	87	88	89	90	91	92	93	94	95
Qatar	100	107	110	145	119	111	209	1032	284	346	310	330
Bahrain	220	206	214	208	234	235	248	262	271	263	263	273
Oman	2771	2655	2310	1965	1685	1859	1961	1602	1901	1773	1864	1735
UAE	2915	2606	2109	2055	1982	1902	2977	5415	2256	2228	2178	1880
Kuwait	2088	2057	1708	1609	1565	2316	15130	17620	20430	3759	3146	3488
Iran	8686	11680	14840	12190	10860	8893	9307	8654	5410	6333	5586	4191
Iraq	24560	17430	19850	21290	22890	15740	16210	9698	6430	5280	4380	4380
Saudi Arabia	29530	29240	23080	20980	16980	17600	26620	39240	37650	21470	17630	17210

Source: Adapted by Anthony H. Cordesman from US Arms Control and Disarmament Agency, World Military Expenditures and Arms Transfers, , GPO, Washington, various editions.

Table Three

Gulf Arms Agreements and Deliveries: 1987-1997

($Current Millions)



	Agreements: 87-90	Agreements: 91-94	Agreements: 94-97		Deliveries: 87-90	Deliveries: 91-94	Deliveries: 94-97
Iran	10,200	2,700	1,600		7,800	3,900	1,900
Iraq	10,500	0	0		16,600	0	0
Saudi Arabia	45,700	30,200	14,100		26,300	27,900	36,400
Other GCC	5,600	13,500	10,500		5,100	4,400	9,000

Iran	10,200	2,700	1,600	7,800	3,900	1,900
Iraq	10,500	0	0	16,600	0	0
Northern Gulf	20,700	2,700	1,600	24,400	3,900	1,900
Total GCC	51,300	43,700	24,600	31,400	32,300	45,400
Bahrain	600	200	300	800	300	200
Kuwait	3,500	5,700	2,300	1,300	2,500	4,500
Oman	400	600	600	200	300	1,200
Qatar	100	2,000	2,200	300	0	700
Saudi Arabia	45,700	30,200	14,100	26,300	27,900	36,400
UAE	1,000	5,000	5,100	2,500	1,300	2,400
(GCC less Saudi)	5,600	13,500	10,500	5,100	4,400	9,000
Yemen	300	1,200	700	2,800	300	500

0 = less than $50 million or nil, and all data rounded to the nearest $100 million.

Source: Richard F. Grimmett, Conventional Arms Transfers to the Developing Nations, Congressional Research Service, various editions.

Table Four

The Dog's Breakfast in the Gulf: Too Many Suppliers Changing Constantly Over Time

(New arms agreements in current US $millions)

Buyer Country	Supplier Country						
	US	Russia	China	Major West European	Other European	All Others	Total
Iran							
1987-90	0	3,500	2,300	200	1,200	1,600	8,800
1991-94	0	200	200	100	100	600	1,200
1994-97	0	200	900	100	100	300	1,600
Iraq							
1987-90	0	300	700	500	500	1,000	3,000
1991-94	0	0	0	0	0	0	0
1994-97	0	0	0	0	0	0	0
Bahrain							
1987-90	300	0	0	0	0	0	300
1991-94	200	0	0	0	0	0	200
1994-97	300	0	0	0	0	0	300
Kuwait							
1987-90	2,500	200	0	200	200	200	3,300
1991-94	3,500	800	0	1,800	0	100	6,200
1994-97	500	800	200	700	0	100	2,300
Oman							
1987-90	100	0	0	600	0	0	700
1991-94	0	0	0	500	0	100	600
1994-97	0	0	0	400	100	100	600
Qatar							
1987-90	0	0	0	0	0	0	0
1991-94	0	0	0	2,000	0	0	2,000
1994-97	0	0	0	2,200	0	0	2,200
Saudi Arabia							
1987-90	18,800	200	300	23,000	2,300	200	44,800
1991-94	15,600	0	0	6,600	100	0	22,300
1994-97	4,200	0	0	7,000	1,100	1,800	14,100
UAE							
1987-90	300	0	0	300	0	400	1,000
1991-94	300	500	0	3,900	100	0	4,800
1994-97	300	400	0	3,700	500	200	5,100

0 = less than $50 million or nil, and all data rounded to the nearest $100 million.

Source: Richard F. Grimmett, Conventional Arms Transfers to the Developing Nations, Congressional Research Service, various editions.

"Focused Poverty" in the Northern Gulf.

For all the criticism of UN sanctions and "dual containment," it is clear from Tables Two to Four that they have not been without their benefits. Iraq has had virtually no arms imports since 1990. Even before the Gulf War, it would have taken about $1.5 billion a year of imports to sustain Iraq's military machine. Iraq's massive equipment losses during the Gulf War have reduced its need for imports to sustain existing systems, but have created a massive new set of requirements to rebuild Iraq's forces and act on the lessons of the Gulf War.

While it is impossible to make reliable estimates, it is difficult to see how Iraq could recapitalize and modernize its forces for less than $35 to $50 billion dollars, and even if all sanctions stopped today, it would take at least half a decade for Iraq to buy and receive deliveries on such orders. In the interim, Iraq has no choice other than to smuggle what it can, seek to transform its military industries from centers of vainglorious rhetoric to centers of actual production, and obtain what it can.

Iran, on the other hand, has encountered fewer constrains. The US and its allies have blocked many transfers of advanced arms to Iran, particularly from Europe and the FSU. Iran's revolutionary economy is also still more "revolting" than "pragmatic," and Iran's mismanagement of its budget, development, and foreign debt have interacted synergistically with containment.

According to declassified US intelligence estimates, Iran signed new agreements worth $10.2 billion during the four year period between 1987-1990 -- the time between the final years of the Iran-Iraq War and the Gulf War. Iran's new arms agreements again dropped sharply during the four year period following the Gulf War, and totaled only $4.8 billion during 1991-1994. Despite some reports of a massive Iranian military build-ups -- new agreements during 1991-1994 totaled only a quarter of the value of the agreements that Iran had signed during the previous four years.

Iran signed only $1.6 billion worth of new arms agreements during 1994-1997 -- a period heavily influenced by an economic crisis inside Iran, low oil revenues, and problems in repaying foreign debt. Iran ordered $200 million from Russia, $900 million from China, $100 million with other European states (mostly Eastern Europe), and $300 million from other countries (mostly North Korea). The drop in agreements with Russia reflected both Iran's financial problems and the result of US pressure that had led President Yeltsin not to make major new arms sales to Iran. Iran's new agreements with China and North Korea heavily emphasized missiles and missile production technology. Similar trends took place in deliveries. Iran took delivery on $7.8 billion worth of arms in 1987-1990, $$3.0 billion in 1990-1993, and $1.9 billion in 1994-1997.

It is Iran's focus on weapons of mass destruction and systems that can threaten tanker traffic and the Southern Gulf that makes Iran dangerous in spite of its relatively low level of arms imports and the obsolescence or low quality of much of its order of battle. These orders are shown in Table Five, and they make an impressive list. Iran has bought enough arms to rebuild its army to the point where it can defend effectively against a weakened Iraq. It has begun to rebuild its air force and land-based air defenses, and can put up a far more effective defense than in 1988. It has restructured its regular forces and the Iranian Revolutionary Guards Corps to improve the defense of its Southern Gulf coast and create a far more effective ability to attack naval forces, tanker traffic, offshore facilities, and targets along the Southern Gulf coast.

Table Five

Key Iranian Equipment Developments - Part One

LAND

- Russian, and Polish T-72 Exports. Reports indicate Iran has procured about 120 T-72Ss from Russia, and 100 T-72M1s from Poland since 1990. Inventory of about 220 T-72s of various types in mid-1996.
- Claims to be producing the Iranian-made Zolfaqar MBT, an M-48/M-60-like tank.
- Has upgraded to T-54/T-54 called "Safir-74. Claims to have upgraded Iraqi T-54s captured in Iran-Iraq War.
- Purchased Russian BMPs. Inventory of 300 BMP-1s and 100 BMP-2s in mid-1996.
- Russia may be licensing Iranian production of T-72 and BMP-2.
- Domestic production of a Chinese version of the BMP called the Boragh.
- 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.
- Testing prototype of 122 mm self-propelled gun called Thunder.
- Has shown a modified heavy equipment transporter called the "Babr 400."
- Russian and Asian AT-2s, AT-3s, and AT-4s. Does not seems to include 100 Chinese Red Arrows.
- Chinese and 15+ 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

AIR/AIR DEFENSE

- Keeping up to 115 combat aircraft that Iraq sent to Iran during Gulf War. Seem to include 24 Su-4s and four MiG-29s.
- Has 30 MiG-29s with refueling in inventory, may be receiving 15-20 more from Russia
- Has 30 Su-24s in inventory (probably Su-24D version), may be receiving 6 to 9 more from Russia
- May be negotiating purchase of AS-10, AS-11, AS-12, AS-14/16s from Russia
- Has Su-25s (formerly Iraqi), although has not deployed.
- 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 25 Chinese F-7M fighters with PL-2, PL2A, and PL-7 AAMs.
- Has purchased 25 Brazilian Tucano trainers and 25 Pakistani MiG-17 trainers. Uncertain report has bought 12 MiG-29UB trainers from Russia.
- Has bought 12 Italian AB-212, 20 German BK-117A-3, and 12 Russian Mi-17 support and utility helicopters.
- 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.

Table Five
Key Iranian Equipment Developments - Part Two

LAND-BASED AIR DEFENSE

- May be negotiating purchase of SA-10, SA-12, SA-14/16s from Russia
- Reports has acquired four HQ-23/2B (CSA-1) launchers and 45-48 missiles, plus 25 SA-6, and 10-15 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 6 multi-purpose destroyers.
- Has taken delivery on three Russian Type 877EKM Kilo-class submarines, possibly with 1,000 modern magnetic, acoustic, and pressure sensitive mines.
- Reports has North Korean midget submarines have never been confirmed
- Has obtained 10 Hudong-class Chinese missile patrol boats.
- US Mark 65 and Russian AND 500, AMAG-1, KRAB anti-ship mines
- Reports 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

MISSILES

- Obtained up to 250-300 Scud Bs with 8-15 launchers
- Up to 150 Chinese CSS-8 surface-to-surface missiles with 25-30 launchers.
- Reports that China is giving Iran technology to produce long-range solid fuel missile
- Iran-130 missile (?)
- 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 may be planning to purchase North Korean No-Dong 1/2s
- Iran also 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.

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, Military Balance, various editions.

Conventional Threats from Iran and Iraq

There is no way to summarize the threats Iran and Iraq can pose in the Gulf without resorting to military short hand, and without talking about capabilities, rather than intentions. There is no way to predict the future behavior of either regime, or to discuss the nuances of its present and near-term military capabilities. It is also important to reiterate the fact that a combination of US, British, and Southern Gulf military forces is presently capable of defeating virtually any conventional war fighting threat from either state if it acts with sufficient speed, unity, and determination.

The only near term developments that could alter this balance would be (a) a major cutback in US power projection capability or Southern Gulf support, (b) the institutionalization of a significant low level internal conflict in a Southern Gulf state that Iran or Iraq could exploit and which would confront the US with the fact that it cannot save a Gulf government from its own people, or (c) the sudden transfer of a nuclear weapon or sufficient fissile material for a "break out" in building a bomb -- a development that could radically change US and Southern Gulf perceptions of the risk in taking military action

The Threat from Iran

It is easy to talk about Iran as seeking to be a hegemon or trying to dominate the Gulf, but it is unclear what this really means. Iran has a regime that is hostile to the West and its neighbors in many ways, but this hostility does not translate into a predictable willingness to start a conflict. Iran's revolutionary rhetoric is mixed with statements describing its good intentions, and threats are mixed with defensiveness. Iran faces powerful limits to its ability to import arms, develop its weapons of mass destruction, and create effective military forces. It has to deal with the fact that every hostile or threatening act it takes is likely to provoke a reaction from the US, Southern Gulf states, and Iraq.

Focusing on major Iranian military build-ups, and Iran's capability to fight a large regional war, does little to explain the complex trends in Iran's military forces. In fact, such efforts are likely to do more to disguise the range of issues and possibilities that need to be analyzed than provide a meaningful way of summarizing Iran's military capabilities. At the same time, Iran's military future is not an exercise in "chaos theory." The previous analysis has shown that many broad trends in its military behavior and capabilities are highly predictable, at least in the near term. While it is impossible to dismiss a long list of "wild card" events and changes, it is possible to summarize the most probable trends in Iran's military future by looking at a range of the most likely contingencies and Iran's present and future capabilities in each such contingency.

Confrontation in the Gulf

Iran cannot win a naval-air battle against US forces in the Gulf, and has no prospect of doing so in the foreseeable future. It would have to rebuild and modernize both its regular navy and air force at levels of strength and capability it simply cannot hope to achieve in the next decade. Alternatively, it would need to develop its capabilities to deliver weapons of mass destruction to the point where it could back its conventional military capabilities with a threat that might seriously inhibit US military action and/or the willingness of Southern Gulf states to support the US and provide air and naval facilities.

The "wild cards" in such contingencies are the US determination to act, the size of the US presence in the Gulf and US power projection capabilities at the time of a given crisis, Southern Gulf support for the US and willingness to provide the US with suitable facilities, and the political liabilities the US would face -- if any -- in terms of the response from nations outside the region. Far more is involved in a confrontation in the Gulf than military capability, and Iran would have far more contingency capability if the US could not respond for political or budgetary reasons.

Confrontation or Conflict with Iraq

Iran has a rough overall military parity with Iraq, although it could not sustain a massive land offensive against Iraq's military forces. Iran has long had the naval and air capabilities to defeat Iraq's negligible naval strength and deny Iraq naval and commercial access to the Gulf. Iran is slowly increasing the capabilities of its land and air forces relative to those of Iraq, and its ability to use chemical warfare in another Iran-Iraq conflict. Iran is now a much stronger defensive power than in 1988, both because of Iran's force improvements and because of Iraq's defeat and the sanctions that have followed.

Iran and Iraq also steadily improved their relations during 1997 and 1998, exchanging prisoners of war, establishing trade relations, and opening their borders. Large numbers of Iranian religious pilgrims entered Iran for the first time in nearly two decades in 1998. This improvement in relations is a matter of expediency, rather then friendship, but it has eased the risk of accidental conflicts and has eased military tensions between the two countries.

The "wild cards" in any contingencies involving a conflict between Iran and Iraq are the possibility of internal unrest and divisions in Iraq that are serious enough to split the Iraqi armed forces, and/or lead to a new Shi'ite uprising. Similarly, a major Kurdish uprising would greatly complicate Iraq's ability to concentrate its forces to defend against an Iranian attack on Iraq's center and south. At the same time, any Iranian victory over Iraq might prove to be more apparent than real. It is far from clear that the US or Southern Gulf states would tolerate an Iranian victory that did more than depose the present Iraqi regime. Further, the split between Persian, Arab, and Kurd seems likely to remain so great that Iraqi independence would rapidly reassert itself if Iran attempted to occupy or dominate a substantial part of Iraq.

Adventures in the Southern Gulf

Iran has steadily improved its relations with its Southern Gulf neighbors, particularly Saudi Arabia, since the election of President Khatami. It seems to be pursuing a more moderate political

course towards all the Southern Gulf states. Furthermore, there is little present prospect that Iran will develop enough power projection capability -- and supporting power from its navy, air force, and weapons of mass destruction -- to win any conflict in the Southern Gulf, or to force its way in support of a coup or uprising. This contingency is also the one most likely to unite the US and the Southern Gulf states and to ensure European and other support for a strong US-Southern Gulf response.

At the same time, there are "wild cards" affecting Iranian military involvement in the Southern Gulf:

- Iran might seek to exploit the fracture lines and political unrest within and between the Southern Gulf states. This is particularly true of the Shi'ite in Bahrain and Saudi Arabia, but it might also prove true of future confrontations between Bahrain and Qatar and Saudi Arabia and Yemen.

- The US would face serious problems in responding to any change of government in a Southern Gulf state that resulted in a pro-Iranian regime and which sought Iranian military advice or an Iranian military presence. The US cannot save a Gulf regime from its own people or (openly) endorse such action by other Southern Gulf countries.

- Iran's process of creeping proliferation is making enough progress so that the US and the Southern Gulf states must reach some degree of agreement on taking suitable counter-proliferation measures. A power vacuum in which Iran proliferates, the Southern Gulf states grow steadily more vulnerable, and US resolve seems progressively more questionable could give Iran far more capability to directly or indirectly intervene in Southern Gulf affairs.

Proxy Wars Against Israel and Other States

Iran has already demonstrated that it is steadily improving its ability to conduct "proxy wars" by training, arming, and funding movements like the Hezbollah. The IRGC and the Quds Force are likely to continue to exploit such methods as long as they are directed to do so by the Iranian regime, and there is little that can be done to force Iran to stop.

