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# **India, Pakistan, and Proliferation in the Middle East**

## **Proliferation's "Western Front"**

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## Reasons for Proliferating and War Fighting Options

- Reasons for proliferating outweigh disincentives, and motivation is growing.
- Arms control regimes harass proliferators without stopping stem and fail to offer non-proliferators security.
- War fighting concepts are likely to lack clear structure and be highly volatile in terms of enemy, targets, and crisis behavior.
- Only a few leadership and military elites -- such as Egypt and Israel -- have shown a concern with highly structured strategic planning in the past.
- Iran-Iraq and Gulf Wars have demonstrated missiles and weapons of mass destruction will be used.
- Israeli actions in 1967 and attack on Osirak, Egyptian and Syrian attack on Israel in 1973, demonstrate regional focus on surprise and preemption.
- Iraq has already demonstrated regional concern with launch on warning, launch under attack options. Syria probably has some option of this kind.
- Concentration of population and leadership in single or a few urban areas makes existential attacks possible.

## Reasons for Proliferating

- **Prestige**
- **Deterrence**
- **War fighting**
- **Lessons of Iran-Iraq War and Gulf War: Missiles and weapons of mass destruction have been used against military and civilian targets.**
- **Arms race with neighbors: Algeria-Libya-Morocco, Egypt-Israel-Syria, Iran-Iraq-Southern Gulf.**
- **The “greater Middle East” -- growing overlap of arms races listed above, plus impact of North Korea and India-Pakistan arms race.**
- **Deterrence and safeguards: No way to know the scale of the efforts of key threats and other major regional actors.**
- **Intimidation**
- **Limit or attack US and other outside power projection options**
- **Compensate for conventional weakness and cost of conventional weapons.**
- **“Glitter Factor”**
- **Alternative to expensive conventional investments**
- **Create existential threat**

**Force arms control; react to absence of meaningful arms control regimes.**

- **Momentum of arms race/respond to proliferation elsewhere**
- **State, proxy, or private terrorism.**

## **War Fighting Options**

- **Covert-indirect, unconventional warfare, “terrorism”**
- **Surprise attack to support conventional war fighting**
- **Avoid conventional defeat**
- **Pose political threat - intimidation**
- **Regional Deterrence - threatened or illustrative use**
- **Attack power projection facilities**
- **Counterproliferation**
- **Extended deterrence**

### **Controlled escalation ladder**

- **Asymmetric escalation/escalation dominance**
- **“Firebreaks”**
- **Launch on warning/launch under attack**
- **Seek to force conflict termination**
- **Destroy enemy as state**

### **Martyrdom**

- **Alter strategic nature of conflict**

## **One-Half Cheer for Arms Control**

- **Egyptian-Israeli dispute has paralyzed ACRS and all near term progress.**
- **NPT aids in early to mid-phases of proliferation. Transfer of technology for fuel cycle**
- **IAEA inspection and “visits” to declared facilities help, but can also be manipulated to disguise proliferation.**
- **Dual use technology now allows states to carry out virtually all aspects of weapons design and manufacture -- including simulated tests.**
- **In spite of Iraq’s grandiose effort, the ability to carry out all aspects of nuclear proliferation except acquiring fissile materials is becoming steadily cheaper, smaller in scale, and easier to conceal.**
- **The CWC only affects signer countries and large efforts or those disclosed through SIGINT; it cannot prevent development and assembly of up to several hundred weapons and warheads.**
- **The steady expansion of petrochemical, industrial process plants, and insecticide plants will make it progressively easier to produce chemical weapons without extensive imports of tell tale feedstocks.**
- **The need to purify and stabilize mustard and nerve agents is now well known, as is the need for more lethal warhead technology. All major proliferators have nerve gas technology.**
- **The BWC has no enforcement provisions and no near to mid-term prospects of acquiring them.**
- **Advances in biotechnology, food processing systems, and pharmaceuticals mean all regional states will soon be able to covertly mass produce dry storage biological weapons in optimal aerosol form.**
- **The MTCR slows things down and is very valuable, but it has not prevented any determined regional actor from getting missiles.**
- **All credible regional proliferators already have long-range strike aircraft and a wide range of unconventional delivery options.**
- **Only a broadly based UNSCOM/IAEA effort of the kind going on in Iraq -- supported by even more intrusive inspection and higher levels of technology -- can really enforce arms control, and it might not work for biological weapons.**

## Strategy, Tactics, and Operations

- **Likely to be radical differences in every aspect of strategy, tactics, operations, and capability between Middle Eastern states.**
- **Israel likely to be only state to develop detailed war plans and tactical employment concepts, and its grand strategy precludes communicating any detailed doctrine of employment and deterrence before a war. Weapons of mass destruction are likely to be used only to prevent the military conquest of Israel after a conventional defeat or in response to major attacks on Israeli population centers.**
- **Many countries may not articulate detailed war plans and employment doctrine beyond the prestige of acquiring such weapons, broad threats, and efforts to intimidate their neighbors and the West.**
- **Even where nations appear to articulate a strategy of deterrence or employment, this may often consist more of words than detailed war fighting capabilities**
- **Most (all?) nations will engage in concealment, denial, and compartmentation -- focusing more on the acquisition and development effort than employment. Targeting plans, test and evaluation, and understanding of lethality will be limited. Joint warfare concepts will rarely be articulated, and doctrine will not be practiced.**
- **WMD forces will often be covert or compartmented from other forces, and under the direct control of ruling elites with little real military experience. Separate lines of C<sup>4</sup>/BM reporting directly to the leadership will be common. Actual weapons may be held separately from delivery systems and by special units chosen more for loyalty than capability.**
- **Any actual employment will be crisis driven, and utilization and escalation will be more a product of the attitudes and decisions of a narrow ruling political elite than any part of the military command chain. Risk taking will often be leader-specific and based on perceptions of a crisis shaped more by internal political attitudes than an objective understanding of the military situation.**
- **Employment is unlikely to be irrational or reckless, but restraint in attacking civilian targets or mass employment against armed forces may be limited. Regimes may also take existential risks in escalating if they feel they are likely to lose power.**
- **The use of proxies and unconventional delivery means may well be improvised without warning.**
- **Proliferating nations will pay highly detailed attention to US counterproliferation and ATBM efforts at the technical level, and the lessons of previous wars. They will seek to steadily improve concealment, denial, and countermeasures.**
- **Arms control will be seen as an extension of conflict and rivalry by other means; not as a valid security option.**

## Major Uncertainties

- **Uncertain weapons accuracy, reliability, and effectiveness: The CEP problem, the weapons effect problem**
- **Probable lack of full operational testing of all weapons used: The “Heisenberg factor.”**
- **Acquisition does not mean war planning**
- **C<sup>4</sup>I/BM breakdowns/lack of accurate battle damage assessment by both attacker and attacks.**
- **Uncertainties coming from use of different types of WMDs and delivery systems**
- **Unattributable attacks/proxy attacks**
- **Unconventional warfare, mass terrorism, covert delivery, delayed effects**
- **Impact of “Cocktails” = mixes of different agents or types of weapon of mass destruction**
- **Reliance on authoritarian leaders or elites who will never take the time to fully understand the technology and effects of weapons of mass destruction for sudden crisis decisions**
- **Coupling effects -- US linkages to allies**
- **Different perceptions of values/escalation ladder**
- **Risk of escalation “total war”: willingness to risk use of infectious agents,**
- **Instability of preemption, launch on warning, launch under attack options.**
- **The risk of martyrdom and nothing to lose: Unplanned “doomsday machines”**
- **Unexpected collateral damage**
- **Uncertain impact on conventional conflict**
- **Uncertain capabilities for NBC defense/counterproliferation**
- **Impact on peripheral states**
- **Long term damage effects**
- **Next generation arms race**

## **Proliferation is Already Here:**

### **Middle Eastern Case Studies in Creeping Proliferation**

- Israel relies on nuclear weapons, deterrence, “soft strike” preemption.
- Iran has chemical and probably biological weapons, nuclear effort continues.
- Iraq’s massive pre-Gulf War efforts will give it a major “break out” effort the moment UNSCOM/IAEA efforts cease and may give a major biological break out capability even with such efforts.
- Syria has significant chemical warfare capabilities and will soon acquire significant biological capabilities -- if it does not have them.
- Libyan chemical effort continues.
- Algerian and Egyptian efforts most uncertain.
- Terrorists, extremists, and “proxies” may also acquire such capabilities.

## Creeping Proliferation Affects Many Key Countries

<u>Country</u>	<u>Weapons of Mass Destruction</u>			<u>Long Range Strike Systems</u>	
	<u>Nuclear</u>	<u>Chemical</u>	<u>Biological</u>	<u>Missiles</u>	<u>Aircraft</u>
<b>Algeria</b>	<b>Research</b>	<b>?</b>	<b>?</b>	<b>No</b>	<b>MiG-23</b>
<b>Libya</b>	<b>Research</b>	<b>Deployed</b>	<b>Research</b>	<b>Scud B</b>	<b>Su-24</b>
<b>Egypt</b>	<b>Research</b>	<b>Stockpile</b>	<b>Research</b>	<b>Scud B</b>	<b>F-16C</b>
<b>Israel</b>	<b>100-200</b>	<b>Developed</b>	<b>Developed</b>	<b>Jericho II</b>	<b>F-15C</b>
<b>Syria</b>	<b>No</b>	<b>Deployed</b>	<b>Developed</b>	<b>Scud C</b>	<b>Su-24</b>
<b>Iran</b>	<b>Developing</b>	<b>Deployed</b>	<b>Deployed</b>	<b>Scud C</b>	<b>Su-24</b>
<b>Iraq</b>	<b>Research</b>	<b>Covert</b>	<b>Covert</b>	<b>Covert</b>	<b>Su-24</b>
<b>Yemen</b>	<b>No</b>	<b>Stockpiled*</b>	<b>No</b>	<b>SS-21*</b>	<b>Su-22</b>

\* Probably no longer usable.

## **Algeria's Search for Weapons of Mass Destruction**

### Delivery Systems

- 10 Su-24 long range strike aircraft.
- 40 MiG-23BN fighter ground attack aircraft.
- Tube artillery and multiple rocket launchers.
- Possible modification of Soviet SS-N-2B Styx.

### Chemical Weapons

- Possible development. No evidence of deployed systems.

### Biological Weapons

- Some early research activity.
- No evidence of production capability.

### Nuclear Weapons

- Deliberately sought to create a covert nuclear research program under military control with Chinese support.
- Secretly built a research reactor (Es Salam) at the Ain Oussera nuclear research facility. This was announced to be a 10-15 megawatt reactor using heavy water and low enriched uranium. The size of its cooling towers, however, indicated it might be as large as 60 megawatts. It was also located far from population centers, had no visible electric generating facilities and was defended by SA-5s. There were also indications Algeria might be constructing a facility to separate out weapons grade plutonium.
- Exposure led to Algeria's agreement to place the facility under IAEA inspection in May 1991, and adhered to the NPT in May 1993. It formally acceded to the NPT on January 12, 1995.
- Exposure to public opinion and Western objections and economic/political crisis seems to have largely halted further progress.
- Algeria does, however, have uranium deposits west of Tamanrasset in southeast Algeria, has a 1 megawatt reactor (Nur) at Draria on the coast east of Algiers, and has hot cells for the production of radioactive isotopes at Draria.

## Libya's Search for Weapons of Mass Destruction

### Delivery Systems

- Has developed a liquid-fueled missile with a range of 200 kilometers. No evidence of deployment.
- Al-Fatih solid-fueled missile with 300-450 mile range reported to have been under development with aid of German technical experts, but no signs of successful development.
- FROG-7 rocket launchers with 40 kilometer range.
- Deployed 80 Scud B launchers with 190 mile range in 1976, but could not successfully operate system. Many of the launchers and missiles sold to Iran.
- Purchased SS-N-2C and SSC-3 cruise missiles. Little operational capability.
- Pursued other missile development programs with little success.
- Tu-22 bombers with minimal operational capability.
- Su-24 long range strike fighters. These are operational and have with limited refueling capability using C-130s.
- operational Mirage 5D/DE and 10 Mirage 5DD fighter ground attack aircraft.
- Mirage F-1AD fighter ground attack aircraft.
- MiG-23BM Flogger F and 14 MiG-23U fighter ground attack.
- Su-20 and Su-22 Fitter E, J. F fighter ground attack aircraft.
- Tube artillery and multiple rocket launchers.
- Fired Scud missiles against the Italian island of Lampadusa in 1987.