At the same time, Iran's confrontation with Afghanistan pits a Shi'ite religious regime against a much more extreme Taliban regime in Afghanistan. Iran has increasingly supplied arms and aid to the opposition to the Taliban, and deployed several hundred thousand troops for exercises on the Afghan border in the fall of 1998 – after the Taliban massacre of Iranian diplomats and advisors aiding Shi'ite forces in Western Afghanistan. A major conflict between Iran and Afghanistan, or even levels of tension that forced Iran to establish a "second front" of major troop deployments along its border with Afghanistan would limit its ability to threaten the Gulf or Iraq.

Unconventional Offensive Conflicts

Iran has steadily improving capabilities for unconventional warfare, including the potential use of chemical and biological weapons. The practical problem that Iran faces is finding a place and contingency where it can exploit such capabilities. The key "wild cards" affecting this set of contingencies are Iran's willingness to take the risk of using such forces and alienating other states, the uncertain value of such adventures to Iran, and the willingness of other states and non-Persian movements to accept such Iranian support and the probable political price tag.

The Defense of Iran

The previous contingencies assume that Iran will take offensive action. If it does, it may well be confronted with a US-led attack on Iran. If this attack is confined to naval and coastal targets, particularly those Iranian military capabilities that potentially threaten Gulf shipping, there is little Iran can do other than try to ride out the attack by dispersing and hiding its smaller boats, anti-ship missiles, etc.

If a US-led attack includes strategic conventional missile strikes and bombings, there is little Iran can do in immediate response other than escalate by using weapons of mass destruction in ways that are more likely to end in increasing the risk and damage to Iran than deter or damage US forces. Iran can, however, respond over time with terrorism, unconventional warfare, and proxy wars. It is much easier for air and missile power to inflict major damage on Iran than it is to predict or control the political and military aftermath. The resulting casualties and damage will be extremely difficult to translate into an “end game.”

Attacks on the Iranian mainland that went beyond a punitive raid would be much more costly. A US-led coalition could defeat Iran’s regular forces, but would have to be at least corps level in size, and occupying Iran would be impractical without massive land forces of several entire corps. Even limited amphibious and land attacks on the mainland would expose the invading forces to a much higher risk of low intensity and guerrilla combat with Iranian forces that constantly received reinforcement and resupply. Further, Iran’s use of terrorism and weapons of mass destruction would be politically easier to justify in a defensive conflict than an offensive one. Such attacks would probably end in futility, and in creating a revanchist Iran.

Exploiting "Wars of Intimidation"

The previous contingencies assume that Iran's strength will be determined largely by the warfighting capabilities of its military forces. Iran may, however, be able to achieve some of its objectives though intimidation and direct and indirect threats. Iran's ability to provide such threats will improve steadily in the near to mid-term, in spite of its military weakness. In many cases, its neighbors may be willing to accommodate Iran to some degree. This is particularly true of those states whose gas and oil resources are most exposed -- like Qatar -- or which see Iraq as a more serious threat -- like Kuwait.

Iraq's Military Future

It is unrealistic to hope for "moderation" in Saddam Hussein's regime, or to expect that a new leader will bring a complete end to Iraq's challenge to its neighbors and the West, or its efforts to proliferate. The Gulf War did not change Saddam's fundamental behavior and neither has the "war of inspections." Saddam's most probable near-term successors are likely to be products of the Ba'ath, Saddam's coterie and/or the military rather than true moderates. They are also likely to be minority Sunnis from some mix of clans and tribes rather than a true national government. While no one can rule out the possibility of an Iraqi Ataturk or Sadat, such leadership is more likely to change Iraq's image, and moderate the more controversial aspects of its behavior, rather than change its fundamental strategic perspective.

Iraq's mid to long-term prospects are more favorable. It is unlikely that any sequence of ruling elites will continue to ignore Iraq's pressing demographic and economic problems to the extent that Saddam has, or that any successor can provide the same mix of political skills and reckless ambition. However, it is unclear when a true national leadership will come to power that can bridge Iraq's deep divisions by religion, ethnic group, tribe, and clan. Iraq is likely to have authoritarian minority leaders for some time to come, and Iraq's geography alone makes it likely that its rulers will believe they must compete with Iran, Saudi Arabia, and the US for regional

influence and power. Iraq is not proliferating simply because its current regime is radical and extreme, it is proliferating because it has good and enduring strategic reasons to do so.

The West and other Gulf states need to accept this reality. They need to understand the fact that they have a vital interest in maintaining export controls on weapons and dual-use items, and the efforts of UNSCOM and the IAEA, just as long as such controls and efforts can be maintained. They need to understand that arms control negotiations with Iraq will be an extension of the "war of inspections" by other means, and that only strong military forces and counter-proliferation efforts can deter and defend against Iraq's break out capabilities and a post-sanctions expansion of its proliferation effort. The world has to learn to live with the true nature of Iraq's "strategic culture" and its unpredictability and opportunism.

Iraq's Near Term Capabilities

At the same time, some of Iraq's near term contingency capabilities are predictable. While it is impossible to dismiss a long list of "wild card" events and changes, it is possible to summarize the most probable trends in Iraq's military future by looking at a range of the most likely contingencies and Iraq's present and future capabilities in each such contingency.

Attacks on Kuwait

Iraq's land forces still retain significant warfighting capabilities and much of the force structure that made Iraq the dominant military power in the Gulf after its victory over Iran. Iraqi forces can still seize Kuwait in a matter of days or occupy part of Saudi Arabia's Eastern Province, *if* they do not face immediate opposition from US, Kuwaiti, and Saudi forces. USCENTCOM and US experts indicate that Iraq could assemble and deploy five heavy divisions south into Kuwait in a matter of days. Iraqi divisions now have an authorized strength of about 10,000 men, and about half of the Iraqi army's 23 divisions had manning levels of around 8,000 men and "a fair state of readiness." Republican Guards divisions had an average of around 8,000 to 10,000 men. Brigades averaged around 2,500 men -- the size of a large US battalion.

Even today, Iraq has five Republican Guards divisions within 140 kilometers of the Kuwaiti and Saudi border. It can rapidly deploy two to five divisions against Kuwait from the area around Basra. A recent background briefing by USCENTCOM indicates that Kuwait could only rapidly deploy a few combat strength battalions to defend its territory, and Saudi Arabia would take days to deploy even one heavy brigade into areas north of Kuwait City. The tyranny of geography, Kuwait's small size, and Saudi Arabia's widely dispersed army give Iraq a natural advantage in any sudden or surprise attack.

The failure of Kuwait and Saudi Arabia to develop any meaningful cooperative defense plans compounds the problem, as does Saudi Arabia's miserable performance in modernizing its land forces. While Saudi Arabia and Kuwait have developed relatively effective air forces at the squadron level, they cannot fight as integrated air forces without massive US assistance and would still face major problems in coalition warfare.

The land balance is dismal. Kuwait, dreamed of a 12 brigade force after the Gulf War, but it only has two understrength active brigades and two reserve brigades. Its land forces total only 11,000 personnel, and this total includes 1,600 foreign contract personnel, most of whom are non-combatants. The total manpower of the Kuwaiti armed forces, including the air force and navy, total about one US brigade "slice" (combat manpower plus support). The Kuwaiti army has an active tank strength of only about 75 M-84s (Yugoslav T-72s) and 174 M-1A2s. It is experiencing major problems in converting to the M-1A2, and has been forced to store 75 of its M-84s plus another 17 Chieftains.

Saudi Arabia is choking on massive deliveries of arms, and its army has reverted to a static defensive force which has limited effectiveness above the company and battalion level. Although it claims to have 70,000 full time regulars in the army, plus 57,000 active members of the National Guard, actual manning levels are significantly lower. About 200 of its M-1A2 tanks are in storage, plus about 145 of its 295 AMX-30s. As a result, Saudi Arabia relies heavily on its 450 M-60A3s. This is still a significant amount of armor, but it is dispersed over much of the Kingdom, and

Saudi Arabia lacks the training, manpower quality, sustainability, and C^4I/SR capabilities for effective aggressive maneuver warfare and forward defense. While there are reports of a Gulf Cooperation Council (GCC) rapid reaction force, the reality is a few hollow allied battalions. The GCC is a military myth.

Unless there are weeks of strategic warning, Kuwait, Saudi Arabia, and the US will lack the land forces to stop Iraq. A force of five Iraqi divisions would compare favorably with total Kuwaiti forces of about four brigades, with only about a brigade equivalent combat-ready, and with a total forward-deployed US strength that normally does not include a single forward-deployed land brigade. The Saudi forces at Hafr al Batin are at most the equivalent of two combat-effective brigades which would probably take two weeks to fully deploy forward to the Kuwait and Saudi borders in sustainable, combat-ready form. The so-called GCC rapid deployment force is largely a political fiction with no meaningful real-world combat capability against Iraqi heavy divisions.

There is little prospect that this situation will improve in the near term. The US has not been able to preposition large numbers of equipment sets in or near Kuwait, and prepositioning brigade sets in Qatar and the UAE means that such forces would take at least a week to 10 days to deploy in combat-ready form in Kuwait. Kuwait is making only limited progress in its military modernization, and the Saudi Army has made little progress in improving its capability to move quickly to the defense of Kuwait or to concentrate its forces along the Saudi border with Iraq.

As a result, the ability to deal with a sudden Iraqi attack on Kuwait is likely to depend on US ability to mass offensive air and missile power and use it immediately against Iraq the moment major troop movements begin without first seeking to win air superiority or air supremacy. The US will also require the full support of Saudi Arabia and the other Southern Gulf countries to assist in the deployment and basing of US forces in the region, support from friendly local forces like the Saudi Air Force, and a firm and immediate Kuwaiti willingness to allow the US and Saudi Arabia to employ force.

Even then, the defense of Kuwait will be an increasingly "close run thing." Even today, Iraqi land forces might penetrate into Kuwait City in spite of US, Saudi, and Kuwaiti air power -- if Iraq was willing to take very high losses in reaching and seizing the city. If Iraq then took the Kuwaiti population hostage, it might succeed. The only way that Iraqi forces could then be dislodged would be through a combination of another land build up in Saudi Arabia by the US and allied forces, and a massive strategic/interdiction air campaign against targets on Iraqi territory.

The essential dilemma in any "second liberation" of Kuwait would be US, Saudi, and Kuwaiti willingness to act in the face of potential massacres of Kuwaiti civilians, versus the willingness of an Iraqi regime to accept massive damage to Iraq. It seems likely that the US and Saudi Arabia would show the necessary ruthlessness if the Kuwaiti government supported such action. Oil is too strategically important to cede such a victory to a leader like Saddam Hussein.

The outcome might be different, however, as sanctions ease or end, and Iraq rebuilds more of its military capabilities. There are a number of "wild cards" in such a case:

- Iraq may somehow obtain nuclear weapons, or demonstrate the possession of highly lethal biological weapons.

- The US may be forced to reduce its forward presence and readiness in the Gulf to the point where it could not rapidly surge air power, and/or had reduced its overall power projection capabilities.

- Iraq may choose a more limited and "acceptable" objective like restoring its pre-Gulf War border or demanding access to Bubiyan, Warbah, the Kwar Abdullah, and the Gulf.

- Saudi Arabia may not immediately and fully support US action and commit its own forces.

- A Kuwait government may refuse to accept the cost of continuing to fight in the face of ruthless Iraqi action against a "hostage" Kuwaiti people.

Civil War in Iraq

Iraq's forces have already shown that they have the military strength to defeat its lightly armed Kurds in a matter of weeks if UN forces cease to protect them. The Iraqi army has effectively defeated all serious Shi'ite resistance. It would take a massive uprising, and possibly a major division within Iraq's military forces, for any civil conflict to challenge the regime.

Power is now so centralized among Sunni tribal elites, who control virtually all senior posts in the military and security forces, that any struggle for power seems more likely to take the form of a coup and counter-coup than civil war. Nevertheless, no one can dismiss the possibility, however, that Saddam Hussein will take another major military risk and end in making another strategic mistake. Saddam may well be able to survive the present situation, but not another major defeat.

It is possible that the Iraqi military could split over the struggle for power after Saddam, and combine warlordism with regional and ethnic alliances. Any serious north-south split within the army could trigger a significant civil conflict, although it is impossible to predict the resulting balance of power and ethnic and political alignments. Such a struggle might also trigger limited Iranian and Turkish intervention.

Confrontation in the Gulf

Iraq has almost none of the assets necessary to win a naval-air battle against US forces in the Gulf, and has no prospect of acquiring these assets in the foreseeable future. It would have to rebuild, modernize, and massively expand both its regular navy and air force at levels of strength and capability it simply cannot hope to achieve for the next half-decade. Alternatively, Iraq could develop its capabilities to deliver weapons of mass destruction to the point where it could back its conventional military capabilities with a threat that might seriously inhibit US military action and/or the willingness of Southern Gulf states to support the US and provide air and naval facilities.

Unlike Iran, Iraq cannot conduct meaningful surface ship, naval air force, and amphibious operations. Currently, the Iraqi navy can only conduct limited mine warfare and land-based anti-ship missile attacks, and surprise raids on off-shore facilities. Its air force may be able to conduct limited anti-ship missile attacks using its Mirage F-1s, but would have to find a permissive environment to survive. Iraqi Mirage F-1s burdened with the AM-39 Exocet would be unlikely to survive Kuwaiti, Saudi, or Iranian air defenses without a level of air escort capability that Iraq cannot currently provide.

Iraq has little ability to intimidate its neighbors into accepting such operations as long as the US has the ability to use its air and missile power to inflict enough strategic damage on Iraq to create a massive deterrent to any Iraqi escalation to chemical or biological weapons, and back these capabilities with the ultimate threat of US theater nuclear escalation.

This does not mean that Iraqi air and/or naval forces could not score some gains from a sudden, well-planned raid in the Gulf. Iraq could not sustain any initial success, however, and would probably accomplish nothing more than provoke a US, Southern Gulf, or Iranian reaction that would far offset any advantages Iraq could gain. The only exception might be a proxy unconventional or terrorist attack that allowed Iraq to preserve some degree of plausible deniability.

The “wild cards” in such contingencies are US determination to act, the future size of the US presence in the Gulf, US ability to surge its power projection capabilities at the time of a given crisis, Southern Gulf support for the US and willingness to provide the US with suitable facilities, and the political liabilities the US would face -- if any -- in terms of the response from nations outside the region. Far more is involved in a confrontation in the Gulf than Iraq’s military capability, and Iraq will be able to acquire far more contingency capability if the US could not respond for political or budgetary reasons.

Similarly, much will depend over time on Iranian, Southern Gulf, and Western reactions to Iraq’s efforts to rebuild the naval strike capability of its air force, and to build-up a meaningful blue water navy. A passive response would obviously strengthen Iraq. So would any indifference to Iraqi efforts to improve its access to the Gulf by renewing its pressure on Kuwait to grant Iraq access to Bubiyan and Warbah, or to secure the channels to Umm Qasr. Even then, however, it is difficult to see how Iraq can acquire much contingency capability beyond the upper Gulf, unless Iran and/or Saudi Arabia are indifferent or supportive of Iraqi action.

Confrontation or Conflict with Iran

Iranian and Iraqi relations are improving, and both countries currently seem committed to avoiding another round of fighting. There also are good military reasons for both countries to avoid such a conflict. The cumulative impact of UN sanctions is slowly eroding the capabilities of Iraqi land and air forces relative to those of Iran, and Iraq has only very limited ability to use chemical warfare in another Iran-Iraq conflict. Iraq cannot hope to challenge Iran’s naval strength or deny Iran naval and commercial access to the Gulf. Iran is now a much stronger defensive power than it was in 1988, both because of Iran’s force improvements and because of Iraq’s defeat and the sanctions that have followed.

It is far from clear, however, that Iran will acquire enough of an “edge” over Iraq to win a major conflict and avoid a repetition of the grinding war of attrition that took place during the Iran-Iraq War. In spite of Saddam Hussein, the Iraqi army seems more likely to unite in a

defensive conflict than to divide, and it still has nearly twice Iran's tank strength and a superior air force.

The "wild cards" in any contingencies involving a conflict between Iran and Iraq are the possibility of internal unrest and divisions in Iraq that are serious enough to split the Iraqi armed forces, and/or which lead to a new Shi'ite uprising. Similarly, a major Kurdish uprising would greatly complicate Iraq's ability to concentrate its forces to defend against an Iranian attack on Iraq's center and south.

If such a contingency does occur, any Iranian victory over Iraq might prove to be more apparent than real. It is far from clear that the US or Southern Gulf states would tolerate an Iranian victory that did more than depose the present Iraqi regime. Further, the split between Persian, Arab, and Kurd seems likely to remain so great that Iraqi independence would rapidly reassert itself if Iran attempted to occupy or dominate a substantial part of Iraq.

Further, an escalation to the use of weapons of mass destruction against urban, economic, and large military area targets could introduce great uncertainties into such a conflict. Iran now has a major advantage in terms of biological and chemical weapons and this advantage will grow steadily until UN sanctions on Iraq are lifted. Iraq could then rebuild its strategic delivery capabilities relatively quickly, however, and the end result of any sustained conflict of this kind would be difficult to predict.

The greatest single uncertainty would be the development and use of advanced biological weapons with near nuclear lethality or the assembly and use of a nuclear device assembled with weapons grade fissile material bought from an outside source. There may be little or no warning of such a strategic development, and the US is unlikely to extend its deterrent coverage over either Iran or Iraq. Another wild card is that a US or Israeli counter-proliferation strike on either Iraq or Iran could make the target vulnerable enough for the other country to exploit the resulting window of opportunity.

Adventures in the Southern Gulf

There is little near-term prospect that Iraq will develop enough power projection capability -- and supporting power from its navy, air force, and weapons of mass destruction -- to win any conflict in the Southern Gulf where it does not attack by land into Kuwait or across the Saudi border. The only exception would seem to be a case where it operated in support of a coup or uprising, or when Iraqi volunteers operated in Southern Yemen in 1994. Any Iraqi attack on a Southern Gulf state is also the contingency most likely to unite the US and the Southern Gulf states and to ensure European and other support for a strong US-Southern Gulf response.

At the same time, there are three important "wild cards" affecting Iraqi military involvement in the Southern Gulf:

- Nothing can prevent Iraq from exploiting the fracture lines within and between the Southern Gulf states. Iraq has much less capacity than Iran to exploit the Shi'ite unrest in Bahrain and Saudi Arabia, but it might be able to exploit future confrontations between Bahrain and Qatar and Saudi Arabia and Yemen.

- The US would face serious problems in responding to any change of government in a Southern Gulf state that resulted in a pro-Arab/pro-Iraqi regime and which sought Iraqi military advice or an Iraqi military presence. The US cannot save a Gulf regime from its own people or (openly) endorse such action by other Southern Gulf countries.

- Iraq's process of creeping proliferation is making enough progress so that the US and the Southern Gulf states must reach some degree of agreement on taking suitable counter-proliferation measures. A power vacuum in which Iraq proliferates, the Southern Gulf states grow steadily more vulnerable, and US resolve seems progressively more questionable, could give Iraq far more capability to directly or indirectly intervene in Southern Gulf affairs.

Wars Against Israel

At least in the near-term, Iraq is so weak that it seems unlikely that it would directly provoke Israel by doing anything more than sending limited forces to Jordan or Syria if another major conflict should somehow take place between Israel and its key neighbors. Iraq could move a corps size force into Jordan or Syria within a matter of days, although it would take weeks to give it the substantial capability needed to sustain itself in intensive combat. It could also deploy air units, although it presently does not have the ability to operate within the Jordanian or Syrian C^4I/BM and identification of friend or foe (IFF) system. Improving this situation requires the extensive rebuilding of Iraq's military capabilities, and joint exercises with Jordan and/or Syria.

Until recently, such a prospect seemed very doubtful Jordan has made peace with Israel, and King Hussein actively supported Iraqi opposition movements during 1994-1996. Syria fought against Iraq in the Gulf War, and its President Hafaz Asad, has long been a bitter rival of Saddam Hussein. The deterioration of the Arab-Israel peace process in 1996-1998, however, led Syria to take a progressively harder line towards Israel and to reach out for new allies. At the same time, Iraq's search to end sanctions and break out of its containment led it to approach Syria. Iraq and Syria began to hold serious meetings for the first time in half a decade. The border was opened for limited traffic and key Iraqi papers like Babel began to call for Iraqi-Syrian military cooperation as a "useful action to all Arabs" and for Iraq and Syria to "resume diplomatic ties."

It seems unlikely that any Arab-Israeli conflict would broaden to include Egypt or Jordan, as long as President Mubarak, King Hussein, or any other moderate leaders remain in power. Asad has shown little interest in taking such risks and remains hostile to Saddam Hussein. Iraq must also realize that it is extremely unlikely that Israel will show restraint in any future missile war, and would probably escalate to the use of nuclear weapons if Iraq made any attributable use of weapons of mass destruction against Israel's civilian population or large formations of Israeli military forces.

Turkey and the Kurds

Iraq is more likely to seek a tacit or open Turkish alliance against the Kurds than to seek military confrontation. There are, however, two possibilities for conflict. One is a future Iraqi-Turkish "alliance" in the form of coordinated operations against the Kurds in the northern border area. Such an "alliance" would offer Turkey the prospect of denying its rebel Kurdish factions sanctuary and bases in the Iraqi border area, and offer Iraq both support in suppressing its Kurds and the prospect that Turkey would cease its raids across the border. Both nations have a strong incentive to secure the area in order to allow them to improve trade and the security of Iraq's pipeline through Turkey.

It is also possible, however, that Turkey's constant incursions into Iraq's border area could trigger some kind of low level fighting if Iraq's military forces should reoccupy the Kurdish security zone. Iraqi senior officials have increasingly protested Turkey's military actions in Iraq, and its establishment of a "security" zone inside Iraq to halt Kurdish attacks on Turkey. Many senior Iraqi officials also seem to fear that Turkey might still attempt to annex some part of northern Iraq, including some of the oil fields in the area. These fears of Turkish ambitions are almost certainly exaggerated, but they are still very real.

Proxy Wars

Unlike Iran, Iraq has never demonstrated much capability to conduct "proxy wars" by training, arming, and funding Arab extremist movements. Iraq does sponsor some extremist and terrorist groups, but the end result has done little for Iraq. Iraq also lacks Iran's bases, training centers, and staging facilities in other countries, and the political support of third nations like the Sudan and Syria which are close to the scene of such proxy conflicts. Similarly, Iraq can only hope to win proxy wars fought against vulnerable governments. Attempts to fight such wars will have little impact on a successful Arab-Israeli peace settlement, or in sustaining civil conflict in the face of a government that demonstrates that it has the capacity to govern and deal with its social problems.

At the same time, the failure of the peace process and of secular regimes may make Iraq's use of proxy wars more successful in the future. So would the creation of a radical Arab regime in Jordan, Egypt, or Syria, which might turn to Iraq for support. Iraq also has a strong revanchist motive to use proxy warfare against Israel, Saudi Arabia, and the United States.

Unconventional Offensive Conflicts

Similarly, Iraq may seek to improve its capabilities for unconventional warfare, including the use of chemical and biological weapons. The practical problem that Iraq faces will be to find a place and contingency where it can exploit such capabilities that offer more return than using proxies, and which allows Iraq to act at an acceptable level of risk.

In broad terms, there do not seem to be any current contingencies where Iraq can achieve major gains by using unconventional military forces in offensive warfare. The closest case seems to be Turkey's struggle with its Kurds, but Turkey is an extraordinarily dangerous opponent for Iraq to provoke, and any Iraqi aid to Turkey's Kurds would present further problems in Iraq's efforts to control its own Kurds.

The key "wild cards" affecting this set of contingencies are Iraq's willingness to take the risk of using its unconventional forces and alienating other states, the uncertain value of such adventures, and the willingness of other states and movements to accept such Iraqi support and the political price tag that would come with it. This situation might change if:

- Iraq could send volunteers to Lebanon and Syria under circumstances where such conflicts had broad Arab support, and Israel was sufficiently preoccupied with other threats so that it could not retaliate;

- Actively supporting some opposition force in Iran appeared to be a safe way of limiting the Iranian threat or ending Iranian support for anti-Iraqi movements;

- Supporting an alienated Yemen offered Iraq a low cost way of using unconventional forces to threaten or put pressure on Saudi Arabia;

- Support of some movement in Turkey seemed likely to gain Iraq broader support in Turkey; and

- A civil conflict took place in Kuwait or Saudi Arabia.

None of these contingencies now seem likely. At the same time, the risks of Iraq using its unconventional warfare capabilities should not be discounted. If nothing else, Iraq might act in a "spoiler role," attempting to deny some other nation influence even if Iraq could not make clear strategic gains on its own.

The Defense of Iraq

The previous contingencies assume that Iraq will take offensive action. If it does, it may well be confronted with a US-led attack. If this attack is confined to naval and coastal targets, particularly those Iraqi military capabilities that potentially threaten Gulf shipping, there is little Iraq can do other than try to ride out the attack by dispersing and hiding its smaller boats, anti-ship missiles, etc.

If a US-led attack includes strategic conventional missile strikes and bombings, there is equally little Iraq can do in terms of an immediate response, other than to escalate to using weapons of mass destruction in ways that are more likely to end in increasing the risk and damage to Iraq than to deter or damage US forces. Iraq can, however, respond over time with terrorism, unconventional warfare, and proxy wars. It is much easier to use air and missile power to inflict major damage on Iraq than it is to predict or control the political and military aftermath. The resulting casualties and damage will be extremely difficult to translate into an "end game."

Any US use of amphibious and land warfare would be considerably more difficult. Iraq can probably mount a significant defense against amphibious attacks on its coastline and islands. It

is impossible to dismiss a popular Shi'ite or Kurdish uprising in support of an outside attack, but the most likely response would seem to be that Iraq's population would unite or remain passive while US or Coalition forces were forced to advance over water barriers and through built-up areas.

The Iraqi Army might collapse in the face of such an assault, but the Republican Guards is more likely to dig in and defend from positions co-located with Iraq's civil population, which would limit the ability to exploit air power. Attacks on Iraqi territory that went beyond a punitive raid might be costly.

A US-led coalition could probably defeat Iraq's forces, but would have to be at least corps level in size, and occupying Iraq would be impractical without massive land forces of several corps. Further, Iraq's use of terrorism and weapons of mass destruction would be much easier to justify politically in a defensive conflict rather than an offensive one. Such outside attacks would probably end in futility, and in creating an even more revanchist Iraq.

As for the Iraqi opposition, its vainglorious claims to military effectiveness are largely meaningless. The deeply divided Kurdish forces have proved to be more interested in fighting each other than Iraq, and every temporary alliance between the Barzani and Talibani factions has collapsed. The claims of the Iraqi National Congress (INC) to have set up a military force in the Kurdish Security Zone, before Iraq reentered the area in 1996 and destroyed the INC's operation, consisted of several hundred badly trained and equipped men organized into a force that would have required thousands to be effective. In spite of some US efforts to help create an opposition force, the only way the US could ever count on help would be if part of the regular Iraqi Army defected – something that seems very unlikely.

Exploiting "Wars of Intimidation"

The previous contingencies assume that Iraq's strength will be determined largely by the warfighting capabilities of its military forces. Iraq may, however, be able to achieve some of its

objectives through intimidation and/or direct and indirect threats. Iraq's ability to provide such intimidation is now very limited but will improve steadily once UN sanctions are lifted. In many cases, Iraq's neighbors may be willing to increasingly accommodate Iran to some degree. This is particularly true of those states which see Iran as a more serious threat -- like Bahrain, Oman, Qatar, and the UAE.

Much will depend upon regional perceptions of the long-term resolve of the US, the ability of the Southern Gulf states to avoid major divisions, and the willingness of the Southern Gulf states to show they will support a firm US response to Iraq, even at some risk. Much will also depend on the ability of Iraq's leadership to set achievable demands and avoid open confrontation. In broad terms, it seems likely that Iraq's ability to intimidate will slowly improve over time, but there is no way to predict how quickly or by how much.

Iran, Iraq, and Weapons of Mass Destruction

It is possible to conduct endless debates over the seriousness of Iran's efforts to proliferate and Iraq's potential success in retaining some of the capabilities it possessed at the time of the Gulf War, developing a covert break out capability in spite of UNSCOM and the IAEA, and rearming once sanctions are lifted. Table Six provides a summary estimate of Iran's on-going efforts and Iraq's past achievements, but it is important to stress that the data in this table are highly uncertain, and that Iran's capabilities are very different from those of Iraq.

Iranian Use of Weapons of Mass Destruction

Iran's effort to acquire chemical, biological, and nuclear weapons -- and suitable long-range strike systems -- are tools to an end, and weapons of mass destruction do not necessarily make radical changes in Iran's contingency capabilities. At the same time, such weapons do give Iran a post-Gulf War edge over Iraq. They also inevitably affect US, British, Israeli and Southern Gulf perceptions of the risks inherent in attacking Iran. Much depends upon these perceptions of

the risk in engaging Iran, refusing its demands, and dealing with Iranian escalation and/or retaliation.

It seems unlikely that Iran's "creeping proliferation" will reach the point in the near term where Iran's capabilities are great enough to change US, British, Israeli and/or Southern Gulf perceptions of risk to the point where they would limit or paralyze outside military action. Further, it seems unlikely that Iran can continue to build up its capabilities without provoking even stronger US counter-proliferation programs, including retaliatory strike capabilities. The same is true of a response from Iraq and the Southern Gulf states. As a result, Iran's "creeping proliferation" may end simply in provoking a "creeping arms race."

Arms races do not, however, always bring deterrence and stability. Further, four "wild cards" deserve special attention:

- A successful Iranian attempt to buy significant amounts of weapons grade material.
- A change in the US and regional perception of biological weapons.
- Iraq find a way to end out of UN sanctions and/or reveal a substantial break-out capability of its own.
- Iran might use such weapons through proxies or in covert attacks with some degree of plausible deniability.

Iraq's Use of Weapons of Mass Destruction

Iraq's present holdings of chemical and biological weapons are so limited that they do not constrain US freedom of action, or do much to intimidate Iraq's neighbors. Also, Iran now has a significant lead over Iraq. Nevertheless, Iraq's possession of such weapons inevitably affects US, British, Israeli and Southern Gulf perceptions of the risks inherent in attacking Iraq. Much

depends upon these outside perceptions of the risk in engaging Iraq, in refusing its demands, and dealing with Iraqi aggression and/or retaliation.

It seems unlikely that Iraq can reach the point, in the near-term, where its capabilities are great enough to change US, British, Israeli and/or Southern Gulf perceptions of risk to the point where they would limit or paralyze outside military action. Further, it seems unlikely that Iraq can continue to build up its capabilities without provoking strong US counter-proliferation programs, including retaliatory strike capabilities. The same is true of a response by Iran and the Southern Gulf states. As a result, Iraq's acquisition of weapons of mass destruction may end simply in provoking an arms race even when UN sanctions are lifted.

Once again, however, arms races scarcely always end in deterrence and stability. As is the case with Iran, several "wild cards" deserve special attention:

- A successful Iraqi attempt to buy significant amounts of weapons grade material. This could allow Iraq to achieve a nuclear break out capability in a matter of months. Both the US and the region would find it much harder to adjust to such an Iraqi effort than to the slow development of nuclear weapons by creating fissile material in Iraq. It seems likely that the US could deal with the situation by extending a nuclear umbrella over the Gulf, but even so, the Southern Gulf states might be far more responsive to Iraqi pressure and intimidation. Most, after all, are so small that they are virtually "one bomb states;"

- A change in the US and regional perception of biological weapons. Biological weapons are now largely perceived as unproven systems of uncertain lethality. Regardless of their technical capabilities, they have little of the political impact of nuclear weapons. Iraq might, however, conduct live animal tests to demonstrate that its biological weapons have near-nuclear lethality or some other power might demonstrate their effectiveness in another conflict. The successful mass testing or use

of biological weapons might produce a rapid "paradigm shift" in the perceived importance of such weapons and of Iraq's biological warfare programs;

- Iraq might break out of UN sanctions and reveal a more substantial capability than now seems likely. Paradoxically, such an Iraqi capability would help to legitimize Iran and Israel's nuclear, biological, and chemical programs and the escalation to the use of such weapons;

- Iraq might use such weapons through proxies or in covert attacks with some degree of plausible deniability. Terrorism and unconventional warfare would be far more intimidating if they made use of weapons of mass destruction.

Table Three

Iranian and Iraqi Weapons of Mass Destruction

Iran's Search for Weapons of Mass Destruction

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 cites." Sixty-one were fired at Baghdad, nine at Mosul, five at Kirkuk, one at Takrit, and one at Kuwait. Iran fired as many as five missiles on a single day, and once fired three missiles within 30 minutes. This still, however, worked out to an average of only about one missile a day, and Iran was down to only 10-20 Scuds when the war of the cities ended.

- Iran's missile attacks were initially more effective than Iraq's attacks. This was largely a matter of geography. Many of Iraq's major cities were comparatively close to its border with Iran, but Tehran and most of Iran's major cities that had not already been targets in the war were outside the range of Iraqi Scud attacks. Iran's missiles, in contrast, could hit key Iraqi cities like Baghdad. This advantage ended when Iraq deployed extended range Scuds.