### Chemical Weapons

- Claims will not sign CWC as long as other states have nuclear weapons.
- May have used mustard gas delivered in bombs by AN-26 aircraft in final phases of war against Chad in September, 1987.
- Pilot plant near Tripoli has been producing small amounts of chemical weapons since early 1980s.
- Are probably two other small research/batch production facilities.
- Main nerve and mustard gas production facilities in an industrial park at chemical weapons plant at Rabta. This plant can produce both the poison gas and the bombs, shells, and warheads to contain it. Are probably two other research facilities.
- Rabta Plant seems to have started test runs in mid-1988. It is a 30 building facility defended by SAM batteries and special troops. Has sheltered underground areas.
  - Libya has acquired large stocks of feedstocks for mustard gas like thiodiglycol, and precursors for nerve gas, and extensive amounts have been sent to Rabta.
  - At least 100 metric tons of blister and nerve agents have been produced at Rabta since the late 1980s, but production rate has been very low and plant is either not successful or is not being utilized because of fear of attack.
  - Some of production seems to be
  - The plant would have a capacity of 100 metric tons per year if operated at full capacity.
  - Fabricated fire at Rabta in 1990 to try to disguise the function of plant and fact was operating.

- German courts have convicted a German national in October 1996, for selling Libya a computer designed for use in chemical weapons programs and helping Libya to import equipment to clean the waste emissions from poison gas production from India using an Irish dummy corporation.
- Additional major chemical weapons plant in construction in extensive underground site near Tarhunah, a mountainous area 65 kilometers southeast of Tripoli, but few recent signs of activity.
- Tarhunah has been designed to minimize its vulnerability to air attack and has twin tunnels 200-450 feet long, protected by 100 feet of sandstone above the tunnels and a lining of reinforce concrete. This is far beyond the penetration capabilities of the US GBU-27B and GBU-28 penetration bombs. The GBU-28 can penetrate a maximum of 25-30 meters of earth or 6 meters of concrete.
- Libya rejected the proposal of President Mubarak that it open the Tarhuna facility to third country inspection to prove it was not a chemical weapons facility in April 1996.
- Reports of construction of another sheltered major facility near Sabha, 460 miles south of Tripoli.
- Reports of Chinese, North Korean, German, Swiss, and other European technical support and advisors.
- Reports of shipments of chemical weapons to Syria and Iran do not seem valid.
- Very low quality weapons designs with poor fusing and lethality.

#### Biological Weapons

- Some early research activity.
- No evidence of production capability.

#### Nuclear Weapons

- Has sought to create a development and production capability, but no evidence of any real progress or success.
- Unsuccessfully attempted to buy nuclear weapons from China in the 1970s.
- Qaddhafi called for Libyan production of nuclear weapons on April 29, 1990.
- Has explored for uranium, but no active mines or uranium mills.
- 10 megawatt, Soviet-supplied nuclear research reactor at Tajura acquired from the USSR in 1970s. Operates under IAEA safeguards.
- Had plan to build at 440 megawatt, Soviet-supplied reactor near the Gulf of Sidra in the 1970s, but canceled project.
- Ratified NPT in 1975. Declares all facilities under IAEA safeguards.
- Continues to train nuclear scientists and technicians abroad.

## **Egypt's Search for Weapons of Mass Destruction**

### Delivery Systems

- Cooperation with Iraq in paying for development and production of "Badar 2000" missile with a 750-1,000 kilometer range. This missile is reported to be a version of the Argentine Condor II or Vector missile. Ranges were reported from 820-980 kilometers, with the possible use of an FAE warhead.
  - Egyptian officers were arrested for trying to smuggle carbon materials for a missile out of the US. in June 1988.
  - Covert US efforts seem to have blocked this development effort.
- Has Scud B TELs and missiles with approximately 100 missiles with 300 kilometers range.
- Reports has developed plant to produce an improved version of the Scud B, and possibly Scud C, with North Korean cooperation.
- North Korean transfers include equipment for building Scud body, special gyroscope measuring equipment and pulse-code modulation equipment for missile assembly and testing.
- Reports in June, 1996 that has made major missile purchase from North Korea, and will soon be able to assemble such missiles in Egypt. Seven shipments from North Korea reported in March and April.
- Media reports that US satellites detected shipments of Scud C missile parts to Egypt in February-May, 1996 -- including rocket motors and guidance devices -- do not seem correct. The Scud C has a range of roughly 480 kilometers.
- The CIA reported in June 1997, however, that Egypt had acquired Scud B parts from Russia and North Korea during 1996.
- US suspects Egypt is developing a liquid-fueled missile called the Vector with an estimated range of 600-1200 kilometers.
- Another liquid-fueled missile under development known as 'Project T' has an estimated range of 450 kilometers.
- FROG 7 rocket launch units with 40 kilometers range.
- Cooperation with Iraq and North Korea in developing the Saqr 80 missile This rocket is 6.5 meters long and 210 mm in diameter, and weighs 660 kilograms. It has a maximum range of 50 miles (80 kilometers) and a 440 pound (200 kilogram) warhead. Longer range versions may be available.
- AS-15, SS-N-2, and CSS-N-1 cruise missiles.
- F-4E fighter ground attack aircraft.
- Mirage 5E2 fighter ground attack.
- Mirage 2000EM fighters.
- F-16A and 80 F-16C fighters
- Multiple rocket launcher weapons.
- Tube artillery

### Chemical Weapons

- Produced and used mustard gas in Yemeni civil war in 1960s, but agents may have been stocks British abandoned in Egypt after World War II. Effort was tightly controlled by Nasser and was unknown to many Egyptian military serving in Yemen.
- Completed research and designs for production of nerve and cyanide gas before 1973.
- Former Egyptian Minister of War, General Abdel Ranny Gamassay stated in 1975, that, "if Israel should decide to use a nuclear weapon in the battlefield, we shall use the weapons of mass destruction that are at our disposal."
- Seems to have several production facilities for mustard and nerve gas. May have limited stocks of bombs, rockets, and shells.
- Unconfirmed reports of recent efforts to acquire feed stocks for nerve gas. Some efforts to obtain feed stocks from Canada. May now be building feed stock plants in Egypt.
- Industrial infrastructure present for rapid production of cyanide gas.

Biological Weapons

- Research and technical base.
- No evidence of major organized research activity.

Nuclear Weapons

- Low level research effort. No evidence of more than basic research since the 1960s.

## Israel's Search for Weapons of Mass Destruction

### Delivery Systems

- New IRBM/ICBM range high payload booster developed with South Africa.
- Up to 50 "Jericho I" missiles deployed in shelters on mobile launchers with up to 400 miles range with a 2,200 pound payload, and with possible nuclear warhead storage nearby.
- Unverified claims that up to 100 missiles are deployed west of Jerusalem.
- A missile bases does seem to exist at Zachariah, several miles southeast of Tel Aviv.
  - Limestone region with caves, to shelter missiles, TELs, and vehicles.
  - Transport-Erector-Launchers (TELs) have been seen at this base on vehicles 16 meters long, 4 meters wide, and 3 meters high. May be road mobile for dispersal.
  - They carry missiles 14 meters long and 1.5 meters wide.
  - There seem to be 50 missiles deployed at the base.
  - Each TEL has three support vehicles. One is a guidance programmer and power vehicle. Another seems to be a firing control vehicle, and the third seems to be a communications vehicle.
  - The base is not hardened against nuclear attack, and would be vulnerable to chemical and biological attack.
- Jericho II missiles now deployed, and some were brought to readiness for firing during the Gulf War.
- These missiles seem to include a single stage follow-on to the Jericho I and a multistage longer range missile.
  - The missile seems to have a range of up to 900 miles with a 2,200 pound payload, and may be a cooperative development with South Africa. (Extensive reporting of such cooperation in press during October 25 and 26, 1989).
  - Commercial satellite imaging indicates the missile may be 14 meters long and 1.5 meters wide. Its deployment configuration hints that it may have radar area guidance similar to the terminal guidance in the Pershing II.
- Jericho II missile production facility at Be'er Yakov.
- A major missile test took place on September 14, 1989. It was either a missile test or failure of Ofeq-2 satellite.
- Work on development of TERCOM type smart warheads. Possible cruise missile guidance developments using GPS navigation systems.
- F-15, F-16, F-4E, and Phantom 2000 fighter-bombers capable of long range refueling and of carrying nuclear and chemical bombs.
- Tel Nof may be the air base used to arm aircraft with nuclear weapons. Storage facilities may exist at Zachariah
- Lance missile launchers and 160 Lance missiles with 130 kilometers range.
- Variant of the Popeye air-to-surface missile believed to have nuclear warhead.
- MAR-290 rocket with 30 kilometers range believed to be deployed
- MAR-350 surface-to-surface missile with range of 56 miles and 735 lb. payload believed to have completed development or to be in early deployment.
- Israel seeking super computers for Technion Institute (designing ballistic missile RVs), Hebrew University (may be engaged in hydrogen bomb research), and Israeli Military Industries (maker of "Jericho II" and Shavit booster).

### Chemical Weapons

- Reports of mustard and nerve gas production facility established in 1982 in the restricted area in the Sinai near Dimona seem incorrect. May have additional facilities. May have capacity to produce other gases. Probable stocks of bombs, rockets, and artillery.
- Extensive laboratory research into gas warfare and defense.
- Development of defensive systems includes Shalom Chemical Industries protection gear, Elbit Computer gas detectors, and Bezal R&D air crew protection system.

- Extensive field exercises in chemical defense.
- Gas masks stockpiled, and distributed to population with other civil defense instructions during Gulf War.
- Warhead delivery capability for bombs, rockets, and missiles, but none now believed to be equipped with chemical agents.

#### Biological Weapons

- Extensive research into weapons and defense.
- Ready to quickly produce biological weapons, but no reports of active production effort.

#### Nuclear Weapons

- Director of CIA indicated in May 1989, that Israel may be seeking to construct a thermonuclear weapon.
- Has two significant reactor projects: the 5 megawatt HEU light-water IRR I reactor at Nahal Soreq; and the 40-150 megawatt heavy water, IRR-2 natural uranium reactor used for the production of fissile material at Dimona. Only the IRR-1 is under IAEA safeguards.
- Dimona has conducted experiments in pilot scale laser and centrifuge enrichment, purifies UO<sub>2</sub>, converts UF<sub>6</sub>, and fabricates fuel for weapons purpose.
- Uranium phosphate mining in Negev, near Beersheba, and yellow cake is produced at two plants in the Haifa area and one in southern Israel.
- Pilot-scale heavy water plant operating at Rehovot.
- Estimates of numbers and types of weapons differ sharply.
  - Stockpile of at least 60-80 plutonium weapons.
  - May have well over 100 nuclear weapons assemblies, with some weapons with yields over 100 Kilotons.
  - US experts believe Israel has highly advanced implosion weapons. Known to have produced Lithium-6, allowing production of both tritium and lithium deuteride at Dimona. Facility no longer believed to be operating.
  - Some weapons may be ER variants or have variable yields.
  - Stockpile of up to 200-300 weapons is possible.
- Major weapons facilities include production of weapons grade Plutonium at Dimona, nuclear weapons design facility at Nahal Soreq (south of Tel Aviv), missile test facility at Palmikim, nuclear armed missile storage facility at Kefar Zekharya, nuclear weapons assembly facility at Yodefah, and tactical nuclear weapons storage facility at Eilabun in eastern Galilee.