- The Scud B is a relatively old Soviet design which first became operational in 1967, designated as the R-17E or R-300E. The Scud B has a range of 290-300 kilometers with its normal conventional payload. The export version of the missile is about 11 meters long, 85-90 centimeters in diameter, and weighs 6,300 kilograms. It has a nominal CEP of 1,000 meters. The Russian versions can be equipped with conventional high explosive, fuel air explosive, runway penetrator, submunition, chemical, and nuclear warheads.

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

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

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

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

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

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

- In fact, a senior North Korean delegation traveled to Tehran to close the deal on November 29, 1990, and met with Mohsen Rezaei, the former commander of the IRGC. Iran either bought the missile then, or placed its order shortly

thereafter. North Korea then exported the missile through its Lyongaksan Import Corporation. Iran imported some of these North Korean missile assemblies using its B-747s, and seems to have used ships to import others.

- Iran probably had more than 60 of the longer range North Korean missiles by 1998, although other sources report 100, and one source reports 170.
- Iran may have 5-10 Scud C launchers, each with several missiles. This total seems likely to include four new North Korean TELs received in 1995.
- Iran seems to want enough missiles and launchers to make its missile force highly dispersible.
- Iran may have begun to test its new North Korean missiles. There are reports it has fired them from mobile launchers at a test site near Qom about 310 miles (500 kilometers) to a target area south of Shahroud. There are also reports that units equipped with such missiles have been deployed as part of Iranian exercises like the Saeqer-3 (Thunderbolt 3) exercise in late October, 1993.
- The missile is more advanced than the Scud B, although many aspects of its performance are unclear. North Korea seems to have completed development of the missile in 1987, after obtaining technical support from the People's Republic of China. While it is often called a “Scud C,” it seems to differ substantially in detail from the original Soviet Scud B. It seems to be based more on the Chinese-made DF-61 than on a direct copy of the Soviet weapon.
- Experts estimate that the North Korean missiles have a range of around 310 miles (500 kilometers), a warhead with a high explosive payload of 700 kilograms, and relatively good accuracy and reliability. While this payload is a bit limited for the effective delivery of chemical agents, Iran might modify the warhead to increase payload at the expense of range and restrict the using of chemical munitions to the most lethal agents such as persistent nerve gas. It might also concentrate its development efforts on arming its Scud C forces with more lethal biological agents. In any case, such missiles are likely to have enough range-payload to give Iran the ability to strike all targets on the southern coast of the Gulf and all of the populated areas in Iraq, although not the West. Iran could also reach targets in part of eastern Syria, the eastern third of Turkey, and cover targets in the border area of the former Soviet Union, western Afghanistan, and western Pakistan.
- Accuracy and reliability remain major uncertainties, as does operational CEP. Much would also depend on the precise level of technology Iran deployed in the warhead. Neither Russia nor the People's Republic of China seem to have transferred the warhead technology for biological and chemical weapons to Iran or Iraq when they sold them the Scud B missile and CSS-8. However, North Korea may have sold Iran such technology as part of the Scud C sale. If it did so, such a technology transfer would save Iran years of development and testing in obtaining highly lethal biological and chemical warheads. In fact, Iran would probably be able to deploy far more effective biological and chemical warheads than Iraq had at the time of the Gulf War.
- Iran may be working with Syria in such development efforts, although Middle Eastern nations rarely cooperate in such sensitive areas. Iran served as a transshipment point for North Korean missile deliveries during 1992 and 1993. Some of this transshipment took place using the same Iranian B-747s that brought missile parts to Iran. Others moved by sea. For example, a North Korean vessel called the *Des Hung Ho*, bringing missile parts for Syria, docked at Bandar Abbas in May, 1992. Iran then flew these parts to Syria. An Iranian ship coming from North Korea and a second North Korean ship followed, carrying missiles and machine tools for both Syria and Iran. At least 20 of the North Korean missiles have gone to Syria from Iran, and production equipment seems to have been transferred to Iran and to Syrian plants near Hama and Aleppo.
    - Iran has created shelters and tunnels in its coastal areas which it could use to store Scud and other missiles in hardened sites and reduce their vulnerability to air attack.
    - Iran can now assemble Scud and Scud C missiles using foreign-made components.
    - Iran is developing an indigenous missile production capability with both solid and liquid fueled missiles. Seems to be seeking capability to produce MRBMs.
- The present scale of Iran’s production and assembly efforts is unclear. Iran seems to have a design center, at least two rocket and missile assembly plants, a missile test range and monitoring complex, and a wide range of smaller design and refit facilities.

- The design center is said to 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 lates 1980s and early 1990s that Iran had ordered the North Korean No Dong missile, which was planned to have the capability to to carry nuclear and biological missile ranges of up to 900 kilometers. This range would allow the missile could reach virtually any target in Gulf, Turkey, and Israel. The status of the No Dong program has since become increasingly uncertain, although North Korea deployed some developmental types at test facilities in 1997.
    - The No-Dong underwent flight tests at ranges of 310 miles (500 kilometers) on May 29, 1993. Some sources indicate that Iranians were present at these tests. Extensive further propulsion tests began in August 1994, and some reports indicate operational training began for test crews in May 1995. Missile storage facilities began to be built in July 1995, and four launch sites were completed in October 1995.
    - The progress of the program has been slow since that time, and may reflect development problems. However, mobile launchers were seen deployed in northeast North Korea on March 24, 1997. According to some reports, a further seven launcher units were seen at a facility about 100 kilometers from Pyongyang.
    - The No-Dong 1 is a single-stage liquid-fueled missile, with a range of up to 1,000 to 1,300 kilometers (810 miles), although longer ranges may be possible with a reduced warhead and maximum burn. There are also indications that there may be a No-Dong 2, using the same rocket motor, but with an improved fuel supply system that allows the fuel to burn for a longer period.
    - The missile is about 15.2 meters long -- four meters longer than the Scud B -- and 1.2 meters in diameter. The warhead is estimated to weigh 770 kilograms (1,200-1,750 pounds) and a warhead manufacturing facility exists near Pyongyang. The No-Dong has an estimated theoretical CEP of 700 meters at maximum range, versus 900 meters for the Scud B, although its practical accuracy could be as wide as 3,000-4,000 meters. It has an estimated terminal velocity of Mach 3.5, versus 2.5 for the Scud B, which presents added problems for tactical missile defense. The missile is be transportable on a modified copy of the MAZ-543P TEL that has been lengthened with a fifth axle and which is roughly

40 meters long. The added support stand for the vertical launch modes brings the overall length to 60 meters, and some experts questioned whether a unit this big is practical.

- 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 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 Galluci, as his special representatives to try to persuade Russia to put a firm halt to aid support of the Iran.
    - These programs are reported to have continuing support from North Korea, and from Russian and Chinese firms and technicians. One such Chinese firm is Great Wall Industries. The Russian firms include the Russian Central Aerohydrodynamic Institute, which has provided Iran's Shahid Hemmat Industrial Group (SHIG) with wind tunnels for missile design, equipment for manufacturing missile models, and the software for testing launch and reentry performance. They may also include Rosvoorouzhenie, a major Russian arms-export agency; NPO Trud, a rocket motor manufacturer; a leading research center called the Bauman Institute, and Polyus (Northstar), a major laser test and manufacturing equipment firm.
    - 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 these systems:
    - Some US experts believe that Iran tested booster engines in 1997 capable of driving a missile ranges of 1,500 kilometers. Virtually all US experts believe that Iran is rapidly approaching the point where it will be able to manufacture missiles with much longer ranges than the Scud B. It is less clear when Iran will be able to bring such programs to the final development stage, carry out suitable test firings, develop effective warheads, and deploy actual units. Much still depends 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 Shihab ("meteor") missiles, with performance similar to those previously identified with Iranian missiles adapted from North Korean designs.
        - The Israeli reports indicated that the Shihab 3 was liquid fueled missile with a range of 810 miles (1,200-1,500 kilometers) and a payload of 1550 pounds (700 kilometers).
        - Israel claimed the Shihab might be ready for deployment as early as
        - Israel has also reported that Iran is developing the Shihab 4, with a range of 1,250 miles (some reports say up to 4,000 kilometers) and a payload in excess of one ton. It indicates that this system could be operational in 2-5 years. US Assistant Secretary for Near East Affairs testified on July 28, 1998, that the US estimated that the system still needed added foreign assistance to improve its motors and guidance system.
        - Israeli indicated that Iran might have two other missile programs include longer-range systems with a maximum range of up to 4,500-55,000 and 10,000 kilometers.
    - Iran tested the Shihab 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 its 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 publically reported on August 2, 1998 that the 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 820,000 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 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.

- There have been other reports that Iran might be using Russian technology to develop a very long-range missiles with range of 3,500 to 6,250 kilometers.
    - It seems clear that Iran has obtained some of the technology and design details of the Russian SS-4. The SS-4 (also known as the R-12 or "Sandal") is an aging Russian liquid fuel designed that first went into service in 1959, and which was supposedly destroyed as part of the IRBM Treaty. It is a very large missile, with technology dating back to the early 1950s, although it was evidently updated at least twice during the period between 1959 and 1980. It has a CEP of 2-4 kilometers and a maximum range 2,000 kilometers, which means it can only be lethal with a nuclear warhead or a biological weapon with near-nuclear lethality.
    - At the same time, the SS-4's overall technology is relatively simple and it has a throwweight of nearly 1,400 kilograms (3,000 pounds). It is one of the few missile designs that a nation with a limited technology base could hope to manufacture or adapt, and its throwweight and range would allow Iran to use a relatively unsophisticated nuclear device or biological warhead. As a result, an updated version of the SS-4 might be a suitable design for a developing country.

- Russia has been a key supplier of missile technology.
    - Some sources have indicated that Russian military industries have signed contracts with Iran to help produce liquid fueled missiles and provide specialized wind tunnels, manufacture model missiles, and develop specialized computer software. For example, these reports indicate that the Russian Central Aerohydrodynamic Institute is cooperating with Iran's Defense Industries Organization (DIO) and the DIO's Shahid Hemmat Industrial Group (SHIG). The Russian State Corporation for Export and Import or Armament and Military Equipment (Rosvoorouzhenie) and Infor are also reported to be involved in deals with the SHIG. These deals are also said to include specialized laser equipment, mirrors, tungsten-coast graphite material, and maraging steel for missile development and production. They could play a major role in help Iran develop long range versions of the Scud B and C, and more accurate variations of a missile similar to the No Dong.
    - The Israeli press reported in August, 1997 that Israeli had evidence that Iran was receiving Russian support. In September, 1997, Israel urged the US to step up its pressure on Iran, and leaked reported indicating that private and state-owned Russian firms had provided gyroscopes, electronic components, wind tunnels, guidance and propulsion systems, and the components needed to build such systems to Iran.
    - President Yeltsin and the Russian Foreign Ministry initially categorically denied that such charges were true. Following a meeting with Vice President Gore, President Yeltsin stated on September 26, 1997 that, "We are being accused of supplying Iran with nuclear or ballistic missile technologies. There is nothing further from the truth. I again and again categorically deny such rumors."
    - Russia agreed, however, that Ambassador Wisner and Yuri 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. As Koptev has said, "There have been several cases where some Russian organizations, desperately struggling to make ends meet and lacking responsibility, have embarked on some ambiguous projects." Conditions in Russia are getting worse, not better, and the desperation that drives sales has scarcely diminished.

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

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

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

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

- Iran has shorter missile range systems:

- In 1990, Iran bought CSS-8 surface-to-surface missiles (converted SA-2s) from China with ranges of 130-150 kilometers.

- Has Chinese sea and land-based anti-ship cruise missiles. Iran fired 10 such missiles at Kuwait during Iran-Iraq War, hitting one US-flagged tanker.

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

- Such missiles would cost only 10% to 25% as much as ballistic missiles of similar range, and both the HY-2 Seersucker and CS-802 could be modified relatively quickly for land attacks against area targets.

- Iran reported in December, 1995 that it had already fired a domestically built anti-ship missile called the Saeqe-4 (Thunderbolt) during exercises in the Strait of Hormuz and Gulf of Oman Other reports indicate that China is helping Iran build copies of the Chinese CS-801/CS-802 and the Chinese FL-2 or F-7 anti-ship cruise missiles. These missiles have

relatively limited range. The range of the CS-801 is 8-40 kilometers, the range of the CS-802 is 15-120 kilometers, the maximum range of the F-7 is 30 kilometers, and the maximum range of the FL-10 is 50 kilometers. Even a range of 120 kilometers would barely cover targets in the Southern Gulf from launch points on Iran's Gulf coast. These missiles also have relatively small high explosive warheads. As a result, Iran may well be seeking anti-ship capabilities, rather than platforms for delivering weapons of mass destruction.

- A platform like the CS-802 might, however, provide enough design data to develop a scaled-up, longer-range cruise missile for other purposes, and the Gulf is a relatively small area where most urban areas and critical facilities are near the coast. Aircraft or ships could launch cruise missiles with chemical or biological warheads from outside the normal defense perimeter of the Southern Gulf states, and it is at least possible that Iran might modify anti-ship missiles with chemical weapons to attack tankers -- ships which are too large for most regular anti-ship missiles to be highly lethal.
- Building an entire cruise missile would be more difficult. The technology for fusing CBW and cluster warheads would be within Iran's grasp. Navigation systems and jet engines, however, would still be a major potential problem. Current inertial navigation systems (INS) would introduce errors of at least several kilometers at ranges of 1,000 kilometers and would carry a severe risk of total guidance failure -- probably exceeding two-thirds of the missiles fired. A differential global positioning system (GPS) integrated with the inertial navigation system (INS) and a radar altimeter, however, might produce an accuracy of 15 meters. Some existing remotely piloted vehicles (RPVs), such as the South African Skua claim such performance. Commercial technology is becoming available for differential global positioning system (GPS) guidance with accuracies of 2 to 5 meters.
- There are commercially available reciprocating and gas turbine engines that Iran could adapt for use in a cruise missile, although finding a reliable and efficient turbofan engine for a specific design application might be difficult. An extremely efficient engine would have to be matched to a specific airframe. It is doubtful that Iran could design and build such an engine, but there are over 20 other countries with the necessary design and manufacturing skills.
- While airframe-engine-warhead integration and testing would present a challenge and might be beyond Iran's manufacturing skills, it is inherently easier to integrate and test a cruise missile than a long-range ballistic missile. Further, such developments would be far less detectable than developing a ballistic system if the program used coded or low altitude directional telemetry.
- Iran could bypass much of the problems inherent in developing its own cruise missile by modifying the HY-2 Seersucker for use as a land attack weapon and extending its range beyond 80 kilometers, or by modifying and improving the CS-801 (Ying Jai-1) anti-ship missile. There are reports that the Revolutionary Guards are working on such developments at a facility near Bandar Abbas.
    - Su-24 long-range strike fighters with range-payloads roughly equivalent to US F-111 and superior to older Soviet medium bombers.
    - F-4D/E fighter bombers with capability to carry extensive payloads to ranges of 450 miles.
    - Can modify HY-2 Silkworm missiles and SA-2 surface-to-air missiles to deliver weapons of mass destruction.
    - Iran has made several indigenous-long range rockets.
        - The Iran-130, or Nazeat, since the end of the Iran-Iraq War. The full details of this system remain unclear, but it seems to use commercially available components, a solid fuel rocket, and a simple inertial guidance system to reach ranges of about 90-120 kilometers. It is 355 mm in diameter, 5.9 meters long, weighs 950 kilograms, and has a 150 kilogram warhead. It seems to have poor reliability and accuracy, and its payload only seems to be several hundred kilograms.
        - The Shahin 2. It too has a 355 mm diameter, but is only 3.87 meters long, and weighs only 580 kilograms. It evidently can be equipped with three types of warheads: A 180 kilogram high explosive warhead, another warhead using high explosive submunitions, and a warhead that uses chemical weapons.
        - Iranian Oghab (Eagle) rocket with 40+ kilometers range.
        - New SSM with 125 mile range may be in production, but could be modified FROG.
    - Large numbers of multiple rocket launchers and tube artillery for short range delivery of chemical weapons.

Chemical Weapons

- Iran purchased large amounts of chemical defense gear from the mid-1980s onwards. Iran also obtained stocks of non-lethal CS gas, although it quickly found such agents had very limited military impact since they could only be used effectively in closed areas or very small open areas.
- Acquiring poisonous chemical agents was more difficult. Iran did not have any internal capacity to manufacture poisonous chemical agents when Iraq first launched its attacks with such weapons. While Iran seems to have made limited use of chemical mortar and artillery rounds as early as 1985 -- and possibly as early as 1984 -- these rounds were almost certainly captured from Iraq.
- Iran had to covertly import the necessary equipment and supplies, and it took several years to get substantial amounts of production equipment, and the necessary feedstocks. Iran sought aid from European firms like Lurgi to produce large "pesticide" plants, and began to try to obtain the needed feedstock from a wide range of sources, relying heavily on its Embassy in Bonn to manage the necessary deals. While Lurgi did not provide the pesticide plant Iran sought, Iran did obtain substantial support from other European firms and feedstocks from many other Western sources.
- By 1986-1987, Iran developed the capability to produce enough lethal agents to load its own weapons. The Director of the CIA, and informed observers in the Gulf, made it clear that Iran could produce blood agents like hydrogen cyanide, phosgene gas, and/or chlorine gas. Iran was also able to weaponize limited quantities of blister (sulfur mustard) and blood (cyanide) agents beginning in 1987, and had some capability to weaponize phosgene gas, and/or chlorine gas. These chemical agents were produced in small batches, and evidently under laboratory scale conditions, which enabled Iran to load small numbers of weapons before any of its new major production plants went into full operation.
- These gas agents were loaded into bombs and artillery shells, and were used sporadically against Iraq in 1987 and 1988.
- Reports regarding Iran’s production and research facilities are highly uncertain:

- Iran seems to have completed completion of a major poison gas plant at Qazvin, about 150 kilometers west of Tehran. This plant is reported to have been completed between November, 1987 and January, 1988. While supposedly a pesticide plant, the facility’s true purpose seems to have been poison gas production using organophosphorous compounds.
- It is impossible to trace all the sources of the major components and technology Iran used in its chemical weapons program during this period. Mujahideen sources claim Iran also set up a chemical bomb and warhead plant operated by the Zakaria Al-Razi chemical company near Mahshar in southern Iran, but it is unclear whether these reports are true.
- Reports that Iran had chemical weapons plants at Damghan and Parchin that began operation as early as March, 1988, and may have begun to test fire Scuds with chemical warheads as early as 1988-1989, are equally uncertain.
- Iran established at least one large research and development center under the control of the Engineering Research Centre of the Construction Crusade (Jahad e-Sazandegi), had established a significant chemical weapons production capability by mid-1989,
  - Debates took place in the Iranian parliament or Majlis in late 1988 over the safety of Pasdaran gas plants located near Iranian towns, and that Rafsanjani described chemical weapons as follows: "Chemical and biological weapons are poor man's atomic bombs and can easily be produced. We should at least consider them for our defense. Although the use of such weapons is inhuman, the war taught us that international laws are only scraps of paper."
  - Post Iran-Iraq War estimates of Iran chemical weapons production are extremely uncertain:
- US experts believe Iran was beginning to produce significant mustard gas and nerve gas by the time of the August, 1988 cease-fire in the Iran-Iraq War, although its use of chemical weapons remained limited and had little impact on the fighting
- Iran’s efforts to equip plants to produce V-agent nerve gases seem to have been delayed by US, British, and German efforts to limit technology transfers to Iran, but Iran may have acquired the capability to produce persistent nerve gas during the mid 1990s.

- Production of nerve gas weapons started no later than 1994.
- Began to stockpile of cyanide (cyanogen chloride), phosgene, and mustard gas weapons after 1985. Recent CIA testimony indicates that production capacity may approach 1,000 tons annually.
    - Weapons include bombs and artillery. Shells include 155 mm artillery and mortar rounds. Iran also has chemical bombs and mines. It may have developmental chemical warheads for its Scuds, and may have a chemical package for its 22006 RPV (doubtful).
    - There are reports that Iran has deployed chemical weapons on some of its ships.
    - Iran has increased chemical defensive and offensive warfare training since 1993.
    - Iran is seeking to buy more advanced chemical defense equipment, and has sought to buy specialized equipment on world market to develop indigenous capability to produce advanced feedstocks for nerve weapons.
- CIA sources indicated in late 1996, that China might have supplied Iran with up to 400 tons of chemicals for the production of nerve gas.
- One report indicated in 1996, that Iran obtained 400 metric tons of chemical for use in nerve gas weapons from China -- including carbon sulfide.
- Another report indicated that China supplied Iran with roughly two tons of calcium-hypochlorate in 1996, and loaded another 40,000 barrels in January or February of 1997. Calcium-hypochlorate is used for decontamination in chemical warfare.
- Iran placed several significant orders from China that were not delivered. Razak Industries in Tehran, and Chemical and Pharmaceutical Industries in Tabriz ordered 49 metric tons of alkyl dimethylamine, a chemical used in making detergents, and 17 tons of sodium sulfide, a chemical used in making mustard gas. The orders were never delivered, but they were brokered by Iran's International Movalled Industries Corporation (Imaco) and China's North Chemical Industries Co. (Nocinco). Both brokers have been linked to other transactions affecting Iran's chemical weapons program since early 1995, and Nocinco has supplied Iran with several hundred tons of carbon disulfide, a chemical uses in nerve gas.
- Another Chinese firm, only publicly identified as Q. Chen, seems to have supplied glass vessels for chemical weapons.
- The US imposed sanctions on seven Chinese firms in May, 1997, for selling precursors for nerve gas and equipment for making nerve gas -- although the US made it clear that it had, "no evidence that the Chinese government was involved." The Chinese firms were the Nanjing Chemical Industries Group and Jiangsu Yongli Chemical Engineering and Import/Export Corporation. Cheong Yee Ltd., a Hong Kong firm, was also involved. The precursors included tionyl chloride, dimethylamine, and ethylene chlorohydril. The equipment included special glass lined vessels, and Nanjing Chemical and Industrial Group completed construction of a production plant to manufacture such vessels in Iran in June, 1997.
- Iran sought to obtain impregnated Alumina, which is used to make phosphorous-oxychloride -- a major component of VX and GB -- from the US.
- It has obtained some equipment from Israelis. Nahum Manbar, an Israeli national living in France, was convicted in an Israeli court in May 1997 for providing Iran with $16 million worth of production equipment for mustard and nerve gas during the period from 1990 to 1995.
- CIA reported in June 1997 that Iran had obtained new chemical weapons equipment technology from China and India in 1996.
- India is assisting in the construction of a major new plant at Qazvim, near Tehran, to manufacture phosphorous pentasulfide, a major precursor for nerve gas. The plant is fronted by Meli Agrochemicals, and the program was negotiated by Dr. Mejid Tehrani Abbaspour, a chief security advisor to Rafsanjani.
- A recent report by German intelligence indicates that Iran has made major efforts to acquire the equipment necessary to produce Sarin and Tabun, using the same cover of purchasing equipment for pesticide plants that Iraq used for its Sa'ad 16 plant in the 1980s. German sources note that three Indian companies -- Tata Consulting Engineering, Transpek, and Rallis

India -- have approached German pharmaceutical and engineering concerns for such equipment and technology under conditions where German intelligence was able to trace the end user to Iran

- Iran ratified the Chemical Weapons Convention in June, 1997.

- It submitted a statement in Farsi to the CWC secretariat in 1998, but this consisted only of questions in Farsi as to the nature of the required compliance.
- It has not provided the CWC with any data on its chemical weapons program.

Biological Weapons

- Extensive laboratory and research capability.
- Weapons effort documented as early as 1982. Reports surfaced that Iran had imported suitable type cultures from Europe and was working on the production of Mycotoxins -- a relatively simple family of biological agents that require only limited laboratory facilities for small scale production.
- US intelligence sources reported in August, 1989, that Iran was trying to buy two new strains of fungus from Canada and the Netherlands that can be used to produce Mycotoxins. German sources indicated that Iran had successfully purchased such cultures several years earlier.
- The Imam Reza Medical Center at Mashhad Medical Sciences University and the Iranian Research Organization for Science and Technology were identified as the end users for this purchasing effort, but it is likely that the true end user was an Iranian government agency specializing in biological warfare.
- Many experts believe that the Iranian biological weapons effort was placed under the control of the Islamic Revolutionary Guards Corps, which is known to have tried to purchase suitable production equipment for such weapons.
- Since the Iran-Iraq War, Iran has conducted research on more lethal active agents like Anthrax, hoof and mouth disease, and biotoxins. In addition, Iranian groups have repeatedly approached various European firms for the equipment and technology necessary to work with these diseases and toxins.

- Unclassified sources of uncertain reliability have identified a facility at Damghan as working on both biological and chemical weapons research and production, and believe that Iran may be producing biological weapons at a pesticide facility near Tehran.
- Some universities and research centers may be linked to biological weapons program.
- Reports surfaced in the spring of 1993 that Iran had succeeded in obtaining advanced biological weapons technology in Switzerland and containment equipment and technology from Germany. According to these reports, this led to serious damage to computer facilities in a Swiss biological research facility by unidentified agents. Similar reports indicated that agents had destroyed German bio-containment equipment destined for Iran.
- More credible reports by US experts indicate that Iran has begun to stockpile anthrax and botulinum in a facility near Tabriz, can now mass manufacture such agents, and has them in an aerosol form. None of these reports, however, can be verified.
- The CIA has reported that Iran has, “sought dual-use biotech equipment from Europe and Asia, ostensibly for civilian use.” It also reported in 1996 that Iran might be ready to deploy biological weapons. Beyond this point, little unclassified information exists regarding the details of Iran's effort to “weaponize” and produce biological weapons.
  - Iran may have the production technology to make dry storable and aerosol weapons. This would allow it to develop suitable missile warheads and bombs and covert devices.
  - Iran may have begun active weapons production in 1996, but probably only at limited scale suitable for advanced testing and development.
  - CIA testimony indicates that Iran is believed to have weaponized both live agents and toxins for artillery and bombs and may be pursuing biological warheads for its missiles. The CIA reported in 1996 that, “We believe that Iran holds

some stocks of biological agents and weapons. Tehran probably has investigated both toxins and live organisms as biological warfare agents. Iran has the technical infrastructure to support a significant biological weapons program with little foreign assistance.

- CIA reported in June 1997 that Iran had obtained new dual use technology from China and India during 1996.
- Iran announced in June 1997 that it would not produce or employ chemical weapons including toxins.

Nuclear Weapons

- The Shah established the Atomic Energy Organization of Iran in 1974, and rapidly began to negotiate for nuclear power plants.
  - He concluded an extendible ten year nuclear fuel contract with the US in 1974, with Germany in 1976, and France in 1977.
  - In 1975, he purchased a 10% share in a Eurodif uranium enrichment plant being built at Tricastin in France that was part of a French, Belgian, Spanish, and Italian consortium. Under the agreement the Shah signed, Iran was to have full access to the enrichment technology Eurodif developed, and agreed to buy a quota of enriched uranium from the new plant.
  - He created an ambitious plan calling for a network of 23 power reactors throughout Iran that was to be operating by the mid-1990s, and sought to buy nuclear power plants from Germany and France.
  - By the time the Shah fell in January, 1979, he had six reactors under contract, and was attempting to purchase a total of 12 nuclear power plants from Germany, France, and the US. Two 1,300 megawatt German nuclear power plants at Bushehr were already 60% and 75% completed, and site preparation work had begun on the first of two 935 megawatt French plants at Darkhouin that were to be supplied by Framatome.
- The Shah also started a nuclear weapons program in the early to mid-1970s, building upon his major reactor projects, investment in URENCO, and smuggling of nuclear enrichment and weapons related technology from US and Europe.
  - 5 megawatt light-water research reactor operating in Tehran.
  - 27 kilowatt neutron-source reactor operating in Isfahan.
  - Started two massive 1300 megawatt reactor complexes.
  - The Shah attempted to covertly import controlled technology from the US/.
- US experts believe that Shah began a low-level nuclear weapons research program, centered at the Amirabad Nuclear Research Center. This research effort included studies of weapons designs and plutonium recovery from spent reactor fuel.
  - It also involved a laser enrichment program which began in 1975, and led to a complex and highly illegal effort to obtain laser separation technology from the US. This latter effort, which does not seems to have had any success, continued from 1976 until the Shah's fall, and four lasers operating in the critical 16 micron band were shipped to Iran in October, 1978.
  - At the same time, Iran worked on other ways to obtain plutonium, created a secret reprocessing research effort to use enriched uranium, and set up a small nuclear weapons design team.
  - In 1976, Iran signed a secret contract to buy $700 million worth of yellow cake from South Africa, and appears to have reached an agreement to buy up to 1,000 metric tons a year. It is unclear how much of this ore South Africa shipped before it agreed to adopt IAEA export restrictions in 1984, and whether South Africa really honored such export restrictions. Some sources indicate that South Africa still made major deliveries as late as 1988-1989.
  - Iran also tried to purchase 26.2 kilograms of highly enriched uranium; the application to the US for this purchase was pending when the Shah fell
  - The Shah did eventually accept full IAEA safeguards but there value is uncertain .

- In 1984, Khomeini revived nuclear weapons program begun under Shah.
  - Received significant West German and Argentine corporate support in some aspects of nuclear technology during the Iran-Iraq War.
  - Limited transfers of centrifuge and other weapons related technology from PRC, possibly Pakistan.
  - It has a Chinese-supplied heavy-water, zero-power research reactor at Isfahan Nuclear Research Center, and two-Chinese supplied sub-critical assemblies -- a light water and graphite design.
  - It has stockpiles of uranium and mines in Yazd area. It may have had a uranium-ore concentration facility at University of Tehran, but status unclear.
  - Some experts feel that the IRGC moved experts and equipment from the Amirabad Nuclear Research Center to a new nuclear weapons research facility near Isfahan in the mid-1980s, and formed a new nuclear research center at the University of Isfahan in 1984 -- with French assistance. Unlike many Iranian facilities, the center at Isfahan was not declared to the IAEA until February 1992, when the IAEA was allowed to make a cursory inspection of six sites that various reports had claimed were the location of Iran's nuclear weapons efforts.
  - (Bushehr I & II), on the Gulf Coast just southwest of Isfahan, were partially completed at the time of the Shah's fall. Iran attempted to revive the program and sought German and Argentine support, but the reactors were damaged by Iraqi air strikes in 1987 and 1988.
  - Iran may also have opened a new uranium ore processing plant close to its Shagand uranium mine in March, 1990, and it seems to have extended its search for uranium ore into three additional areas. Iran may have also begun to exploit stocks of yellow cake that the Shah had obtained from South Africa in the late 1970s while obtaining uranium dioxide from Argentina by purchasing it through Algeria.
  - Iran began to show a renewed interest in laser isotope separation (LIS) in the mid-1980s, and held a conference on LIS in September, 1987.
  - Iran opened a new nuclear research center in Isfahan in 1984, located about four kilometers outside the city and between the villages of Shahrida and Fulashans. This facility was built at a scale far beyond the needs of peaceful research, and Iran sought French and Pakistani help for a new research reactor for this center.
  - The Khomeini government may also have obtained several thousand pounds of uranium dioxide from Argentina by purchasing it through Algeria. Uranium dioxide is considerably more refined than yellow cake, and is easier to use in irradiating material in a reactor to produce plutonium.
- The status of Iran's nuclear program since the Iran-Iraq War is highly controversial, and Iran has denied the existence of such a program.
  - On February 7, 1990, the speaker of the Majlis publicly toured the Atomic Energy Organization of Iran and opened the new Jabir Ibn al Hayyan laboratory to train Iranian nuclear technicians. Reports then surfaced that Iran had at least 200 scientists and a work force of about 2,000 devoted to nuclear research
  - Iran's Deputy President Ayatollah Mohajerani stated in October, 1991, that Iran should work with other Islamic states to create an "Islamic bomb."
  - The Iranian government has repeatedly made proposals to create a nuclear-free zone in the Middle East. For example, President Rafsanjani was asked if Iran had a nuclear weapons program in an interview in the CBS program *60 Minutes* in February 1997. He replied, "Definitely not. I hate this weapon."
  - Other senior Iranian leaders, including President Khatami have made similar categorical denials. Iran's new Foreign Minister, Kamal Kharrazi, stated on October 5, 1997, that, ÒWe 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 repoerts thAT Iran has fully complied with its present requirements, and that it has found no indications of nuclEARweapons effort, but IAEA only inspects Iran's small research reactors.
  - The IAEA visits to other Iranian sites are not inspections, and do not use instruments, cameras, seals, etc. The are informal walk throughs.
  - The IAEA visited five suspect Iranian facilities in 1992 and 1993 in this manner, but did not conduct full inspections.
  - Iran has not had any 93+2 inspections and its position on improved inspections is that it will not be either the first or the last to have them.
  - Iranian officials have repeatedly complained that the West tolerated Iraqi use of chemical weapons and its nuclear and biological build-up during the Iran-Iraq War, and has a dual standard where it does not demand inspections of Israel or that Israel sign the NPT.
- These are reasons to assume that Iran still has a nuclear program:
  - Iran attempted to buy highly enriched fissile material from Khazakstan. The US paid between $20 million and $30 million to buy 1,300 pounds of highly enriched uranium from the Ust-Kamenogorsk facility in Khazakstan that Iran may have sought to acquire in 1992. A total of 120 pounds of the material -- enough for two bombs -- cannot be fully accounted for.
  - Iran has imported maraging steel, sometimes used for centrifuges, by smuggling it in through dummy fronts. Britain intercepted 110 pound (50 kilo) shipment in August, 1996. Seems to have centrifuge research program at Sharif University of Technology in Tehran. IAEA "visit" did not confirm.
  - Those aspects of Iran's program that are visible indicate that Iran has had only uncertain success. Argentina agreed to train Iranian technicians at its Jose Balaseiro Nuclear Institute, and sold Iran $5.5 million worth of uranium for its small Amirabad Nuclear Research Center reactor in May 1987. A CENA team visited Iran in late 1987 and early 1988, and seems to have discussed selling sell Iran the technology necessary to operate its reactor with 20% enriched uranium as a substitute for the highly enriched core provided by the US, and possibly uranium enrichment and plutonium reprocessing technology as well. Changes in Argentina's government, however, made it much less willing to support proliferation. The Argentine government announced in February, 1992, that it was canceling an $18 million nuclear technology sale to Iran because it had not signed a nuclear safeguards arrangement. Argentine press sources suggested, however, that Argentina was reacting to US pressure.
  - In February, 1990 a Spanish paper reported that Associated Enterprises of Spain was negotiating the completion of the two nuclear power plants at Bushehr. Another Spanish firm called ENUSA (National Uranium Enterprises) was to provide the fuel, and Kraftwerke Union (KWU) would be involved. Later reports indicated that a 10 man delegation from Iran's Ministry of Industry was in Madrid negotiating with the Director of Associated Enterprises, Adolofo Garcia Rodriguez.
  - Iran negotiated with Kraftwerke Union and CENA of Germany in the late 1980s and early 1990s. Iran attempted to import reactor parts from Siemens in Germany and Skoda in Czechoslovakia. None of these efforts solved Iran's problems in rebuilding its reactor program, but all demonstrate the depth of its interest.
  - Iran took other measures to strengthen its nuclear program during the early 1990s. It installed a cyclotron from Ion Beam Applications in Belgium at a facility in Karzaj in 1991.
  - Iran conducted experiments in uranium enrichment and centrifuge technology at its Sharif University of Technology in Tehran. Sharif University was also linked to efforts to import cylinders of fluorine suitable for processing enriched material, and attempts to import specialized magnets that can be used for centrifuges, from Thyssen in Germany in 1991.