#### Missile Defenses

- Patriot missiles with future PAC-3 upgrade to reflect lessons of the Gulf War.
- Arrow 2 two-stage ATBM with slant intercept ranges at altitudes of 8-10 and 50 kilometers speeds of up to Mach 9, plus possible development of the Rafale AB-10 close in defense missile with ranges of 10-20 kilometers and speeds of up to Mach 4.5. Taas rocket motor, Rafael warhead, and Tadiran BM/C4I system and "Music" phased array radar.
- Israel plans to deploy three batteries of the Arrow to cover Israel, each with four launchers, to protect up to 85% of its population.
- Undergoing phase two tests with successful flights on August 20, 1996 and March 11, 1997. Development costs is \$330 million with Israel paying 28% and the US paying 72%. Deployment will be jointly funded under a 1996 accord, as a part of a \$556 million six-year program. Israel will pay 64% and the US 36%.
- Will be deployed in batteries as a wide area defense system with intercepts normally at reentry or exoatmospheric altitudes. Capable of multi-target tracking and multiple intercepts.

#### Advanced Intelligence Systems

- The Shavit I launched Israel's satellite payload on September 19, 1989. It used a three stage booster system capable of launching a 4,000 pound payload over 1,200 miles or a 2,000 pound payload over 1,800

miles. It is doubtful that it had a payload capable of intelligence missions and seems to have been launched, in part, to offset the psychological impact of Iraq's missile launches.

- Ofeq 2 launched in April, 1990 -- one day after Saddam Hussein threatens to destroy Israel with chemical weapons if it should attack Baghdad.
- Launched first intelligence satellite on April 5, 1995, covering Syria, Iran, and Iraq in orbit every 90 minutes. The Ofeq 3 satellite is a 495 pound system launched using the Shavit launch rocket, and is believed to carry an imagery system. Its orbit pass over or near Damascus, Tehran, and Baghdad.

## Syria's Search for Weapons of Mass Destruction

### Delivery Systems

- Four SSM brigades: 1 with FROG, 1 with Scud Bs, 1 with Scud Cs, and 1 with SS-21s.
- New long range North Korean Scud Cs deployed
  - Two brigades of 18 launchers each are said to be deployed in a horseshoe shaped valley. This estimate of 36 launchers is based on the fact there are 36 tunnels into the hillside. The launchers must be for the Scud C since the older Scud Bs would not be within range of most of Israel. Up to 50 missiles are stored in bunkers to the north as possible reloads. There is a maintenance building and barracks.
  - Estimates indicate that Syria has 24-36 Scud launchers for a total of 120 missiles of all types. The normal ratio of launchers to missiles is 10:1, but Syria is focusing on both survivability and the capability to launch a large preemptive strike.
  - The Scud Cs have ranges of up to 550-600 kilometers.
  - Possible nerve gas warheads with cluster bomblets reported in September, 1997
  - CEP of 1,000-2,600 meters.
  - A training site exists about 6 kilometers south of Hama, with an underground facility where TELs and missiles are stored.
- Up to 12 additional Scud B launchers and 200 Scud B missiles with 310 kilometers range. Believed to have chemical warheads. Scud B warhead weighs 985 kilograms.
- 18 SS-21 launchers and at least 36 SS-21 missiles with 80-100 kilometers range. May be developing chemical warheads.
- Reports of Chinese deliveries of missiles do not seem correct:
  - Reports of PRC deliveries of missile components by China Precision Machinery Company, maker of the M-11, in July, 1996. The M-11 has a 186 mile range with a warhead of 1,100 pounds.
  - Some sources believe M-9 missile components, or M-9-like components delivered to Syria. Missile is reported to have a CEP as low as 300 meters.
- Sheltered or underground missile production/assembly facilities at Aleppo and Hama have been built with aid from Chinese, Iranian, and North Korean technicians. Possibly some Russian technical aid.
- A missile test site exists 15 kilometers south of Homs where Syria has tested missile modifications and new chemical warheads. It has heavy perimeter defenses, a storage area and bunkers, heavily sheltered bunkers, and a missile storage area just west of the site.
  - Syria has shorter range systems:
    - Short range M-1B missiles (up to 60 miles range) seem to be in delivery from PRC.
    - SS-N-3, and SSC-1b cruise missiles.
  - May be converting some long range surface-to-air and naval cruise missiles to use chemical warheads.
  - 20 Su-24 long range strike fighters.
  - 30-60 operational MiG-23BM Flogger F fighter ground attack aircraft.
  - 20 Su-20 fighter ground attack aircraft.
  - 60-70 Su-22 fighter ground attack aircraft.
  - 18 FROG-7 launchers and rockets.
  - Negotiations for PRC-made M-9 missile (185-375 mile range).
  - Multiple rocket launchers and tube artillery.

### Chemical Weapons

- First acquired small amounts of chemical weapons from Egypt in 1973.
- Began production of non-persistent nerve gas in 1984. May have had chemical warheads for missiles as early as 1985.
- Experts believe has stockpiled 500 to 1,000 metric tons of chemical agents.
- Believed to have begun deploying VX in late 1996, early 1997.
  - CIA reported in June 1997 that Syria had acquired new chemical weapons technology from Russia and Eastern Europe in 1996.

- Unconfirmed reports of sheltered Scud missiles with unitary Sarin or Tabun nerve gas warheads deployed in caves and shelters near Damascus.
- Tested Scuds in manner indicating possible chemical warheads in 1996.
- Seems to have cluster warheads and bombs.
- May have VX and Sarin in modified Soviet ZAB-incendiary bombs and PTAB-500 cluster bombs.
- Acquired design for Soviet Scud warhead using VX in 1970s.
- Major nerve gas, and possible other chemical agent production facilities north of Damascus. Two to three plants.
  - One facility is located near Homs and is located next to a major petrochemical plant. It reported produces several hundred tons of nerve gas a year.
  - Reports is building new major plant near Aleppo.
  - Reports that a facility co-located with the Center d'Etdues et de Recherche Scientifique (CERS) is developing a warhead with chemical bomblets for the Scud C.
- Many parts of the program are dispersed and compartmented. Missiles, rockets, bombs, and artillery shells are produced/modified and loaded in other facilities.
- Wide range of delivery systems:
  - Extensive testing of chemical warheads for Scud Bs. May have tested chemical warheads for Scud Cs.
  - Shells, bombs, and nerve gas warheads for multiple rocket launchers.
  - FROG warheads may be under development.
  - Reports of SS-21 capability to deliver chemical weapons are not believed by US or Israeli experts.
  - Israeli sources believe Syria has binary weapons and cluster bomb technology suitable for delivering chemical weapons.

#### Biological Weapons

- Signed, but not ratified the 1972 Biological and Toxin Weapons Convention. Extensive research effort.
- ACDA report in August 1996 indicated that, "it is highly probably that Syria is developing an offensive biological capability."
- Extensive research effort. Reports of one underground facility and one near the coast.
- Probable production capability for anthrax and botulism, and possibly other agents.
- Israeli sources claim Syria weaponized botulin and ricin toxin in early 1990s, and probably anthrax.
- Limited indications may be developing or testing biological variations on ZAB-incendiary bombs and PTAB-500 cluster bombs and Scud warheads.

#### Nuclear Weapons

- Ongoing research effort.
- No evidence of major progress in development effort.
- Announced nuclear reactor purchase plans including 10 megawatt research reactor and six power reactors in 1980s, but never implemented.
- Has miniature 30 kilowatt neutron-source reactor, but unsuitable for weapons production.

#### Missile Defenses

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

## 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 cities." Sixty-one were fired at Baghdad, nine at Mosul, five at Kirkuk, one at Takrit, and one at Kuwait. Iran fired as many as five missiles on a single day, and once fired three missiles within 30 minutes. This still, however, worked out to an average of only about one missile a day, and Iran was down to only 10-20 Scuds when the war of the cities ended.
- Iran's missile attacks were initially more effective than Iraq's attacks. This was largely a matter of geography. Many of Iraq's major cities were comparatively close to its border with Iran, but Tehran and most of Iran's major cities that had not already been targets in the war were outside the range of Iraqi Scud attacks. Iran's missiles, in contrast, could hit key Iraqi cities like Baghdad. This advantage ended when Iraq deployed extended range Scuds.
- The Scud B is a relatively old Soviet design which first became operational in 1967, designated as the R-17E or R-300E. The Scud B has a range of 290-300 kilometers with its normal conventional payload. The export version of the missile is about 11 meters long, 85-90 centimeters in diameter, and weighs 6,300 kilograms. It has a nominal CEP of 1,000 meters. The Russian versions can be equipped with conventional high explosive, fuel air explosive, runway penetrator, submunition, chemical, and nuclear warheads.
- The export version of the Scud B comes with a conventional high explosive warhead weighing about 1,000 kilograms, of which 800 kilograms are the high explosive payload and 200 are the warhead structure and fusing system. It has a single stage storable liquid rocket engine and is usually deployed on the MAZ-543 eight wheel transporter-erector-launcher (TEL). It has a strap-down inertial guidance, using three gyros to correct its ballistic trajectory, and uses internal graphite jet vane steering. The warhead hits at a velocity above Mach 1.5.
- Most estimates indicate that Iran now has 6-12 Scud launchers and up to 200 Scud B (R-17E) missiles with 230-310 KM range.
- Some estimates give higher figures. They estimate Iran bought 200-300 Scud Bs from North Korea between 1987 and 1992, and may have continued to buy such missiles after that time. Israeli experts estimate that Iran had at least 250-300 Scud B missiles, and at least 8-15 launchers on hand in 1997.
- US experts also believe that Iran can now manufacture virtually all of the Scud B, with the possible exception of the most sophisticated components of its guidance system and rocket motors. This makes it difficult to estimate how many missiles Iran has in inventory and can acquire over time, as well as to estimate the precise performance characteristics of Iran's missiles, since it can alter the weight of the warhead and adjust the burn time and improve the efficiency of the rocket motors

- Iran has new long range North Korean Scuds - with ranges near 500 kilometers.
  - The North Korean missile system is often referred to as a "Scud C." Typically, Iran formally denied the fact it had such systems long after the transfer of these missiles became a reality. Hassan Taherian, an Iranian foreign ministry official, stated in February, 1995, "There is no missile cooperation between Iran and North Korea whatsoever. We deny this."
  - In fact, a senior North Korean delegation traveled to Tehran to close the deal on November 29, 1990, and met with Mohsen Rezaei, the former commander of the IRGC. Iran either bought the missile then, or placed its order shortly thereafter. North Korea then exported the missile through its Lyongaksan Import Corporation. Iran imported some of these North Korean missile assemblies using its B-747s, and seems to have used ships to import others.
  - Iran probably had more than 60 of the longer range North Korean missiles by 1998, although other sources report 100, and one source reports 170.
  - Iran may have 5-10 Scud C launchers, each with several missiles. This total seems likely to include four new North Korean TELs received in 1995.
  - Iran seems to want enough missiles and launchers to make its missile force highly dispersible.
  - Iran may have begun to test its new North Korean missiles. There are reports it has fired them from mobile launchers at a test site near Qom about 310 miles (500 kilometers) to a target area south of Shahroud. There are also reports that units equipped with such missiles have been deployed as part of Iranian exercises like the Saeqer-3 (Thunderbolt 3) exercise in late October, 1993.
  - The missile is more advanced than the Scud B, although many aspects of its performance are unclear. North Korea seems to have completed development of the missile in 1987, after obtaining technical support from the People's Republic of China. While it is often called a "Scud C," it seems to differ substantially in detail from the original Soviet Scud B. It seems to be based more on the Chinese-made DF-61 than on a direct copy of the Soviet weapon.
  - Experts estimate that the North Korean missiles have a range of around 310 miles (500 kilometers), a warhead with a high explosive payload of 700 kilograms, and relatively good accuracy and reliability. While this payload is a bit limited for the effective delivery of chemical agents, Iran might modify the warhead to increase payload at the expense of range and restrict the using of chemical munitions to the most lethal agents such as persistent nerve gas. It might also concentrate its development efforts on arming its Scud C forces with more lethal biological agents. In any case, such missiles are likely to have enough range-payload to give Iran the ability to strike all targets on the southern coast of the Gulf and all of the populated areas in Iraq, although not the West. Iran could also reach targets in part of eastern Syria, the eastern third of Turkey, and cover targets in the border area of the former Soviet Union, western Afghanistan, and western Pakistan.
  - Accuracy and reliability remain major uncertainties, as does operational CEP. Much would also depend on the precise level of technology Iran deployed in the warhead. Neither Russia nor the People's Republic of China seem to have transferred the warhead technology for biological and chemical weapons to Iran or Iraq when they sold them the Scud B missile and CSS-8. However, North Korea may have sold Iran such technology as part of the Scud C sale. If it did so, such a technology transfer would save Iran years of development and testing in obtaining highly lethal biological and chemical warheads. In fact, Iran would probably be able to deploy far more effective biological and chemical warheads than Iraq had at the time of the Gulf War.
  - Iran may be working with Syria in such development efforts, although Middle Eastern nations rarely cooperate in such sensitive areas. Iran served as a transshipment point for North Korean missile deliveries during 1992 and 1993. Some of this transshipment took place using the same Iranian B-747s that brought missile parts to Iran. Others moved by sea. For example, a North Korean vessel called the *Des Hung Ho*, bringing missile parts for Syria, docked at Bandar Abbas in May, 1992. Iran then flew these parts to Syria. An Iranian ship coming from North Korea and a second North Korean

ship followed, carrying missiles and machine tools for both Syria and Iran. At least 20 of the North Korean missiles have gone to Syria from Iran, and production equipment seems to have been transferred to Iran and to Syrian plants near Hama and Aleppo.