- It is clear from Iran's imports that it has sought centrifuge technology ever since. Although many of Iran's efforts have never been made public, British customs officials seized 110 pounds of maraging steel being shipped to Iran in July 1996.
- Iran seems to have conducted research into plutonium separation and Iranians published research on uses of tritium that had applications to nuclear weapons boosting. Iran also obtained a wide range of US and other nuclear literature with applications for weapons designs. Italian inspectors seized eight steam condensers bound for Iran that could be used in a covert reactor program in 1993, and high technology ultrasound equipment suitable for reactor testing at the port of Bari in January, 1994.
- Other aspects of Iran's nuclear research effort had potential weapons applications. Iran continued to operate an Argentine-fueled five megawatt light water highly enriched uranium reactor at the University of Tehran. It is operated by a Chinese-supplied neutron source research reactor, and subcritical assemblies with 900 grams of highly enriched uranium, at its Isfahan Nuclear Research Center. This Center has experimented with a heavy water zero-power reactor, a light water sub-critical reactor, and a graphite sub-critical reactor. In addition, it may have experimented with some aspects of nuclear weapons design.

- The German Ministry of Economics has circulated a wide list of such Iranian fronts which are known to have imported or attempted to import controlled items. These fronts include the:
  - Bonyad e-Mostazafan;
  - Defense Industries Organization (Sazemane Sanaye Defa);
  - Pars Garma Company, the Sadadja Industrial Group (Sadadja Sanaye Daryaee);
  - Iran Telecommunications Industry (Sanaye Mokhaberet Iran);
  - Shahid Hemat Industrial Group, the State Purchasing Organization, Education Research Institute (ERI);
  - Iran Aircraft Manufacturing Industries (IAI);
  - Iran Fair Deal Company, Iran Group of Surveyors;
  - Iran Helicopter Support and Renewal Industries (IHI);
  - Iran Navy Technical Supply Center;
  - Iran Tehran Kohakd Daftar Nezarat, Industrial Development Group;
  - Ministry of Defense (Vezerate Defa).
- Iran claims it eventually needs to build enough nuclear reactors to provide 20% of its electric power. This Iranian nuclear power program presents serious problems in terms of proliferation. Although the reactors are scarcely ideal for irradiating material to produce Plutonium or cannibalizing the core, they do provide Iran with the technology base to make its own reactors, have involved other technology transfer helpful to Iran in proliferating and can be used to produce weapons if Iran rejects IAEA safeguards.
- Russian has agreed to build up to four reactors, beginning with a complex at Bushehr -- with two 1,000-1,200 megawatt reactors and two 465 megawatt reactors, and provide significant nuclear technology.
  - Russia has consistently claimed the light water reactor designs for Bushehr cannot be used to produce weapons grade Plutonium and are similar to the reactors the US is providing to North Korea.
  - The US has claimed, however, that Victor Mikhaliov, the head of Russia's Atomic Energy Ministry, proposed the sale of a centrifuge plant in April, 1995. The US also indicated that it had persuaded Russia not to sell Iran centrifuge technology as part of the reactor deal during the summit meeting between President's Clinton and Yeltsin in May, 1995.
  - It was only after US pressure that Russia publicly stated that it never planned to sell centrifuge and advanced enrichment technology to Iran, and Iran denied that it had ever been interested in such technology. For example, the statement of Mohammed Sadegh Ayatollahi, Iran's representative to the IAEA, stated that, "We've had contracts before for the Bushehr plant in which we agreed that the spent fuel would go back to the supplier. For

our contract with the Russians and Chinese, it is the same." According to some reports, Russia was to reprocess the fuel at its Mayak plant near Chelyabinsk in the Urals, and could store it at an existing facility, at Krasnoyarsk-26 in southern Siberia.

- The CIA reported in June 1997 that Iran had obtained new nuclear technology from Russia during 1996.
- A nuclear accident at plant at Rasht, six miles north of Gilan, exposed about 50 people to radiation in July, 1996.
- Russian Nuclear Energy Minister Yevgeny Adamov and Russian Deputy Prime Minister Vladimir Bulgak visited in March, 1998. and Iran and dismissed US complaints about the risk the reactors would be used to proliferate.
  - Russia indicated that it would go ahead with selling two more reactors for construction at Bushehr within the next five years.
- The first 1,000 megawatt reactor at Bushehr has experienced serious construction delays. In March, 1998, Russia and Iran agreed to turn the construction project into a turn key plant because the Iranian firms working on infrastructure had fallen well behind schedule. In February, Iran had agreed to fund improved safety systems. The reactor is reported to be on a 30 month completion cycle.
- The US persuaded the Ukraine not to sell Iran $45 million worth of turbines for its nuclear plant in early March, 1998, and to strengthen its controls on Ukrainian missile technology under the MTCR.

- China is reported to have agreed to provide significant nuclear technology transfer and possible sale of two 300 megawatt pressurized water reactors in the early 1990s, but then to have agreed to halt nuclear assistance to Iran after pressure from the US.
  - Iran signed an agreement with China's Commission on Science, Technology, and Industry for National Defense on January 21, 1991, to build a small 27-kilowatt research reactor at Iran's nuclear weapons research facility at Isfahan. On November 4, 1991, China stated that it had signed commercial cooperation agreements with Iran in 1989 and 1991, and that it would transfer an electromagnetic isotope separator (Calutron) and a smaller nuclear reactor, for "peaceful and commercial" purposes.
  - The Chinese reactor and Calutron were small research-scale systems and had no direct value in producing fissile material. They did, however, give Iran more knowledge of reactor and enrichment technology, and US experts believe that China provided Iran with additional data on chemical separation, other enrichment technology, the design for facilities to convert uranium to uranium hexaflouride to make reactor fuel, and help in processing yellowcake.
  - The US put intense pressure on China to halt such transfers. President Clinton and Chinese President Jiang Zemin reached an agreement at an October, 1997 summit. China strengthened this pledge in negations with the US in February, 1998.
  - In March, 1998, the US found that the China Nuclear Energy Corporation was negotiating to sell Iran several hundred tons of anhydrous hydrogen flouride (AHF) to Isfahan Nuclear Research Corporation in central Iran, a site where some experts believe Iran is working on the development of nuclear weapons. AHF can be used to separate plutonium, help refine yellow cake into uranium hexaflouride to produce U-235, and as a feedstock for Sarin. It is on two nuclear control lists. China agreed to halt the sale.
  - Iran denied that China had halted nuclear cooperation on March 15, 1998.
  - Even so, the US acting Under Secretary of State for Arms Control and International Security Affairs stated that China was keeping its pledge not to aid Iran on March 26, 1998.
- US estimates of Iran's progress in acquiring nuclear weapons have become more conservative with time.

- In 1992, the CIA estimated that Iran would have the bomb by the year 2000. In 1995, John Holum testified that Iran could have the bomb by 2003.

- In 1997, after two years in which Iran might have made progress, he testified that Iran could have the bomb by 2005-2007.
    - US experts increasingly refer to Iran's efforts as "creeping proliferation" and there is no way to tell when or if Iranian current efforts will produce a weapon, and unclassified lists of potential facilities have little credibility..
    - Timing of weapons acquisition depends heavily on whether Iran can buy fissile material -- if so it has the design capability and can produce weapons in 1-2 years -- or must develop the capability to process Plutonium or enrich Uranium -- in which case, it is likely to be 5-10 years.
- The control of fissile material in the FSU remains a major problem:
    - US estimates indicate the FSU left a legacy of some 1,485 tons of nuclear material. This include 770 tons in some 27,000 weapons, including 816 strategic bombs, 5,434 missile warheads, and about 20,000 theater and tactical weapons. In addition, there were 715 tons of fissile or near-fissile material in eight countries of the FSU in over 50 sites: enough to make 35,000-40,000 bombs.
    - There are large numbers of experienced FSU technicians, including those at the Russian weapons design center at Arzamas, and at nuclear production complexes at Chelyabinsk, Krasnoyarsk, and Tomsk.
    - These factors led the US to conduct Operation Sapphire in 1994, where the US removed 600 kilograms of highly enriched uranium from the Ulba Metallurgy Plant in Kazakhstan at a time Iran was negotiating for the material.
    - They also led to Britain and the US cooperating in Auburn Endeavor, and airlifting fissile material out of a nuclear research facility in Tiblisi, Georgia. There were 10 pounds of material at the institute, and 8.8 pounds were HEU. (It takes about 35 pounds to make a bomb.) This operation was reported in the New York Times on April 21, 1998. The British government confirmed it took place, but would not give the date.
- The Jerusalem Post reported on April 9, 1998 that Iran had purchased four tactical nuclear weapons from Russian smugglers for $25 million in the early 1990s, that the weapons had been obtained from Kazakhstan in 1991, and that Argentine technicians were helping to activate the weapon.
    - It quoted what it claimed was an Iranian report, dated December 26, 1991, of a meeting between Brigadier General Rahim Safavi, the Deputy Commander of the Revolutionary Guards and Reza Amrohalli, then head of the Iranian atomic energy organization.
    - It also quoted a second document -- dated January 2, 1992 --- saying the Iranians were awaiting the arrival of Russian technicians to show them how to disarm the protection systems that would otherwise inactivate the weapons if anyone attempted to use them.
    - The documents implied the weapons were flawed by did not indicate whether Iran had succeeded in activating them.
    - The US intelligence community denied any evidence that such a transfer had taken place.
- The most detailed reports of Iran's nuclear weapons program are the least reliable, and come from the People's Mujahideen, a violent, anti-regime, terrorist group. Such claims are very doubtful, but the People's Mujahideen has reported that:
    - Iran's facilities include a weapons site called Ma'allem Kelayah, near Qazvin on the Caspian. This is said to be an IRGC-run facility established in 1987, which has involved an Iranian investment of $300 million. Supposedly, the site was to house the 10 megawatt reactor Iran tried to buy from India.
    - Two Soviet reactors were to be installed at a large site at Gorgan on the Caspian, under the direction of Russian physicists.
    - The People's Republic of China provided uranium enrichment equipment and technicians for the site at Darkhouin, where Iran once planned to build a French reactor.
    - A nuclear reactor was being constructed at Karaj; and that another nuclear weapons facility exists in the south central part of Iran, near the Iraqi border.

- The ammonia and urea plant that the British firm M. W. Kellog was building at Borujerd in Khorassan province, near the border with Turkestan, might be adapted to produce heavy water.
- The Amir Kabar Technical University, the Atomic Energy Organization of Iran (AEOI) (also known as the Organization for Atomic Energy of Iran or AEOI), Dor Argham Ltd., the Education and Research Institute, GAM Iranian Communications, Ghoods Research Center, Iran Argham Co., Iran Electronic Industries, Iranian Research Organization, Ministry of Sepah, Research and Development Group, Sezemane Sanaye Defa, the Sharif University of Technology, Taradis Iran Computer Company, and Zakaria Al-Razi Chemical Company are all participants in the Iranian nuclear weapons effort.
- Other sources based on opposition data have listed the Atomic Energy Organization of Iran, the Laser Research Center and Ibn-e Heysam Research and Laboratory Complex, the Bonab Atomic Energy Research Center (East Azerbaijan), the Imam Hussein University of the Revolutionary Guards, the Jabit bin al-Hayyan Laboratory, the Khoshomi uranium mine (Yazd), a possible site at Moallem Kalayeh, the Nuclear Research Center at Tehran University, the Nuclear Research Center for Agriculture and Medicine (Karaj), the Nuclear Research Center of Technology (Isfahan), the Saghand Uranium mine (Yazd), the Sharif University (Tehran) and its Physics Research Center.

Missile Defenses

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

Iraq's Search for Weapons of Mass Destruction

Delivery Systems

- Prior to the Gulf War Iraq had extensive delivery systems incorporating long-range strike aircraft with refueling capabilities and several hundred regular and improved, longer-range Scud missiles, some with chemical warheads. These systems included:
  - Tu-16 and Tu-22 bombers.
  - MiG-29 fighters.
  - Mirage F-1, MiG-23BM, and Su-22 fighter attack aircraft.
  - A Scud force with a minimum of 819 missiles.
  - Extended range Al Husayn Scud variants (600 kilometer range) extensively deployed throughout Iraq, and at three fixed sites in northern, western, and southern Iraq.
  - Developing Al-Abbas missiles (900 kilometer range), which could reach targets in Iran, the Persian Gulf, Israel, Turkey, and Cyprus.
  - Long-range super guns with ranges of up to 600 kilometers.
- Iraq also engaged in efforts aimed at developing the Tamuz liquid fueled missile with a range of over 2,000 kilometers, and a solid fueled missile with a similar range. Clear evidence indicates that at least one design was to have a nuclear warhead.
- Iraq attempted to conceal a plant making missile engines from the UN inspectors. It only admitted this plant existed in 1995, raising new questions about how many of its missiles have been destroyed.
- Iraq had design work underway for a nuclear warhead for its long-range missiles.
- The Gulf War deprived Iraq of some of its MiG-29s, Mirage F-1s, MiG-23BMs, and Su-22s.
- Since the end of the war, the UN inspection regime has also destroyed many of Iraq's long-range missiles:

- UNSCOM has directly supervised the destruction of 48 Scud-type missiles.
- It has verfied the Iraqi unilateral destruction of 83 more missiles and 9 mobile launchers.