- Iran has created shelters and tunnels in its coastal areas which it could use to store Scud and other missiles in hardened sites and reduce their vulnerability to air attack.
- Iran can now assemble Scud and Scud C missiles using foreign-made components.
- Iran is developing an indigenous missile production capability with both solid and liquid fueled missiles. Seems to be seeking capability to produce MRBMs.
  - The present scale of Iran's production and assembly efforts is unclear. Iran seems to have a design center, at least two rocket and missile assembly plants, a missile test range and monitoring complex, and a wide range of smaller design and refit facilities.
  - The design center is said to be located at the Defense Technology and Science Research Center, which is a branch of Iran's Defense Industry Organization, and located outside Karaj -- near Tehran. This center directs a number of other research efforts. Some experts believe it has support from Russian and Chinese scientists.
  - Iran's largest missile assembly and production plant is said to be a North Korean-built facility near Isfahan, although this plant may use Chinese equipment and technology. There are no confirmations of these reports, but this region is the center of much of Iran's advanced defense industry, including plants for munitions, tank overhaul, and helicopter and fixed wing aircraft maintenance. Some reports say the local industrial complex can produce liquid fuels and missile parts from a local steel mill.
  - A second missile plant is said to be located 175 kilometers east of Tehran, near Semnan. Some sources indicate this plant is Chinese-built and began rocket production as early as 1987. It is supposed to be able to build 600-1,000 Oghab rockets per year, if Iran can import key ingredients for solid fuel motors like ammonium perchlorate. The plant is also supposed to produce the Iran-130.
  - Another facility may exist near Bandar Abbas for the assembly of the Seersucker. China is said to have built this facility in 1987, and is believed to be helping the naval branch of the Guards to modify the Seersucker to extend its range to 400 kilometers. It is possible that China is also helping Iran develop solid fuel rocket motors and produce or assemble missiles like the CS-801 and CS-802. There have, however, been reports that Iran is developing extended range Scuds with the support of Russian experts, and of a missile called the Tondar 68, with a range of 700 kilometers.
  - Still other reports claim that Iran has split its manufacturing facilities into plants near Pairzan, Seman, Shiraz, Maghdad, and Islaker. These reports indicate that the companies involved in building the Scuds are also involved in Iran's production of poison gas and include Defense Industries, Shahid, Bagheri Industrial Group, and Shahid Hemat Industrial Group.
  - Iran's main missile test range is said to be further east, near Shahroud, along the Tehran-Mashhad railway. A telemetry station is supposed to be 350 kilometers to the south at Taba, along the Mashhad-Isfahan road. All of these facilities are reportedly under the control of the Islamic Revolutionary Guards Corps.
  - There have been reports that Iran ordered the North Korean No Dong missile, which may be able to carry nuclear and biological missile ranges of up to 900 kilometers. This missile could reach virtually any target in Gulf, Turkey, and Israel. The status of the No Dong program is increasingly uncertain, although North Korea had some developmental types at test facilities in 1997.
    - The No-Dong underwent flight tests at ranges of 310 miles (500 kilometers) on May 29, 1993. Some sources indicate that Iranians were present at these tests. Extensive further propulsion tests began in August 1994, and some reports indicate operational training began

for test crews in May 1995. Missile storage facilities began to be built in July 1995, and four launch sites were completed in October 1995.

- The progress of the program has been slow since that time, and may reflect development problems. However, mobile launchers were seen deployed in northeast North Korea on March 24, 1997. According to some reports, a further seven launcher units were seen at a facility about 100 kilometers from Pyongyang.
- The No-Dong 1 is a single-stage liquid-fueled missile, with a range of up to 1,000 to 1,300 kilometers (810 miles), although longer ranges may be possible with a reduced warhead and maximum burn. There are also indications that there may be a No-Dong 2, using the same rocket motor, but with an improved fuel supply system that allows the fuel to burn for a longer period.
- The missile is about 15.2 meters long -- four meters longer than the Scud B -- and 1.2 meters in diameter. The warhead is estimated to weigh 770 kilograms (1,200-1,750 pounds) and a warhead manufacturing facility exists near Pyongyang. The No-Dong has an estimated theoretical CEP of 700 meters at maximum range, versus 900 meters for the Scud B, although its practical accuracy could be as wide as 3,000-4,000 meters. It has an estimated terminal velocity of Mach 3.5, versus 2.5 for the Scud B, which presents added problems for tactical missile defense. The missile is transportable on a modified copy of the MAZ-543P TEL that has been lengthened with a fifth axle and which is roughly 40 meters long. The added support stand for the vertical launch modes brings the overall length to 60 meters, and some experts question whether a unit this big is practical
- Other reports indicate that Iran is developing two variants of the No Dong for indigenous production:
  - One version is reported to have a range of 800-930 miles and a 1,650 pound warhead. Reports differ sharply on its size. Jane's estimates a launch weight up to 16,000 kilograms, provided the system is derived from the No Dong. It could have a launch weight of 15,000 kilograms, a payload of 600 kilograms, and a range of 1,700-1,800 kilometers if it is based on a system similar to the Chinese CSS-5 (DF-21) and CSS-N3 ((JL-1). These systems entered service in 1983 and 1987.
  - Booster testing is reported to have taken place in 1997.
  - The other missile is said to have improved guidance components, a range of up to 1,240 miles and a warhead of up to 2,200 pounds.
  - IOC dates have ranged from 1999-2001.
  - These programs are said to have support from North Korea, and both Russian and Chinese firms and technicians. The Chinese firm is said to be Great Wall Industries. The Russian firms are said to include the Russian Central Aerohydrodynamic Institute, which has provided Iran's Shahid Hemmat Industrial Group (SHIG) with wind tunnels for missile design, equipment for manufacturing missile models, and the software for testing launch and reentry performance. They may also include Rosvoorouzhnie, a major Russian arms-export agency; NPO Trud, a rocket motor manufacturer; a leading research center called the Bauman Institute, and Polyus (Northstar), a major laser test and manufacturing equipment firm.
  - The details of these reports may be incorrect, but many US experts believe that Iran tested boosters in 1997 capable of ranges of 1,500 kilometers, and is approaching the point where it will be able to manufacture missiles with much longer ranges than the Scud B. It is unclear when they will be able to bring such programs to the final development stage, carry out suitable test firings, develop effective warheads, and deploy actual units. It is possible, however, that Iran could deploy its first units in three to five years, and by this time it may

have much more lethal chemical and biological warheads than Iraq had at the beginning of the Gulf War.

- Iran seems to have been interested in two developmental North Korean IRBMs called the Tapeo Dong 1 and Tapeo Dong 2. It is not clear how these missiles are linked to the earlier reports.
  - The Tapeo Dong 1 missile has an estimated maximum range of 2,000 kilometers, and the Tapeo Dong 2 may have a range up to 3,500 kilometers.
  - Both Tapeo Dongs are liquid fueled missiles which seem to have two stages.
  - Unlike the No-Dong, the Tapeo Dongs must be carried to a site in stages and then assembled at a fixed site. The No-Dong transporter may be able to carry both stages of the Tapeo Dong 1, but some experts believe that a special transporter is needed for the first stage of the Tapeo Dong 1, and for both stages of the Tapeo Dong 2.
- These reports about transfers of missile technology from North Korea cannot be separated from reports on transfers from China and Russia, and Iran may be obtaining technology from all three countries to support the same programs.
- The reports on China involve the least detail:
  - There have been past reports that Iran placed orders for PRC-made M-9 (CSS-6/DF-15) missile (280-620 kilometers range, launch weight of 6,000 kilograms).
  - It is more likely, however, that PRC firms are giving assistance in developing indigenous missile R&D and production facilities for the production of an Iranian solid fueled missile.
  - The US offered to provide China with added missile technology if it would agree to fully implement an end of technology transfer to Iran and Pakistan during meetings in Beijing on March 25-26, 1998.
- The CIA reported in June 1997 that Iran had obtained new missile technology from Russia and China during 1996. Since that time, there have been many additional reports of technology transfer from Russia.
  - Russia agreed in 1994 that it would adhere to the terms of the Missile Technology Control Regime and would place suitable limits on the sale or transfer of rocket engines and technology. Nevertheless, the CIA has identified Russia as a leading source of Iranian missile technology, and the State Department has indicated that President Clinton expressed US concerns over this cooperation to President Yeltsin. This transfer is one reason the President appointed former Ambassador Frank Wisner, and then Robert Galluci, as his special representatives to try to persuade Russia to put a firm halt to aid support of the Iran.
  - Eitan Ben Eliyahu -- the commander of the Israeli Air Force -- reported on April 14, 1997 that Iran had tested a missile capable of reaching Israel. The background briefings to his statement implied that Russia was assisting Iran in developing two missiles -- with ranges of 620 and 780 miles. Follow-on intelligence briefings that Israel provided in September, 1997, indicated that Russia was helping Iran develop four missiles.
    - These missiles included the Shihab missiles, with performance similar to those previously identified with Iranian missiles adapted from North Korean designs.
    - The Israeli reports indicated that the Shihab 3 was liquid fueled missile with a range of 810 miles (1,200-1,500 kilometers) and a payload of 1550 pounds (700 kilograms).
    - Israel claimed the Shihab might be ready for deployment as early as 1999 -- and the Shihab 4, with a range of 1,250 miles (some reports say up to 4,000 kilometers) and a payload in excess of one ton.