- The UN still estimates, however, that it is able to account for 817 of the 819 long-range missiles that Iraq imported in the period ending in 1988:
  - Pre-1980 expenditures, such as training 8
  - Expenditures during the Iran-Iraq War (1980-1981), including the war
  - of the cities in February-April 1988 516
  - Testing activities for the development of Iraq's modifications of
  - imported missiles and other experimental activities (1985-1990) 69
  - Expenditures during the Gulf War (January-March 191) 93
  - Destruction under the supervision of UNSCOM 48
  - Unilateral destruction by Iraq (mid-July and October 1991 83
  - UNSCOM's analysis has shown that Iraq had destroyed 83 of the 85 missiles it had claimed were destroyed. at the same time, it stated that Iraq had not given an adequate account of its proscribed missile assets, including launchers, warheads, and propellants.
  - UNSCOM also reports that it supervised the destruction of 10 mobile launchers, 30 chemnical warheads, and 18 conventional warheads.
- Iraq maintains a significant delivery capability consisting of:
  - HY-2, SS-N-2, and C-601 cruise missiles, which are unaffected by UN cease-fire terms.
  - FROG-7 rockets with 70 kilometer ranges, also allowed under UN resolutions.
  - Multiple rocket launchers and tube artillery.
  - Experimental conversions such as the SA-2.
- Iraq claims to have manufactured only 80 missile assemblies, 53 of which were unusable. UNSCOM claims that 10 are unaccounted for.
  - US experts believe Iraq may still have components for several dozen extended-range Scud missiles.
- In addition, Iraq has admitted to:
  - Hiding its capability to manufacture its own Scuds.
  - Developing an extended range variant of the FROG-7 called the Laith. The UN claims to have tagged all existing FROG-7s to prevent any extension of their range beyond the UN imposed limit of 150 kilometers for Iraqi missiles.
  - Experimenting with cruise missile technology and ballistic missile designs with ranges up to 3,000 kilometers.
  - Flight testing Al Husayn missiles with chemical warheads in April 1990.
  - Developing biological warheads for the Al Husayn missile as part of Project 144 at Taji.
  - Initiating a research and development program for a nuclear warhead missile delivery system.
  - Successfully developing and testing a warhead separation system.
  - Indigenously developing, testing, and manufacturing advanced rocket engines to include liquid-propellant designs.

  - Conducting research into the development of Remotely Piloted Vehicles (RPVs) for the dissemination of biological agents.
  - Attempting to expand its Ababil-100 program designed to build surface-to-surface missiles with ranges beyond the permitted 100-150 kilometers.
  - Importing parts from Britain, Switzerland, and other countries for a 350 mm "super gun," as well as starting an indigenous 600 mm supergun design effort.

- Iraq initially claimed that it had 45 missile warheads filled with chemical weapons in 1992. It then stated that it had 20 chemical and 25 biological warheads in 1995. UNSCOM established that it had a minimum of 75 operational warheads and 5 used for trials. It has evidence of the existence of additional warheads. It can only verify that 16 warheads were filled with Sarin, and 34 with chemical warfare binary components, and that 30 were destroyed under its supervision -- 16 with Sarin and 14 with binary components.
- US and UN officials conclude further that:
  - Iraq is trying to rebuild its ballistic missile program using a clandestine network of front companies to obtain the necessary materials and technology from European and Russian firms.
  - This equipment is then concealed and stockpiled for assembly concomitant with the end of the UN inspection regime.
  - The equipment clandestinely sought by Iraq includes advanced missile guidance components, such as accelerometers and gyroscopes, specialty metals, special machine tools, and a high-tech, French-made, million-dollar furnace designed to fabricate engine parts for missiles.
- Recent major violations and smuggling efforts:
  - In November, 1995, Iraq was found to have concealed an SS-21 missile it had smuggled in from Yemen.
  - Jordan found that Iraq was smuggling missile components through Jordan in early December, 1995. These included 115 gyroscopes in 10 crates, and material for making chemical weapons. The shipment was worth an estimated $25 million. Iraq claimed the gyroscopes were for oil exploration but they are similar to those used in the Soviet SS-N-18 SLBM. UNSCOM also found some gyroscopes dumped in the Tigris.
- Iraq retains the technology it acquired before the war and evidence clearly indicates an ongoing research and development effort, in spite of the UN sanctions regime.
- The fact the agreement allows Iraq to continue producing and testing short-range missiles (less than 150 kilometers range) means it can retain significant missile development effort.
  - The SA-2 is a possible test bed, but UNSCOM has tagged all missiles and monitors all high apogee tests.
  - Iraq's Al-Samoud and Ababil-100 programs are similar test beds. The Al-Samoud is a scaled-down Scud which Iraq seems to have tested.
  - Iraq continues to expand its missile production facility at Ibn Al Haytham, which has two new buildings large enough to make much longer-range missiles.
  - US satellite photographs reveal that Iraq has rebuilt its Al-Kindi missile research facility.
- Ekeus reported on December 18, 1996 that Iraq retained missiles, rocket launchers, fuel, and command system to "make a missile force of significance". UNSCOM reporting as of October, 1997 is more optimistic, but notes that Iraq, "continued to conceal documents describing its missile propellants, and the material evidence relating to its claims to have destroyed its indigenous missile production capabilities indicated in might has destroyed less than a tenth of what it claimed"

<u>Chemical Weapons</u>

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

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

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

- In revelations to the UN, Iraq admitted that, prior to the Gulf War, it:
    - Procured more than 1,000 key pieces of specialized production and support equipment for its chemical warfare program.
    - Maintained large stockpiles of mustard gas, and the nerve agents Sarin and Tabun.
    - Produced binary Sarin filled artillery shells, 122 mm rockets, and aerial bombs.
    - Manufactured enough precursors to produce 70 tons (70,000 kilograms) of the nerve agent VX. These precursors included 65 tons of choline and 200 tons of phosphorous pentasulfide and di-isopropylamine
    - Tested Ricin, a deadly nerve agent, for use in artillery shells.
    - Had three flight tests of long-range Scuds with chemical warheads.
    - Had a large VX production effort underway at the time of the Gulf War. The destruction of the related weapons and feedstocks has been claimed by Iraq, but not verified by UNSCOM. Iraq seems to have had at least 3,800 kilograms of V-agents by time the of the Gulf War, and 12-16 missile warheads.
- The majority of Iraq's chemical agents were manufactured at a supposed pesticide plant located at Muthanna. Various other production facilities were also used, including those at Salman Pak, Samara, and Habbiniyah. Though severely damaged during the war, the physical plant for many of these facilities has been rebuilt.
- Iraq possessed the technology to produce a variety of other persistent and non-persistent agents.
- The Gulf War and the subsequent UN inspection regime may have largely eliminated some of stockpiles and reduced production capability.
- During 191-1994, UNSCOM supervised the destruction of:
    - 38,537 filled and unfilled chemical munitions.
    - 690 tons of chemical warfare agents.
    - More than 3,000 tons of precursor chemicals.
    - Over 100 pieces of remaining production equipment at the Muthan State Establishment, Iraq's primary CW research, production, filling and storage site.
- Since that time, UNSCOM has forced new disclosures from Iraq that have led to:
    - The destruction of 325 newly identified production equipment, 120 of which were only disclosed in August, 1997.

    - The destruction of 275 tons of additional precursors.
    - The destruction of 125 analytic instruments.
    - The return of 91 analytic pieces of equipment to Kuwait.
- As of February, 1998, UNSCOM had supervised the destruction of a total of:
    - 40,000 munitions, 28,000 filled and 12,000 empty.
    - 480,000 liters of chemical munitions
    - 1,800,000 liters of chemical precursors.
    - eight types of delivery systems including missile warheads.
- US and UN experts believe Iraq has concealed significant stocks of precursors. Iraq also appears to retain significant amounts of production equipment dispersed before, or during, Desert Storm and not recovered by the UN.
- UNSCOM reports that Iraq has failed to account for
    - Special missile warheads intended for filling with chemical or biological warfare agent.
    - The material balance of some 550 155 mm mustard gas shells, the extent of VX programs, and the rationale for the acquisition of various types of chemical weapons
    - 130 tons of chemical warfare agents.
    - Some 4,000 tons of declared precursors for chemical weapons,
    - The production of several hundred tons of additional chemical warfare agents, the consumption of chemical precursors,
    - 107,500 empty casings for chemical weapons,
    - Whether several thousand additional chemical weapons were filled with agents,
    - The unilateral destruction of 15, 620 weapons, and the fate of 16,038 additional weapons Iraq claimed it had discarded. “The margin of error” in the accounting presented by Iraq is in the neighborhood of 200 munitions.”
    - Iraq systematically lied about the existence of its production facilities for VX gas until 1995, and made “significant efforts” to conceal its production capabilities after that date. Uncertainties affecting the destruction of its VX gas still affect some 750 tons of imported precursor chemicals, and 55 tons of domestically produced precursors. Iraq has made unverifiable claims that 460 tons were destroyed by Coalition air attacks, and that it unilaterally destroyed 212 tons. UNSCOM has only been able to verify the destruction of 155 tons and destroy a further 36 tons on its own.
- Iraq has developed basic chemical warhead designs for Scud missiles, rockets, bombs, and shells. Iraq also has spray dispersal systems.
- Iraq maintains extensive stocks of defensive equipment.
- The UN feels that Iraq is not currently producing chemical agents, but Iraq has offered no evidence that it has destroyed its VX production capability and/or stockpile. Further, Iraq retains the technology it acquired before the war and evidence clearly indicates an ongoing research and development effort, in spite of the UN sanctions regime.
- Recent UNSCOM work confirms that Iraq did deploy gas-filled 155 mm artillery and 122 mm multiple rocket rounds into the rear areas of the KTO during the Gulf War.
- Iraq’s chemical weapons had no special visible markings, and were often stored in the same area as conventional weapons.
- Iraq has the technology to produce stable, highly lethal VX gas with long storage times.
- May have developed improved binary and more stable weapons since the Gulf War.

- Since 1992, Iraq attempted to covertly import precursors and production equipment for chemical weapons through Qatar, Saudi Arabia, and Jordan since the Gulf War.
- The current status of the Iraqi program is as follows (according to US intelligence as of February 19, 1998):

Agent	Declared	Potential Unaccounted For	Comments
Chemical Agents	(Metric Tons)	(Metric Tons)	
VX Nerve Gas	3	300	Iraq lied about the program until 1995
G Agents (Sarin)	100-150	200	Figures include weaponized and bulk agents
Mustard Gas	500-600	200	Figures include weaponized and bulk agents
Delivery Systems	(Number)	(Number)	
Missile Warheads	75-100	45-70	UNSCOM supervised destruction of 30
Rockets	100,000	15,000-25,000	UNSCOM supervised destruction of 40,000, 28,000 of which were filled.
Aerial Bombs	16,000	2,000	
Artillery shells	30,000	15,000	
Aerial Spray Tanks	?	?	
Biological Weapons			

- Had highly compartmented “black” program with far tighter security regulations than chemical program.
- Had 18 major sites for some aspect of biological weapons effort before the Gulf War. Most were non-descript and had no guards or visible indications they were a military facility.
- The US targeted only one site during the Gulf War. It struck two sites, one for other reasons. It also struck at least two targets with no biological facilities that it misidentified.
- Systematically lied about biological weapons effort until 1995. First stated that had small defensive efforts, but no offensive effort. In July, 1995, admitted had a major defensive effort. In October, 1995, finally admitted major weaponization effort.
- Iraq has continued to lie about its biological weapons effort since October, 1995. It has claimed the effort was headed by Dr. Taha, a woman who only headed a subordinate effort. It has not admitted to any help by foreign personnel or contractors. It has claimed to have destroyed its weapons, but the one site UNSCOM inspectors visited showed no signs of such destruction and was later said to be the wrong site. It has claimed only 50 people were employed full time, but the scale of the effort would have required several hundred.
- Since July 1995, Iraq has presented three versions of FFCDs and four “drafts.”
    - The most recent FFCD was presented by Iraq on 11 September 1997. This submission followed the UNSCOM’s rejection, of the FFCD of June 1996. In the period since receiving that report, UNSCOM conducted eight inspections in an attempt to investigate critical areas of Iraq’s proscribed activities such as warfare agent production and destruction, biological munitions manufacturing, filling and destruction, and military involvement in and support to the proscribed program. Those investigations, confirmed the assessment that the June 1996 declaration was deeply deficient. The UNSCOM concluded that the new FFCD, it received on 11 September 1997, contains no significant changes from the June 1996 FFCD
- Iraq has not admitted to the production of 8,500 liters of anthrax, 19,000 liters of botulinum toxin, 2,200 liters of aflatoxin,
- Reports indicate that Iraq tested at least 7 principal biological agents for use against humans.
    - Anthrax, Botulinum, and Aflatoxin are known to be weaponized.

- Looked at viruses, bacteria, and fungi. Examined the possibility of weaponizing gas gangrene and Mycotoxins. Some field trials were held of these agents.
- Examined foot and mouth disease, haemorrhagic conjunctivitis virus, rotavirus, and camel pox virus.
- Conducted research on a "wheat pathogen" and a Mycotoxin similar to "yellow rain" defoliant.
- The "wheat smut" was first produced at Al Salman, and then put in major production during 1987-1988 at a plant near Mosul. Iraq claims the program was abandoned.

- The August 1995 defection of Lieutenant general Husayn Kamel Majid, formerly in charge of Iraq's weapons of mass destruction, revealed the extent of this biological weapons program. Lt. General Kamel's defection prompted Iraq to admit that it:
  - Imported 39 tons of growth media (31,000 kilograms or 68,200 pounds) for biological agents obtained from three European firms. According to UNSCOM, 3,500 kilograms or 7,700 pounds) remains unaccounted for. Some estimates go as high as 17 tons. Each ton can be used to produce 10 tons of bacteriological weapons.
  - Imported type cultures from the US which can be modified to develop biological weapons.
  - Had a laboratory- and industrial-scale capability to manufacture various biological agents including the bacteria which cause Anthrax and botulism; Aflatoxin, a naturally occurring carcinogen; clostridium perfringens, a gangrene-causing agent; the protein toxin Ricin; tricothecene Mycotoxins, such as T-2 and DAS; and an anti-wheat fungus known as wheat cover smut. Iraq also conducted research into the rotavirus, the camel pox virus and the virus which causes haemorrhagic conjunctivitis.
  - Created at least seven primary production facilities including the Sepp Institute at Muthanna, the Ghazi Research Institute at Amaria, the Daura Foot and Mouth Disease Institute, and facilities at Al-Hakim, Salman Pak Taji, and Fudaliyah. According to UNSCOM, weaponization occurred primarily at Muthanna through May, 1987 (largely Botulinum), and then moved to Al Salman. (Anthrax). In March, 1988 a plant was open at Al Hakim, and in 1989 an Aflatoxin plant was set up at Fudaliyah.
  - Had test site about 200 kilometers west of Baghdad, used animals in cages and tested artillery and rocket rounds against live targets at ranges up to 16 kilometers.
  - Took fermenters and other equipment from Kuwait to improve effort during the Gulf War.
  - Iraq had least 79 civilian facilities capable of playing some role in biological weapons production still in existence in 1997.
- The Iraqi program involving Aflatoxin leaves many questions unanswered.
  - Iraqi research on Aflatoxin began in May 1988 at Al Salman, where the toxin was produced by the growth of fungus aspergilus in 5.3 quart flasks.
  - The motives behind Iraq's research on Aflatoxin remain one of the most speculative aspects of its program. Aflatoxin is associated with fungal-contaminated food grains, and is considered non-lethal. It normally can produce liver cancer, but only after a period of months to years and in intense concentrations. There is speculation, however, that a weaponized form might cause death within days and some speculation that it can be used as an incapacitating agent.
  - Iraq moved its production of Aflatoxin to Fudaliyah in 1989, and produced 481 gallons of toxin in solution between November, 1988 and May, 1990.
  - It developed 16 R-400 Aflatoxin bombs and two Scud warheads. Conducted trials with Aflatoxin in 122 mm rockets and R-400 bombs in November 1989 and May and August 1990. Produced a total of 572 gallons of toxin and loaded 410.8 gallons into munitions.
  - UNSCOM concluded in October, 1997, that Iraq's accounting for its Aflatoxin production was not credible.