- The other two missiles were longer-range systems with a maximum ranges of up to 4,500-55,000 and 10,000 kilometers.
- US intelligence reports indicate that China has also been helping Iran with some aspects of these missile efforts.
- There have been other reports that Iran might be using Russian technology to develop a very long-range missiles with range of 3,500 to 6,250 kilometers.
  - It seems clear that Iran has obtained some of the technology and design details of the Russian SS-4. The SS-4 (also known as the R-12 or "Sandal") is an aging Russian liquid fuel designed that first went into service in 1959, and which was supposedly destroyed as part of the IRBM Treaty. It is a very large missile, with technology dating back to the early 1950s, although it was evidently updated at least twice during the period between 1959 and 1980. It has a CEP of 2-4 kilometers and a maximum range 2,000 kilometers, which means it can only be lethal with a nuclear warhead or a biological weapon with near-nuclear lethality.
  - At the same time, the SS-4's overall technology is relatively simple and it has a throwweight of nearly 1,400 kilograms (3,000 pounds). It is one of the few missile designs that a nation with a limited technology base could hope to manufacture or adapt, and its throwweight and range would allow Iran to use a relatively unsophisticated nuclear device or biological warhead. As a result, an updated version of the SS-4 might be a suitable design for a developing country.
- Russia has been a key supplier of missile technology.
  - Some sources have indicated that Russian military industries have signed contracts with Iran to help produce liquid fueled missiles and provide specialized wind tunnels, manufacture model missiles, and develop specialized computer software. For example, these reports indicate that the Russian Central Aerohydrodynamic Institute is cooperating with Iran's Defense Industries Organization (DIO) and the DIO's Shahid Hemmat Industrial Group (SHIG). The Russian State Corporation for Export and Import or Armament and Military Equipment (Rosvoorouzhnie) 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 Koptjev, the head of the Russian space program, should jointly examine the US intelligence and draft a report on Russian transfers to Iran. This report reached a very different conclusion from President Yeltsin and concluded that Russia had provided such aid to Iran. Further, on October 1, 1997 -- roughly a week after Yeltsin issued his denial -- the Russian security service issued a statement that it had "thwarted" an Iranian attempt to have parts for liquid fuel rocket motors manufactured in Russia, disguised as gas compressors and pumps.

- Russian firms said to be helping Iran included the Russian Central Aerohydrodynamic Institute which developed a special wind tunnel; Rosvoorouzhnie, a major Russian arms-export agency; 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 Minister Viktor Chernomyrdin, and Secretary of State Madeline Albright made an indirect threat that the Congress might apply sanctions. Sergi Yastrzhembsky, a Kremlin spokesman, initially responded by denying that any transfer of technology had taken place.
- This Russian denial was too categorical to have much credibility. Russia had previously announced the arrest of an Iranian diplomat on November 14, 1997, that it caught attempting to buy missile technology. The Iranian was seeking to buy blueprints and recruit Russian scientists to go to Iran. Yuri Koptev, the head of the Russian Space Agency, explained this, however, by stating that that, "There have been several cases where some Russian organizations, desperately struggling to make ends meet and lacking responsibility, have embarked on some ambiguous projects...they were stopped long before they got to the point where any technology got out."
- The end result of these talks was an agreement by Gore and Chernomyrdin to strengthen controls over transfer technology, but it was scarcely clear that it put an end to the problem. As Koptev has said, "There have been several cases where some Russian organizations, desperately struggling to make ends meet and lacking responsibility, have embarked on some ambiguous projects." Conditions in Russia are getting worse, not better, and the desperation that drives sales has scarcely diminished.
- Prime Minister Chernomyrdin again promised to strengthen his efforts to restrict technology transfer to Iran in a meeting with Gore on March 12, 1998. The US informed Russia of 13 cases of possible Russian aid to Iran at the meeting and offered to increase the number of Russian commercial satellite launches it would license for US firms as an incentive.
- New arrests of smugglers took place on April 9, 1998. The smugglers had attempted to ship 22 tons of specialized steel to Iran via Azerbaijan, using several Russia shell corporations as a cover.
- On April 16, 1998, the State Department declared 20 Russian agencies and research facilities were ineligible to receive US aid because of their role in transferring missile technology to Iran.
- A US examination of Iran's dispersal, sheltering, and hardening programs for its anti-ship missiles and other missile systems indicate that Iran has developed effective programs to ensure that they would survive a limited number of air strikes and that Iran had reason to believe that the limited number of

preemptive strikes Israel could conduct against targets in the lower Gulf could not be effective in denying Iran the capability to deploy its missiles.

- Iran has shorter missile range systems:
  - In 1990, Iran bought CSS-8 surface-to-surface missiles (converted SA-2s) from China with ranges of 130-150 kilometers.
  - Has Chinese sea and land-based anti-ship cruise missiles. Iran fired 10 such missiles at Kuwait during Iran-Iraq War, hitting one US-flagged tanker.
- Iran has acquired much of the technology necessary build long-range cruise missile systems from China:
  - Such missiles would cost only 10% to 25% as much as ballistic missiles of similar range, and both the HY-2 Seersucker and CS-802 could be modified relatively quickly for land attacks against area targets.
  - Iran reported in December, 1995 that it had already fired a domestically built anti-ship missile called the Saeqe-4 (Thunderbolt) during exercises in the Strait of Hormuz and Gulf of Oman. Other reports indicate that China is helping Iran build copies of the Chinese CS-801/CS-802 and the Chinese FL-2 or F-7 anti-ship cruise missiles. These missiles have relatively limited range. The range of the CS-801 is 8-40 kilometers, the range of the CS-802 is 15-120 kilometers, the maximum range of the F-7 is 30 kilometers, and the maximum range of the FL-10 is 50 kilometers. Even a range of 120 kilometers would barely cover targets in the Southern Gulf from launch points on Iran's Gulf coast. These missiles also have relatively small high explosive warheads. As a result, Iran may well be seeking anti-ship capabilities, rather than platforms for delivering weapons of mass destruction.
  - A platform like the CS-802 might, however, provide enough design data to develop a scaled-up, longer-range cruise missile for other purposes, and the Gulf is a relatively small area where most urban areas and critical facilities are near the coast. Aircraft or ships could launch cruise missiles with chemical or biological warheads from outside the normal defense perimeter of the Southern Gulf states, and it is at least possible that Iran might modify anti-ship missiles with chemical weapons to attack tankers -- ships which are too large for most regular anti-ship missiles to be highly lethal.
  - Building an entire cruise missile would be more difficult. The technology for fusing CBW and cluster warheads would be within Iran's grasp. Navigation systems and jet engines, however, would still be a major potential problem. Current inertial navigation systems (INS) would introduce errors of at least several kilometers at ranges of 1,000 kilometers and would carry a severe risk of total guidance failure -- probably exceeding two-thirds of the missiles fired. A differential global positioning system (GPS) integrated with the inertial navigation system (INS) and a radar altimeter, however, might produce an accuracy of 15 meters. Some existing remotely piloted vehicles (RPVs), such as the South African Skua claim such performance. Commercial technology is becoming available for differential global positioning system (GPS) guidance with accuracies of 2 to 5 meters.
  - There are commercially available reciprocating and gas turbine engines that Iran could adapt for use in a cruise missile, although finding a reliable and efficient turbofan engine for a specific design application might be difficult. An extremely efficient engine would have to be matched to a specific airframe. It is doubtful that Iran could design and build such an engine, but there are over 20 other countries with the necessary design and manufacturing skills.
  - While airframe-engine-warhead integration and testing would present a challenge and might be beyond Iran's manufacturing skills, it is inherently easier to integrate and test a cruise missile than a long-range ballistic missile. Further, such developments would be far less detectable than developing a ballistic system if the program used coded or low altitude directional telemetry.
  - Iran could bypass much of the problems inherent in developing its own cruise missile by modifying the HY-2 Seersucker for use as a land attack weapon and extending its range beyond 80 kilometers, or by modifying and improving the CS-801 (Ying Jai-1) anti-ship missile. There are reports that the Revolutionary Guards are working on such developments at a facility near Bandar Abbas.

- Su-24 long-range strike fighters with range-payloads roughly equivalent to US F-111 and superior to older Soviet medium bombers.
- F-4D/E fighter bombers with capability to carry extensive payloads to ranges of 450 miles.
- Can modify HY-2 Silkworm missiles and SA-2 surface-to-air missiles to deliver weapons of mass destruction.
- Iran has made several indigenous-long range rockets.
  - The Iran-130, or Nazeat, since the end of the Iran-Iraq War. The full details of this system remain unclear, but it seems to use commercially available components, a solid fuel rocket, and a simple inertial guidance system to reach ranges of about 90-120 kilometers. It is 355 mm in diameter, 5.9 meters long, weighs 950 kilograms, and has a 150 kilogram warhead. It seems to have poor reliability and accuracy, and its payload only seems to be several hundred kilograms.
  - The Shahin 2. It too has a 355 mm diameter, but is only 3.87 meters long, and weighs only 580 kilograms. It evidently can be equipped with three types of warheads: A 180 kilogram high explosive warhead, another warhead using high explosive submunitions, and a warhead that uses chemical weapons.
  - Iranian Oghab (Eagle) rocket with 40+ kilometers range.
  - New SSM with 125 mile range may be in production, but could be modified FROG.
- Large numbers of multiple rocket launchers and tube artillery for short range delivery of chemical weapons.

#### Chemical Weapons

- Iran purchased large amounts of chemical defense gear from the mid-1980s onwards. Iran also obtained stocks of non-lethal CS gas, although it quickly found such agents had very limited military impact since they could only be used effectively in closed areas or very small open areas.
- Acquiring poisonous chemical agents was more difficult. Iran did not have any internal capacity to manufacture poisonous chemical agents when Iraq first launched its attacks with such weapons. While Iran seems to have made limited use of chemical mortar and artillery rounds as early as 1985 -- and possibly as early as 1984 -- these rounds were almost certainly captured from Iraq.
- Iran had to covertly import the necessary equipment and supplies, and it took several years to get substantial amounts of production equipment, and the necessary feedstocks. Iran sought aid from European firms like Lurgi to produce large "pesticide" plants, and began to try to obtain the needed feedstock from a wide range of sources, relying heavily on its Embassy in Bonn to manage the necessary deals. While Lurgi did not provide the pesticide plant Iran sought, Iran did obtain substantial support from other European firms and feedstocks from many other Western sources.
- By 1986-1987, Iran developed the capability to produce enough lethal agents to load its own weapons. The Director of the CIA, and informed observers in the Gulf, made it clear that Iran could produce blood agents like hydrogen cyanide, phosgene gas, and/or chlorine gas. Iran was also able to weaponize limited quantities of blister (sulfur mustard) and blood (cyanide) agents beginning in 1987, and had some capability to weaponize phosgene gas, and/or chlorine gas. These chemical agents were produced in small batches, and evidently under laboratory scale conditions, which enabled Iran to load small numbers of weapons before any of its new major production plants went into full operation.
- These gas agents were loaded into bombs and artillery shells, and were used sporadically against Iraq in 1987 and 1988.
- Reports regarding Iran's production and research facilities are highly uncertain:
  - Iran seems to have completed completion of a major poison gas plant at Qazvin, about 150 kilometers west of Tehran. This plant is reported to have been completed between November, 1987 and January,

1988. While supposedly a pesticide plant, the facility's true purpose seems to have been poison gas production using organophosphorous compounds.