- Total Iraqi production of more orthodox biological weapons reached at least 19,000 liters of concentrated Botulinum (10,000 liters filled into munitions); 8,500 liters of concentrated Anthrax (6,500 liters filled into munitions); and 2,500 liters of concentrated Aflatoxin (1,850 liters filled into munitions).
    - It manufactured 6,000 liters of concentrated Botulinum toxin and 8,425 liters of Anthrax at Al-Hakim during 1990; 5400 liters of concentrated Botulinum toxin at the Daura Foot and Mouth Disease Institute from November 1990 to January 15, 1991; 400 liters of concentrated Botulinum toxin at Taji; and 150 liters of concentrated Anthrax at Salman Pak.
    - Iraq is also known to have produced at least:
        - 1,850 liters of Aflatoxin in solution at Fudaliyah.
        - 340 liters of concentrated clostridium perfringens, a gangrene-causing biological agent, beginning in August 1990.
        - 10 liters of concentrated Ricin at Al Salam. Claim abandoned work after tests failed.
- Iraq weaponized at least three biological agents for use in the Gulf War. The weaponization consisted of at least:
    - 100 bombs and 16 missile warheads loaded with Botulinum.
    - 50 R-400 air-delivered bombs and 5 missile warheads loaded with anthrax; and
    - 4 missile warheads and 7 R-400 bombs loaded with Aflatoxin, a natural carcinogen.
    - The warheads were designed for operability with the Al Husayn Scud variant.
- Iraq had other weaponization activities:
    - Armed 155 mm artillery shells and 122 mm rockets with biological agents.
    - Conducted field trials, weaponization tests, and live firings of 122 mm rockets armed with Anthrax and Botulinum toxin from March 1988 to May 1990.
    - Tested Ricin, a deadly protein toxin, for use in artillery shells.
    - Iraq produced at least 191 bombs and 25 missile warheads with biological agents.
    - Developed and deployed 250 pound aluminum bombs coverage in fiberglass. Bombs were designed so they could be mounted on both Soviet and French-made aircraft. They were rigged with parachutes for low altitudes drops to allow efficient slow delivery and aircraft to fly under radar coverage. Some debate over whether bombs had cluster munitions or simply dispersed agent like LD-400 chemical bomb.
    - Deployed at least 166 R-400 bombs with 85 liters of biological agents each during the Gulf War. Deployed them at two sites. One was near an abandoned runway where it could fly in aircraft, arm them quickly, and disperse with no prior indication of activity and no reason for the UN to target the runway.
    - Filled at least 25 Scud missile warheads, and 157 bombs and aerial dispensers, with biological agents during the Gulf War.
- Developed and stored drop tanks ready for use for three aircraft or RPV s with the capability of dispersing 2,000 liters of anthrax. Development took place in December 1990. Claimed later that tests showed the systems were ineffective.
    - The UN found, however, that Iraq equipped crop spraying helicopters for biological warfare and held exercises and tests simulating the spraying of Anthrax spores.
    - Iraqi Mirages were given spray tanks to disperse biological agents.
        - Held trials as late as January 13, 1991.
        - The Mirages were chosen because they have large 2,200 liter belly tanks and could be refueled by air, giving them a longer endurance and greater strike range.

- The tanks had electric valves to allow the agent to be released and the system was tested by releasing simulated agent into desert areas with scattered petri dishes to detect the biological agent. UNSCOM has video tapes of the aircraft.

- Project 144 at Taji produced at least 25 operational Al Husayn warheads. Ten of these were hidden deep in a railway tunnel, and 15 in holes dug in an unmanned hide site along the Tigris.
- Biological weapons were only distinguished from regular weapons by a black stripe.
- The UN claims that Iraq has offered no evidence to corroborate its claims that it destroyed its stockpile of biological agents after the Gulf War. Further, Iraq retains the technology it acquired before the war and evidence clearly indicates an ongoing research and development effort, in spite of the UN sanctions regime.
- UNSCOM reported in October 1997 that:
  - Iraq has never provided a clear picture of the role of its military in its biological warfare program, and has claimed it only played a token role.
  - It has never accounted for its disposal of growth media. The unaccounted for media is sufficient, in quantity, for the production of over three times more of the biological agent -- Anthrax -- Iraq claims to have been produced.
  - Bulk warfare agent production appears to be vastly understated by Iraq. Expert calculations of possible agent production quantities, either by equipment capacity or growth media amounts, far exceed Iraq's stated results
  - Significant periods when Iraq claims its fermenters were not utilized are unexplained
  - Biological warfare field trials are underreported and inadequately described.
  - Claims regarding field trials of chemical and biological weapons using R400 bombs are contradictory and indicate that, "more munitions were destroyed than were produced.
  - The Commission is unable to verify that the unilateral destruction of the BW-filled Al Hussein warheads has taken place."
  - There is no way to confirm whether Iraq destroyed 157 bombs of the R400 type, some of which were filled with Botulin or anthrax spores.
  - "The September 1997 FFCD fails to give a remotely credible account of Iraq's biological program. This opinion has been endorsed by an international panel of experts."
- The current status of the Iraqi program is as follows (according to US intelligence as of February 19, 1998):

Agent	Declared Concentrated Amount		Declared Total Amount		Uncertainty
	Liters	Gallons	Liters	Gallons	
Anthrax	8500	12,245	85000	22457	Could be 3-4 times declared amount
Botulinum toxin	19,400	NA	380,000	NA	Probably twice declared amount. Some extremely concentrated.
Gas Gangrene Clostridium Perfingens	340	90	3,400	900	Amounts could be higher
Aflatoxin	NA	NA	2,200	581	Major uncertainties
Ricin	NA	NA	10	2.7	Major uncertainites

- UNSCOM cannot confirm the unilateral destruction of 25 warheads. It can confirm the destruction of 23 of at least 157 bombs. Iraq may have more aerosol tanks.
- UN currently inspects 79 sites -- 5 used to make weapons before war; 5 vaccine or pharmaceutical sites; 35 research and university sites; thirteen breweries, distilleries, and dairies with dual-purpose capabilities; eight diagnostic laboratories.

- Iraq retains laboratory capability to manufacture various biological agents including the bacteria which cause anthrax, botulism, tularemia and typhoid.
- Many additional civilian facilities are capable of playing some role in biological weapons production.

Nuclear Weapons

- Inspections by UN teams have found evidence of two successful weapons designs, a neutron initiator, explosives and triggering technology needed for production of bombs, plutonium processing technology, centrifuge technology, Calutron enrichment technology, and experiments with chemical separation technology. Iraq had some expert technical support, including at least one German scientist who provided the technical plans for the URENCO TC-11 centrifuge.
- Iraq's main nuclear weapons related facilities were:
    - Al Atheer - center of nuclear weapons program. Uranium metallurgy; production of shaped charges for bombs, remote controlled facilities for high explosives manufacture.
    - Al Tuwaitha - triggering systems, neutron initiators, uranium metallurgy, and hot cells for plutonium separation. Laboratory production of UO_2, UCL_4, UF_6, and fuel fabrication facility. Prototype-scale gas centrifuge, prototype EMIS facility, and testing of laser isotope separation technology.
    - Al Qa Qa - high explosives storage, testing of detonators for high explosive component of implosion nuclear weapons.
    - Al Musaiyib/Al Hatteen - high explosive testing, hydrodynamic studies of bombs.
    - Al Hadre - firing range for high explosive devices, including FAE.
    - Ash Sharqat - designed for mass production of weapons grade material using EMIS.
    - Al Furat - designed for mass production of weapons grade material using centrifuge method.
    - Al Jesira (Mosul) - mass production of UCL_4.
    - Al Qaim - phosphate plant for production of U308.
    - Akashat uranium mine.
- Iraq had three reactor programs:
    - Osiraq/Tammuz I 40 megawatt light-water reactor destroyed by Israeli air attack in 1981.
    - Isis/Tammuz II 800 kilowatt light water reactor destroyed by Coalition air attack in 1991.
    - IRT-5000 5 megawatt light water reactor damaged by Coalition air attack in 1991.
- Iraq used Calutron (EMIS), centrifuges, plutonium processing, chemical defusion and foreign purchases to create new production capability after Israel destroyed most of Osiraq.
- Iraq established a centrifuge enrichment system in Rashidya and conducted research into the nuclear fuel cycle to facilitate development of a nuclear device.
- After invading Kuwait, Iraq attempted to accelerate its program to develop a nuclear weapon by using radioactive fuel from French and Russian-built reactors. It made a crash effort in September, 1990 to recover enriched fuel from its supposedly safe-guarded French and Russian reactors, with the goal of producing a nuclear weapon by April, 1991. The program was only halted after Coalition air raids destroyed key facilities on January 17, 1991.
- Iraq conducted research into the production of a radiological weapon, which disperses lethal radioactive material without initiating a nuclear explosion.
    - Orders were given in 1987 to explore the use of radiological weapons for area denial in the Iran-Iraq War.

    - Three prototype bombs were detonated at test sites -- one as a ground level static test and two others were dropped from aircraft.
    - Iraq claims the results were disappointing and the project was shelved but has no records or evidence to prove this.
- UN teams have found and destroyed, or secured, new stockpiles of illegal enriched material, major production and R&D facilities, and equipment-- including Calutron enriching equipment.
- UNSCOM believes that Iraq's nuclear program has been largely disabled and remains incapacitated, but warns that Iraq retains substantial technology and established a clandestine purchasing system in 1990 that it has used to import forbidden components since the Gulf War.
- The major remaining uncertainties are:
    - Iraq still retains the technology developed before the Gulf War and US experts believe an ongoing research and development effort continues, in spite of the UN sanctions regime.
    - Did Iraq conceal an effective high speed centrifuge program.
    - Are there elements for radio9logical weapons.
    - Is it actively seeking to clandestinely buy components for nuclear weapons and exami9ning the purchase of fissile material from outside Iraq.
    - Is it continuing with the development of a missile warhead suited to the use of a nuclear device.
    - A substantial number of declared nuclear weapons components and research equipment has never been recovered. There is no reason to assume that Iraqi declarations were comprehensive.

Source: Prepared by Anthony H. Cordesman, Co-Director, Middle East Program, CSIS.

The Problem of Terrorism

The subject of terrorism presents a host of issues. It is often difficult to distinguish terrorism from unconventional or proxy warfare, and one person's "terrorist" is another person's "freedom fighter." Failed regimes create their own violent opposition through their mistreatment of minorities, repression, and economic failures. These pressures interact in the Gulf with the economic costs of war and revolution, and with a broad failure to offer Gulf youth the education, job opportunities, and social role necessary to fully integrate one of the world's youngest and most rapidly growing populations into its society. The "rentier," or welfare character, of Southern Gulf regimes and economies is rapidly becoming unaffordable, and Islamic extremism is often a natural refuge.

At one level, this is likely to pose at least a low-level continuing threat to US and other Western power projection forces and other foreigners in the Gulf as the natural proxies for the regime. This problem is likely to be compounded by the dismal quality of the efforts of Southern Gulf regimes to explain their own security policies to their peoples or the reasons for the US and Western presence. At another level, those dispossessed and discriminated against are likely to use violence directly against their regimes and become the natural proxies of Iran and Iraq. This is particularly true in countries where royal families deny the legitimacy of their grievances, blame the problem on other states, and/or fail to respond to demands for broader political participation.

Generally, these threats will generally only be serious if Southern Gulf regimes consistently fail their peoples, and attempt to live in a world of patriarchal illusions. The bad news is that there will be e many bombings and killings in the years to come. The good news is that they should be as containable as those in other parts of the world if regimes transform their good intentions regarding economic and social reform into actions, and learn that they must communicate far more effectively with their own people. As bad as future "Embassy bombings" and "Al Khobars" may be, they will only be fatal to Gulf security if the Gulf's problems are allowed to escalate out of control -- something that currently seems improbable.

The key wild card is the possible use of weapons of mass destruction. Iran and Iraq have the option of exploiting a wide range of unconventional delivery methods that are far less expensive, difficult, and detectable than most of the previous delivery systems. In addition, Iraq and may be able to use other radical nations or groups that either sympathize with it or would strike against Iraq's enemies for their own reasons.

Once again, there is no way to determine what Iran and Iraq will or will not plan in the future. Their official attitude toward terrorism is the usual one of denial, but this has scarcely proved to be the reality in the past. Further, Iran and Iraq's efforts may well be improvised and reactive -- suddenly escalating the scale of its use of unconventional warfare/terrorism in reaction to a given contingency or the failure of its military forces. This makes any effort to characterize their use of such delivery methods purely speculative -- whether in terms of warning against such threats or denying their existence.

What is clear is that such attacks are technically feasible and could offer Iran and Iraq significant advantages in a wide range of scenarios. Table Seven illustrates this point. Many of the attacks postulated in this table may seem to borrow plots from bad spy novels and science fiction, but all of the scenarios are at least technically possible. These scenarios also illustrate the fact that Iraq does not need sophisticated military delivery systems or highly lethal weapons of mass destruction, but can use terrorism to pose existential threats, complex mixes of weapons of mass destruction, and mix terrorism with elements of covert action and deniability.

The danger of such scenarios is that they tend to overstate Iran and Iraq's willingness turn to extreme forms of terror, the readiness of proxies to risk dying, and Iran and Iraq's ability to undetectably execute complex attacks. At the same time, the scenarios in Table Seven are not difficult to execute, and only a few require large numbers of people and complex technical activity.

The actions of Aum Shinrikyo have already shown that it can be extremely difficult to characterize the level of extremism and capability for sophisticated action by a given group until it has committed at least one act of terror. The cell structure used by the violent elements of most Middle Eastern extremist groups tends to encourage the creation of compartmented groups with different and unpredictable commitments to violence. At the same time, the loose and informal chain of contacts between extremist movements, known terrorist groups, and radical governments like Iran creates the possibility of random or unpredictable transfers of technology or weapons. There are many possibilities and no clear probabilities.

Table Seven

Possible Unconventional or Terrorist Attack Scenarios Using Weapons of Mass Destruction: Iraq as a Test Case

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

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

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

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

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

- An Iraqi-backed terrorist group modifies the valves on a Japanese remote-controlled crop spraying helicopter which has been imported legally for agricultural purposes. It uses this system at night or near dawn to spray a chemical or biological agent at altitudes below radar coverage in a line-source

configuration. Alternatively, it uses a large home-built RPV with simple GPS guidance. The device eventually crashes undetected into the sea or in the desert. Delivery of a chemical agent achieves far higher casualties than any conventional military warhead. A biological agent is equally effective and the first symptoms appear days after the actual attack -- by which time treatment is difficult or impossible.

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

- An Iraqi-backed terrorist group scatters high concentrations of a radiological, chemical, or biological agent in various areas in a city, and trace elements into the processing intakes to the local water supply. When the symptoms appear, terrorist group makes its attack known, but claims that it has contaminated the local water supply. The authorities are forced to confirm that water is contaminated and mass panic ensues.

- Immunized terrorists carry small amounts of Anthrax or a similar biological agent onto a passenger aircraft like a B-747, quietly scatter the powder, and deplane at the regular scheduled stop. No airport detection system or search detects the agent. Some 70-80% of those on the aircraft die as a result of symptoms that only appear days later.

- Several identical nuclear devices are smuggled out of the FSU through Afghanistan or Central Asia. They do not pass directly through governments. One of the devices is disassembled to determine the precise technology and coding system used in the weapon's PAL. This allows users to activate the remaining weapons. The weapon is then disassembled to minimize detection with the fissile core shipped covered in lead. The weapon is successfully smuggled into the periphery of an urban area outside any formal security perimeter. A 100 kiloton ground burst destroys a critical area and blankets the region in fall out.

- The same device is shipped to Israel or a Gulf area in a modified standard shipping container equipped with detection and triggering devices that set it off as a result of local security checks or with a GPS system that sets it off automatically when it reaches the proper coordinates in the port of destination. The direct explosive effect is significant, but "rain out" contaminates a massive local area.

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

- An Iraqi -backed terrorist group scatters small amounts of a biological or radiological agent in a Jewish area during critical stages of the final settlement talks. Near panic ensures, and a massive anti-Palestinian reaction follows. Israeli security then learns that the terrorist group has scattered small amounts of the same agent in cells in every sensitive Palestinian town and area, and the terrorist group announces that it has also stored some in politically sensitive mosques and shrines. Israeli security is forced to shut down all Palestinian movement and carry out intrusive searches in every politically sensitive area. Palestinian riots and then exchanges of gun fire follow. The peace talks break down permanently.

- Iraq equips dhows to spread Anthrax. The dhows enter the ports of Kuwait as commercial vessels -- possibly with local or other Southern Gulf registrations and flags. It is several days before the attack is detected, and the resulting casualties include much of the population of Abu Dhabi and government of the UAE. The UAE breaks up as a result, no effective retaliation is possible, and Iran achieves near hegemony over Gulf oil policy.

- An Iraqi-backed terrorist group attempting to drive Western influence out of Saudi Arabia smuggles a large nuclear device into Al Hufuf on the edge of the Ghawar oil field. It develops a crude fall out model using local weather data which it confirms by sending out scouts with cellular phones. It waits for the ideal wind, detonates the devices, shuts down the world's largest exporting oil field, and causes the near collapse of Saudi Arabia.

- Alternatively, the same group takes advantage of the security measures the US has adopted in Saudi Arabia, and the comparative isolation of US military personnel. It waits for the proper wind pattern and allows the wind to carry a biological agent over a Saudi airfield with a large US presence from an area outside the security perimeter. The US takes massive casualties and has no ability to predict the next attack. It largely withdraws from Saudi Arabia.

- A freighter carrying fertilizer enters a Middle Eastern port and docks. In fact, the freighter has mixed the fertilizer with a catalyst to create a massive explosion and also carries a large amount of a chemical, radiological, and/or biological agent. The resulting explosion destroys both the immediate target area and scatters the chemical or biological weapon over the area.

- A large terrorist device goes off in a populated, critical economic, or military assembly area -- scattering mustard or nerve gas. Emergency teams rush in to deal with the chemical threat and the residents are evacuated. Only later does it become clear that the device also included a biological agent and that the response to this "cocktail" killed most emergency response personnel and the evacuation rushed the biological agent to a much wider area.