- It is impossible to trace all the sources of the major components and technology Iran used in its chemical weapons program during this period. Mujahideen sources claim Iran also set up a chemical bomb and warhead plant operated by the Zakaria Al-Razi chemical company near Mahshar in southern Iran, but it is unclear whether these reports are true.
- Reports that Iran had chemical weapons plants at Damghan and Parchin that began operation as early as March, 1988, and may have begun to test fire Scuds with chemical warheads as early as 1988-1989, are equally uncertain.
- Iran established at least one large research and development center under the control of the Engineering Research Centre of the Construction Crusade (Jahad e-Sazandegi), had established a significant chemical weapons production capability by mid-1989,
- Debates took place in the Iranian parliament or Majlis in late 1988 over the safety of Pasdaran gas plants located near Iranian towns, and that Rafsanjani described chemical weapons as follows: "Chemical and biological weapons are poor man's atomic bombs and can easily be produced. We should at least consider them for our defense. Although the use of such weapons is inhuman, the war taught us that international laws are only scraps of paper."
- Post Iran-Iraq War estimates of Iran chemical weapons production are extremely uncertain:
  - US experts believe Iran was beginning to produce significant mustard gas and nerve gas by the time of the August, 1988 cease-fire in the Iran-Iraq War, although its use of chemical weapons remained limited and had little impact on the fighting
  - Iran's efforts to equip plants to produce V-agent nerve gases seem to have been delayed by US, British, and German efforts to limit technology transfers to Iran, but Iran may have acquired the capability to produce persistent nerve gas during the mid 1990s.
  - Production of nerve gas weapons started no later than 1994.
  - Began to stockpile of cyanide (cyanogen chloride), phosgene, and mustard gas weapons after 1985. Recent CIA testimony indicates that production capacity may approach 1,000 tons annually.
- Weapons include bombs and artillery. Shells include 155 mm artillery and mortar rounds. Iran also has chemical bombs and mines. It may have developmental chemical warheads for its Scuds, and may have a chemical package for its 22006 RPV (doubtful).
- There are reports that Iran has deployed chemical weapons on some of its ships.
- Iran has increased chemical defensive and offensive warfare training since 1993.
- Iran is seeking to buy more advanced chemical defense equipment, and has sought to buy specialized equipment on world market to develop indigenous capability to produce advanced feedstocks for nerve weapons.
  - CIA sources indicated in late 1996, that China might have supplied Iran with up to 400 tons of chemicals for the production of nerve gas.
  - One report indicated in 1996, that Iran obtained 400 metric tons of chemical for use in nerve gas weapons from China -- including carbon sulfide.
  - Another report indicated that China supplied Iran with roughly two tons of calcium-hypochlorate in 1996, and loaded another 40,000 barrels in January or February of 1997. Calcium-hypochlorate is used for decontamination in chemical warfare.
  - Iran placed several significant orders from China that were not delivered. Razak Industries in Tehran, and Chemical and Pharmaceutical Industries in Tabriz ordered 49 metric tons of alkyl

dimethylamine, a chemical used in making detergents, and 17 tons of sodium sulfide, a chemical used in making mustard gas. The orders were never delivered, but they were brokered by Iran's International Movallid Industries Corporation (Imaco) and China's North Chemical Industries Co. (Nocinco). Both brokers have been linked to other transactions affecting Iran's chemical weapons program since early 1995, and Nocinco has supplied Iran with several hundred tons of carbon disulfide, a chemical used in nerve gas.

- Another Chinese firm, only publicly identified as Q. Chen, seems to have supplied glass vessels for chemical weapons.
- The US imposed sanctions on seven Chinese firms in May, 1997, for selling precursors for nerve gas and equipment for making nerve gas -- although the US made it clear that it had, "no evidence that the Chinese government was involved." The Chinese firms were the Nanjing Chemical Industries Group and Jiangsu Yongli Chemical Engineering and Import/Export Corporation. Cheong Yee Ltd., a Hong Kong firm, was also involved. The precursors included thionyl chloride, dimethylamine, and ethylene chlorohydril. The equipment included special glass lined vessels, and Nanjing Chemical and Industrial Group completed construction of a production plant to manufacture such vessels in Iran in June, 1997.
- Iran sought to obtain impregnated Alumina, which is used to make phosphorous-oxychloride -- a major component of VX and GB -- from the US.
- It has obtained some equipment from Israelis. Nahum Manbar, an Israeli national living in France, was convicted in an Israeli court in May 1997 for providing Iran with \$16 million worth of production equipment for mustard and nerve gas during the period from 1990 to 1995.
- CIA reported in June 1997 that Iran had obtained new chemical weapons equipment technology from China and India in 1996.
- India is assisting in the construction of a major new plant at Qazvim, near Tehran, to manufacture phosphorous pentasulfide, a major precursor for nerve gas. The plant is fronted by Meli Agrochemicals, and the program was negotiated by Dr. Mejid Tehrani Abbaspour, a chief security advisor to Rafsanjani.
- A recent report by German intelligence indicates that Iran has made major efforts to acquire the equipment necessary to produce Sarin and Tabun, using the same cover of purchasing equipment for pesticide plants that Iraq used for its Sa'ad 16 plant in the 1980s. German sources note that three Indian companies -- Tata Consulting Engineering, Transpek, and Rallis India -- have approached German pharmaceutical and engineering concerns for such equipment and technology under conditions where German intelligence was able to trace the end user to Iran
- Iran ratified the Chemical Weapons Convention in June, 1997.
  - It submitted a statement in Farsi to the CWC secretariat in 1998, but this consisted only of questions in Farsi as to the nature of the required compliance.
  - It has not provided the CWC with any data on its chemical weapons program.

#### Biological Weapons

- Extensive laboratory and research capability.
- Weapons effort documented as early as 1982. Reports surfaced that Iran had imported suitable type cultures from Europe and was working on the production of Mycotoxins -- a relatively simple family of biological agents that require only limited laboratory facilities for small scale production.
- US intelligence sources reported in August, 1989, that Iran was trying to buy two new strains of fungus from Canada and the Netherlands that can be used to produce Mycotoxins. German sources indicated that Iran had successfully purchased such cultures several years earlier.

- The Imam Reza Medical Center at Mashhad Medical Sciences University and the Iranian Research Organization for Science and Technology were identified as the end users for this purchasing effort, but it is likely that the true end user was an Iranian government agency specializing in biological warfare.
- Many experts believe that the Iranian biological weapons effort was placed under the control of the Islamic Revolutionary Guards Corps, which is known to have tried to purchase suitable production equipment for such weapons.
- Since the Iran-Iraq War, Iran has conducted research on more lethal active agents like Anthrax, hoof and mouth disease, and biotoxins. In addition, Iranian groups have repeatedly approached various European firms for the equipment and technology necessary to work with these diseases and toxins.
  - Unclassified sources of uncertain reliability have identified a facility at Damghan as working on both biological and chemical weapons research and production, and believe that Iran may be producing biological weapons at a pesticide facility near Tehran.
  - Some universities and research centers may be linked to biological weapons program.
  - Reports surfaced in the spring of 1993 that Iran had succeeded in obtaining advanced biological weapons technology in Switzerland and containment equipment and technology from Germany. According to these reports, this led to serious damage to computer facilities in a Swiss biological research facility by unidentified agents. Similar reports indicated that agents had destroyed German bio-containment equipment destined for Iran.
  - More credible reports by US experts indicate that Iran has begun to stockpile anthrax and botulinum in a facility near Tabriz, can now mass manufacture such agents, and has them in an aerosol form. None of these reports, however, can be verified.
  - The CIA has reported that Iran has, "sought dual-use biotech equipment from Europe and Asia, ostensibly for civilian use." It also reported in 1996 that Iran might be ready to deploy biological weapons. Beyond this point, little unclassified information exists regarding the details of Iran's effort to "weaponize" and produce biological weapons.
- Iran may have the production technology to make dry storable and aerosol weapons. This would allow it to develop suitable missile warheads and bombs and covert devices.
- Iran may have begun active weapons production in 1996, but probably only at limited scale suitable for advanced testing and development.
- CIA testimony indicates that Iran is believed to have weaponized both live agents and toxins for artillery and bombs and may be pursuing biological warheads for its missiles. The CIA reported in 1996 that, "We believe that Iran holds some stocks of biological agents and weapons. Tehran probably has investigated both toxins and live organisms as biological warfare agents. Iran has the technical infrastructure to support a significant biological weapons program with little foreign assistance.
- CIA reported in June 1997 that Iran had obtained new dual use technology from China and India during 1996.
- Iran announced in June 1997 that it would not produce or employ chemical weapons including toxins.

#### Nuclear Weapons

- The Shah established the Atomic Energy Organization of Iran in 1974, and rapidly began to negotiate for nuclear power plants.
  - He concluded an extendible ten year nuclear fuel contract with the US in 1974, with Germany in 1976, and France in 1977.
  - In 1975, he purchased a 10% share in a Eurodif uranium enrichment plant being built at Tricastin in France that was part of a French, Belgian, Spanish, and Italian consortium. Under the agreement the

Shah signed, Iran was to have full access to the enrichment technology Eurodif developed, and agreed to buy a quota of enriched uranium from the new plant.

- He created an ambitious plan calling for a network of 23 power reactors throughout Iran that was to be operating by the mid-1990s, and sought to buy nuclear power plants from Germany and France.
- By the time the Shah fell in January, 1979, he had six reactors under contract, and was attempting to purchase a total of 12 nuclear power plants from Germany, France, and the US. Two 1,300 megawatt German nuclear power plants at Bushehr were already 60% and 75% completed, and site preparation work had begun on the first of two 935 megawatt French plants at Darkhouin that were to be supplied by Framatome.
- The Shah also started a nuclear weapons program in the early to mid-1970s, building upon his major reactor projects, investment in URENCO, and smuggling of nuclear enrichment and weapons related technology from US and Europe.
  - 5 megawatt light-water research reactor operating in Tehran.
  - 27 kilowatt neutron-source reactor operating in Isfahan.
  - Started two massive 1300 megawatt reactor complexes.
  - The Shah attempted to covertly import controlled technology from the US/.
- US experts believe that Shah began a low-level nuclear weapons research program, centered at the Amirabad Nuclear Research Center research effort included studies of weapons designs and plutonium recovery from spent reactor fuel.
  - It also involved a laser enrichment program which began in 1975, and led to a complex and highly illegal effort to obtain laser separation technology from the US. This latter effort, which does not seem to have had any success, continued from 1976 until the Shah's fall, and four lasers operating in the critical 16 micron band were shipped to Iran in October, 1978.
  - At the same time, Iran worked on other ways to obtain plutonium, created a secret reprocessing research effort to use enriched uranium, and set up a small nuclear weapons design team.
  - In 1976, Iran signed a secret contract to buy \$700 million worth of yellow cake from South Africa, and appears to have reached an agreement to buy up to 1,000 metric tons a year. It is unclear how much of this ore South Africa shipped before it agreed to adopt IAEA export restrictions in 1984, and whether South Africa really honored such export restrictions. Some sources indicate that South Africa still made major deliveries as late as 1988-1989.
  - Iran also tried to purchase 26.2 kilograms of highly enriched uranium; the application to the US for this purchase was pending when the Shah fell
  - The Shah did eventually accept full IAEA safeguards but their value is uncertain .
- In 1984, Khomeini revived nuclear weapons program begun under Shah.
  - Received significant West German and Argentine corporate support in some aspects of nuclear technology during the Iran-Iraq War.
  - Limited transfers of centrifuge and other weapons related technology from PRC, possibly Pakistan.
  - It has a Chinese-supplied heavy-water, zero-power research reactor at Isfahan Nuclear Research Center, and two-Chinese supplied sub-critical assemblies -- a light water and graphite design.
  - It has stockpiles of uranium and mines in Yazd area. It may have had a uranium-ore concentration facility at University of Tehran, but status unclear.
  - Some experts feel that the IRGC moved experts and equipment from the Amirabad Nuclear Research Center to a new nuclear weapons research facility near Isfahan in the mid-1980s, and formed a new nuclear research center at the University of Isfahan in 1984 -- with French assistance. Unlike many

Iranian facilities, the center at Isfahan was not declared to the IAEA until February 1992, when the IAEA was allowed to make a cursory inspection of six sites that various reports had claimed were the location of Iran's nuclear weapons efforts.

- (Bushehr I & II), on the Gulf Coast just southwest of Isfahan, were partially completed at the time of the Shah's fall. Iran attempted to revive the program and sought German and Argentine support, but the reactors were damaged by Iraqi air strikes in 1987 and 1988.
- Iran may also have opened a new uranium ore processing plant close to its Shagand uranium mine in March, 1990, and it seems to have extended its search for uranium ore into three additional areas. Iran may have also begun to exploit stocks of yellow cake that the Shah had obtained from South Africa in the late 1970s while obtaining uranium dioxide from Argentina by purchasing it through Algeria.
- Iran began to show a renewed interest in laser isotope separation (LIS) in the mid-1980s, and held a conference on LIS in September, 1987.
- Iran opened a new nuclear research center in Isfahan in 1984, located about four kilometers outside the city and between the villages of Shahrida and Fulashans. This facility was built at a scale far beyond the needs of peaceful research, and Iran sought French and Pakistani help for a new research reactor for this center.
- The Khomeini government may also have obtained several thousand pounds of uranium dioxide from Argentina by purchasing it through Algeria. Uranium dioxide is considerably more refined than yellow cake, and is easier to use in irradiating material in a reactor to produce plutonium.
- The status of Iran's nuclear program since the Iran-Iraq War is highly controversial, and Iran has denied the existence of such a program.
  - On February 7, 1990, the speaker of the Majlis publicly toured the Atomic Energy Organization of Iran and opened the new Jabir Ibn al Hayyan laboratory to train Iranian nuclear technicians. Reports then surfaced that Iran had at least 200 scientists and a work force of about 2,000 devoted to nuclear research
  - Iran's Deputy President Ayatollah Mohajerani stated in October, 1991, that Iran should work with other Islamic states to create an "Islamic bomb."
  - The Iranian government has repeatedly made proposals to create a nuclear-free zone in the Middle East. For example, President Rafsanjani was asked if Iran had a nuclear weapons program in an interview in the CBS program *60 Minutes* in February 1997. He replied, "Definitely not. I hate this weapon."
  - Other senior Iranian leaders, including President Khatami have made similar categorical denials. Iran's new Foreign Minister, Kamal Kharrazi, stated on October 5, 1997, that, "We are certainly not developing an atomic bomb, because we do not believe in nuclear weapons... We believe in and promote the idea of the Middle East as a region free of nuclear weapons and other weapons of mass destruction. But why are we interested to develop nuclear technology? We need to diversify our energy sources. In a matter of a few decades, our oil and gas reserves would be finished and therefore, we need access to other sources of energy...Furthermore, nuclear technology has many other utilities in medicine and agriculture. The case of the United States in terms of oil reserve is not different from Iran's. The United States also has large oil resources, but at the same time they have nuclear power plants. So there is nothing wrong with having access to nuclear technology if it is for peaceful purposes..."
- The IAEA reports that Iran has fully complied with its present requirements, and that it has found no indications of nuclear weapons effort, but IAEA only inspects Iran's small research reactors.
  - The IAEA visits to other Iranian sites are not inspections, and do not use instruments, cameras, seals, etc. They are informal walk throughs.

- The IAEA visited five suspect Iranian facilities in 1992 and 1993 in this manner, but did not conduct full inspections.
- Iran has not had any 93+2 inspections and its position on improved inspections is that it will not be either the first or the last to have them.
- Iranian officials have repeatedly complained that the West tolerated Iraqi use of chemical weapons and its nuclear and biological build-up during the Iran-Iraq War, and has a dual standard where it does not demand inspections of Israel or that Israel sign the NPT.
- These are reasons to assume that Iran still has a nuclear program:
  - Iran attempted to buy highly enriched fissile material from 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, Adolfo Garcia Rodriguez.
  - Iran negotiated with Kraftwerke Union and CENA of Germany in the late 1980s and early 1990s. Iran attempted to import reactor parts from Siemens in Germany and Skoda in Czechoslovakia. None of these efforts solved Iran's problems in rebuilding its reactor program, but all demonstrate the depth of its interest.
  - Iran took other measures to strengthen its nuclear program during the early 1990s. It installed a cyclotron from Ion Beam Applications in Belgium at a facility in Karzaj in 1991.
  - Iran conducted experiments in uranium enrichment and centrifuge technology at its Sharif University of Technology in Tehran. Sharif University was also linked to efforts to import cylinders of fluorine suitable for processing enriched material, and attempts to import specialized magnets that can be used for centrifuges, from Thyssen in Germany in 1991.
  - It is clear from Iran's imports that it has sought centrifuge technology ever since. Although many of Iran's efforts have never been made public, British customs officials seized 110 pounds of maraging steel being shipped to Iran in July 1996.
  - Iran seems to have conducted research into plutonium separation and Iranians published research on uses of tritium that had applications to nuclear weapons boosting. Iran also obtained a wide range of US and other nuclear literature with applications for weapons designs. Italian inspectors seized eight

steam condensers bound for Iran that could be used in a covert reactor program in 1993, and high technology ultrasound equipment suitable for reactor testing at the port of Bari in January, 1994.

- Other aspects of Iran's nuclear research effort had potential weapons applications. Iran continued to operate an Argentine-fueled five megawatt light water highly enriched uranium reactor at the University of Tehran. It is operated by a Chinese-supplied neutron source research reactor, and subcritical assemblies with 900 grams of highly enriched uranium, at its Isfahan Nuclear Research Center. This Center has experimented with a heavy water zero-power reactor, a light water sub-critical reactor, and a graphite sub-critical reactor. In addition, it may have experimented with some aspects of nuclear weapons design.
- The German Ministry of Economics has circulated a wide list of such Iranian fronts which are known to have imported or attempted to import controlled items. These fronts include the:
  - Bonyad e-Mostazafan;
  - Defense Industries Organization (Sazemane Sanaye Defa);
  - Pars Garma Company, the Sadadja Industrial Group (Sadadja Sanaye Daryae);
  - Iran Telecommunications Industry (Sanaye Mokhaberet Iran);
  - Shahid Hemat Industrial Group, the State Purchasing Organization, Education Research Institute (ERI);
  - Iran Aircraft Manufacturing Industries (IAI);
  - Iran Fair Deal Company, Iran Group of Surveyors;
  - Iran Helicopter Support and Renewal Industries (IHI);
  - Iran Navy Technical Supply Center;
  - Iran Tehran Kohakd Daftar Nezarat, Industrial Development Group;
  - Ministry of Defense (Vezerate Defa).
- Iran claims it eventually needs to build enough nuclear reactors to provide 20% of its electric power. This Iranian nuclear power program presents serious problems in terms of proliferation. Although the reactors are scarcely ideal for irradiating material to produce Plutonium or cannibalizing the core, they do provide Iran with the technology base to make its own reactors, have involved other technology transfer helpful to Iran in proliferating and can be used to produce weapons if Iran rejects IAEA safeguards.
- Russian has agreed to build up to four reactors, beginning with a complex at Bushehr -- with two 1,000-1,200 megawatt reactors and two 465 megawatt reactors, and provide significant nuclear technology.
  - Russia has consistently claimed the light water reactor designs for Bushehr cannot be used to produce weapons grade Plutonium and are similar to the reactors the US is providing to North Korea.
  - The US has claimed, however, that Victor Mikhaliiov, the head of Russia's Atomic Energy Ministry, proposed the sale of a centrifuge plant in April, 1995. The US also indicated that it had persuaded Russia not to sell Iran centrifuge technology as part of the reactor deal during the summit meeting between President's Clinton and Yeltsin in May, 1995.
  - It was only after US pressure that Russia publicly stated that it never planned to sell centrifuge and advanced enrichment technology to Iran, and Iran denied that it had ever been interested in such technology. For example, the statement of Mohammed Sadegh Ayatollahi, Iran's representative to the IAEA, stated that, "We've had contracts before for the Bushehr plant in which we agreed that the spent fuel would go back to the supplier. For our contract with the Russians and Chinese, it is the same." According to some reports, Russia was to reprocess the fuel at its Mayak plant near Chelyabinsk in the Urals, and could store it at an existing facility, at Krasnoyarsk-26 in southern Siberia.

- The CIA reported in June 1997 that Iran had obtained new nuclear technology from Russia during 1996.
- A nuclear accident at plant at Rasht, six miles north of Gilan, exposed about 50 people to radiation in July, 1996.
- Russian Nuclear Energy Minister Yevgeny Adamov and Russian Deputy Prime Minister Vladimir Bulgak visited in March, 1998. and Iran and dismissed US complaints about the risk the reactors would be used to proliferate.
- Russia indicated that it would go ahead with selling two more reactors for construction at Bushehr within the next five years.
- The first 1,000 megawatt reactor at Bushehr has experienced serious construction delays. In March, 1998, Russia and Iran agreed to turn the construction project into a turn key plant because the Iranian firms working on infrastructure had fallen well behind schedule. In February, Iran had agreed to fund improved safety systems. The reactor is reported to be on a 30 month completion cycle.
- The US persuaded the Ukraine not to sell Iran \$45 million worth of turbines for its nuclear plant in early March, 1998, and to strengthen its controls on Ukrainian missile technology under the MTCR.
- China is reported to have agreed to provide significant nuclear technology transfer and possible sale of two 300 megawatt pressurized water reactors in the early 1990s, but then to have agreed to halt nuclear assistance to Iran after pressure from the US.
  - Iran signed an agreement with China's Commission on Science, Technology, and Industry for National Defense on January 21, 1991, to build a small 27-kilowatt research reactor at Iran's nuclear weapons research facility at Isfahan. On November 4, 1991, China stated that it had signed commercial cooperation agreements with Iran in 1989 and 1991, and that it would transfer an electromagnetic isotope separator (Calutron) and a smaller nuclear reactor, for "peaceful and commercial" purposes.
  - The Chinese reactor and Calutron were small research-scale systems and had no direct value in producing fissile material. They did, however, give Iran more knowledge of reactor and enrichment technology, and US experts believe that China provided Iran with additional data on chemical separation, other enrichment technology, the design for facilities to convert uranium to uranium hexafluoride to make reactor fuel, and help in processing yellowcake.
  - The US put intense pressure on China to halt such transfers. President Clinton and Chinese President Jiang Zemin reached an agreement at an October, 1997 summit. China strengthened this pledge in negotiations with the US in February, 1998.
  - In March, 1998, the US found that the China Nuclear Energy Corporation was negotiating to sell Iran several hundred tons of anhydrous hydrogen fluoride (AHF) to Isfahan Nuclear Research Corporation in central Iran, a site where some experts believe Iran is working on the development of nuclear weapons. AHF can be used to separate plutonium, help refine yellow cake into uranium hexafluoride to produce U-235, and as a feedstock for Sarin. It is on two nuclear control lists. China agreed to halt the sale.
  - Iran denied that China had halted nuclear cooperation on March 15, 1998.
  - Even so, the US acting Under Secretary of State for Arms Control and International Security Affairs stated that China was keeping its pledge not to aid Iran on March 26, 1998.
- US estimates of Iran's progress in acquiring nuclear weapons have become more conservative with time.
  - In 1992, the CIA estimated that Iran would have the bomb by the year 2000. In 1995, John Holum testified that Iran could have the bomb by 2003.
  - In 1997, after two years in which Iran might have made progress, he testified that Iran could have the bomb by 2005-2007.

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

- The ammonia and urea plant that the British firm M. W. Kellogg was building at Borujerd in Khorassan province, near the border with Turkestan, might be adapted to produce heavy water.
- The Amir Kabir Technical University, the Atomic Energy Organization of Iran (AEOI) (also known as the Organization for Atomic Energy of Iran or AEOI), Dor Argham Ltd., the Education and Research Institute, GAM Iranian Communications, Ghods Research Center, Iran Argham Co., Iran Electronic Industries, Iranian Research Organization, Ministry of Sepah, Research and Development Group, 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 verified 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 1991)	93
• Destruction under the supervision of UNSCOM	48
• Unilateral destruction by Iraq (mid-July and October 1991)	83
• UNSCOM's analysis has shown that Iraq had destroyed 83 of the 85 missiles it had claimed were destroyed. at the same time, it stated that Iraq had not given an adequate account of its proscribed missile assets, including launchers, warheads, and propellants.	

- UNSCOM also reports that it supervised the destruction of 10 mobile launchers, 30 chemical warheads, and 18 conventional warheads.
- Iraq maintains a significant delivery capability consisting of:
  - HY-2, SS-N-2, and C-601 cruise missiles, which are unaffected by UN cease-fire terms.
  - FROG-7 rockets with 70 kilometer ranges, also allowed under UN resolutions.
  - Multiple rocket launchers and tube artillery.
  - Experimental conversions such as the SA-2.
- Iraq claims to have manufactured only 80 missile assemblies, 53 of which were unusable. UNSCOM claims that 10 are unaccounted for.
  - US experts believe Iraq may still have components for several dozen extended-range Scud missiles.
- In addition, Iraq has admitted to:
  - Hiding its capability to manufacture its own Scuds.
  - Developing an extended range variant of the FROG-7 called the Laith. The UN claims to have tagged all existing FROG-7s to prevent any extension of their range beyond the UN imposed limit of 150 kilometers for 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 Dec, 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"

### Chemical Weapons

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

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

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

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

<u>Agent</u>	<u>Declared</u>	Potential Unaccounted <u>For</u>	<u>Comments</u>
<u>Chemical Agents</u>	(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
<u>Delivery Systems</u>	(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 aspergillus in 5.3 quart flasks.
  - The motives behind Iraq’s research on Aflatoxin remain one of the most speculative aspects of its program. Aflatoxin is associated with fungal-contaminated food grains, and is considered non-lethal. It normally can produce liver cancer, but only after a period of months to years and in intense concentrations. There is speculation, however, that a weaponized form might cause death within days and some speculation that it can be used as an incapacitating agent.
  - 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 covered in fiberglass. Bombs were designed so they could be mounted on both Soviet and French-made aircraft. They were rigged with parachutes for low altitude 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):

<u>Agent</u>	<u>Declared Concentrated Amount</u>		<u>Declared Total Amount</u>		<u>Uncertainty</u>
	<u>Liters</u>	<u>Gallons</u>	<u>Liters</u>	<u>Gallons</u>	
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 Perfringens	340	90	3,400	900	Amounts could be higher
Aflatoxin	NA	NA	2,200	581	Major uncertainties
Ricin	NA	NA	10	2.7	Major uncertainties

- UNSCOM cannot confirm the unilateral destruction of 25 warheads. It can confirm the destruction of 23 of at least 157 bombs. Iraq may have more aerosol tanks.
- 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 radiological weapons.
  - Is it actively seeking to clandestinely buy components for nuclear weapons and examining the purchase of fissile material from outside Iraq.
  - Is it continuing with the development of a missile warhead suited to the use of a nuclear device.
  - A substantial number of declared nuclear weapons components and research equipment has never been recovered. There is no reason to assume that Iraqi declarations were comprehensive.

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

## Iraqi Covert Break Out Capabilities

- UNSCOM and the IAEA's success have created new priorities for Iraqi proliferation. The UN's success in destroying the large facilities Iraq needs to produce fissile materials already may well have led Iraq to focus on covert cell-like activities to manufacture highly lethal biological weapons as a substitute for nuclear weapons.
- All of the biological agents Iraq had at the time of the Gulf War seem to have been "wet" agents with limited storage life and limited operational lethality. Iraq may have clandestinely carried out all of the research necessarily to develop a production capability for dry, storage micro-power weapons which would be far easier to clandestinely stockpile, and have much more operational lethality.
- Iraq did not have advanced binary chemical weapons and most of its chemical weapons used unstable ingredients. Iraq has illegally imported specialized glassware since the Gulf War, and may well have developed advanced binary weapons and tested them in small numbers. It may be able to use a wider range of precursors and have developed plans to produce precursors in Iraq. It may have improved its technology for the production of VX gas.
- Iraq is likely to covertly exploit Western analyses and critiques of its pre-war proliferation efforts to correct many of the problems in the organization of its proliferation efforts, its weapons design, and its organization for their use.
- Iraq bombs and warheads were relatively crude designs which did not store chemical and biological agents well and which did a poor job of dispersing them. Fusing and detonation systems did a poor job of ensuring detonation at the right height and Iraq made little use of remote sensors and weather models for long-range targeting and strike planning. Iraq could clandestinely design and test greatly improve shells, bombs, and warheads. The key tests could be conducted using towers, simulated agents, and even indoors. Improved targeting, weather sensors, and other aids to strike planning are dual-use or civil technologies that are not controlled by UNSCOM. The net impact would be weapons that could be 5-10 times more effective than the relatively crude designs Iraq had rushed into service under the pressure of the Iran-Iraq War.
- UNSCOM and the IAEA's success give Iraq an equally high priority to explore ways of obtaining fissile material from the FSU or other potential supplier country and prepare for a major purchase effort the moment sanctions and inspections are lifted and Iraq has the hard currency to buy its way into the nuclear club. Iraq could probably clandestinely assemble all of the components of a large nuclear device except the fissile material, hoping to find some illegal source of such material.
- The components for cruise missiles are becoming steadily more available on the commercial market, and Iraq has every incentive to create a covert program to examine the possibility of manufacturing or assembling cruise missiles in Iraq.
- UN inspections and sanctions may also drive Iraq to adopt new delivery methods ranging from clandestine delivery and the use of proxies to sheltered launch-on-warning capabilities designed to counter the US advantage in airpower.
- Iraq can legally maintain and test missiles with ranges up to 150 kilometers. This allows for exoatmospheric reentry testing and some testing of improved guidance systems. Computer simulation, wind tunnel models, and production engineering tests can all be carried out clandestinely under the present inspection regime. It is possible that Iraq could develop dummy or operational high explosive warheads with shapes and weight distribution of a kind that would allow it to test concepts for improving its warheads for weapons of mass destruction. The testing of improved bombs using simulated agents would be almost impossible to detect as would the testing of improved spray systems for biological warfare.
- Iraq has had half a decade in which to improve its decoys, dispersal concepts, dedicated command and control links, targeting methods, and strike plans. This kind of passive warfare planning is impossible to forbid and monitor, but ultimately is as important and lethal as any improvement in hardware.

- There is no evidence that Iraq made an effort to develop specialized chemical and biological devices for covert operations, proxy warfare, or terrorist use. It would be simple to do so clandestinely and they would be simple to manufacture.

## **Terrorism and Unconventional War Fighting Options**

- Unconventional and terrorist delivery means offer significant incentives.
- Powers like Iran and Syria have used terrorists and extremists as proxies in attacking neighbors.
- Biological warfare -- the easiest way to achieve extremely high lethalties -- is best conducted in this manner.
- Past terrorist attacks have shown it can take months to years to firmly characterize the enemy and where terrorism have full state support.
- “Plausible deniability” may exist indefinitely and a state subject to an existential attack has no meaningful way to retaliate.

## **The Problem of Terrorism and Unconventional Warfare**

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

## **Attack Scenarios: “Dr. Ben No” and “Professor Abu Moriarity” At Work in the Middle East - Part One**

- A radiological power is introduced into the air conditioning systems of Cairo’s high-rise tourist hotels. Symptoms are only detected over days or weeks or 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.
- Parts for a crude gun-type nuclear device are smuggled 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 effect 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.
- A terrorist 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 -- trusting God to “sort out” the resulting casualties. He 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.
- A 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.

## **Attack Scenarios: “Dr. Ben No” and “Professor Abu Moriarity” At Work in the Middle East - Part Two**

- A truck filled with what appears to be light gravel is driven through the streets of Tel Aviv or Cairo 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 powder 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.
- A 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.
- A 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 ensues, 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.
- The Iranian Revolutionary Guards equips dhows to spread Anthrax. The dhows enter the ports of Dubai and Abu Dhabi 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.

## **Attack Scenarios: “Dr. Ben No” and “Professor Abu Moriarity” At Work in the Middle East - Part Three**

- A 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.
- Extreme believers in Eretz Israel move a “cocktail” of radiological and persistent biological/chemical agents to the Temple Mount to contaminate the Mosques. They use carefully designed devices which only scatter very heavy matter over a limited area, although they use explosives to ensure a high degree of contamination within the mosques. All prayer in the mosque area must be halted indefinitely and there are significant casualties among the Islamic faithful in Jerusalem. The Jewish group issues a statement demanding that the temple area be clear of all non-Jewish religious activity triggering mass violence.
- A large terrorist device goes off in a populated, critical economic, or military assembly area -- scattering mustard or nerve gas. Emergency teams rush into 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.

## Counter Proliferation

- No one area of focus can possibly be effective.
- There is no present prospect that any combination of arms control and active/passive counter proliferation can fully secure the region, any state in the region, or Western power projection forces.
- However, a synergistic effort blending arms control, containment, preemptive options, deterrence, retaliation, and civil defense should offer significant stability.
  - There is no present prospect that such stability can be offered without at least tacit US threats to retaliate with nuclear weapons.
  - Such policies cannot work by enforcing restraint on friends, not enemies. There is no near to mid-term prospect that Israel can give up nuclear weapons.
- Creeping proliferation will follow the line of least resistance:
  - There is no present prospect that any combination of measures can defend against biological warfare, and many proposed forms of counter-proliferation act as incentive to develop biological weapons and use unconventional means of delivery.
  - Theater missile defense will be meaningless without radical improvements in defense against air attacks, cruise missiles, and unconventional means of delivery.

## Possible Counterproliferation Policy

- **Dissuasion to convince non-weapons of mass destruction states that their security interests are best served through not acquiring weapons of mass destruction.**
- **Denial to curtail access to technology and materials for weapons of mass destruction through export controls and other tools,**
- **Arms control efforts to reinforce the Nuclear Non-Proliferation Treaty, Biological and Chemical Weapons Conventions, nuclear free zones, conventional arms treaties that stabilize arms races, confidence and security building measures, and Anti-Ballistic Missile Treaty clarification efforts to allow US deployment of advanced theater ballistic missile defenses.**
- **Region-wide arms control agreements backed by intelligence sharing and ruthless, intrusive challenge inspection without regard for the niceties of sovereignty.**
- **International pressure to punish violators with trade sanctions to publicize and expose companies and countries that assist proliferators, and to share intelligence to heighten awareness of the proliferation problem.**
- **Defusing potentially dangerous situations by undertaking actions to reduce the threat from weapons of mass destruction already in the hands of selected countries -- such as agreements to destroy, inspect, convert, monitor, or even reverse their capabilities.**
- **Military capabilities to be prepared to seize, disable, or destroy weapons of mass destruction in time of conflict.**
- **Improve tracking and detection of sales, technology transfer, research efforts, extremist groups.**
- **Defensive capabilities, both active (theater missile defenses) and passive (protective gear and vaccines) that will mitigate or neutralize the effects of weapons of mass destruction and enable US forces to fight effectively even on a contaminated battlefield.**
- **Declared and convincing counterstrike options ranging from conventional strikes devastating a user nation's economy, political structure and military forces to the use of nuclear weapons against the population centers of user nations and groups.**

## Key Force Improvements Affecting Counteproliferation Policy

- ***Detection and characterization of biological and chemical agents.*** This initiative is intended to accelerate the fielding of stand-off and point detection and characterization systems by up to six years. It also addresses the integration of sensors into existing and planned carrier platforms, emphasizing man-portability and compatibility with UAVs.
- ***Detection, characterization, and defeat of hard, underground targets.*** The US is seeking new sensors, enhanced lethality, and penetrating weapons to increase the probability of defeating the target while minimizing the risk of collateral damage.
- ***Detection, localization and neutralization of weapons of mass destruction inside and outside the US.*** The US is seeking to identify and evaluate systems, force structures, and operational plans to protect key military facilities and logistic nodes, and conduct joint exercises to improve the capability to respond to potential biological and chemical threats.
- ***Development and deployment of additional passive defense capabilities for US forces, including development and production of biological agent vaccines.*** This program will develop and field improved protective suits, shelters, filter systems, and equipment two to five years faster than previously planned. It also restores funding to the development of improved decontamination methods.
- ***Support for weapons of mass destruction related armed control measures include strengthening the NNPT, CTB, and BWC.*** They include establishing a COCOM successor regime, and improving controls on exports and technology by strengthening the MTCR, Nuclear Suppliers Group and Australia Group.
- ***Missile defense capabilities, with primary emphasis on theater ballistic missile defenses.*** This activity involves improvements in active and passive defenses, attack operations, and improvements in BM/C4I as well as the deployment of theater missile defenses. The primary focus, however, is on anti-ballistic missile defenses, and in the near term, this involves the development of the Patriot Advanced Capability Level-3 (PAC-3/ERINT), Navy area theater missile defense (Aegis), and theater high altitude area defense (THAAD).
- ***Publicized counterstrike options.*** Options ranging from a convincing declared capability to conduct precision mass air and missile strikes with conventional weapons that can devastate user states to use of nuclear weapons escalating to the destruction of population centers.
- ***New force tailored to dealing with terrorist and unconventional threats.*** New intelligence and tracking systems dedicated to the prevention of mass terrorism, and tailored special forces to detect and attack terrorist groups and deal with unconventional uses of weapons of mass destruction.