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Weapons of Mass Destruction in India and Pakistan

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Table of Contents

US CIA Estimate of Indian Force Developments as of September 2001

India continues its nuclear weapons development program, for which its underground nuclear tests in May 1998 were a significant milestone. The acquisition of foreign equipment will benefit New Delhi in its efforts to develop and produce more sophisticated nuclear weapons. During this reporting period, India continued to obtain foreign assistance for its civilian nuclear power program, primarily from Russia.

India continues to rely on foreign assistance for key missile technologies, where it still lacks engineering or production expertise. Entities in Russia and Western Europe remained the primary conduits of missile-related and dual-use technology transfers during the latter half of 2000.

India continues an across-the-board modernization of its armed forces through ACW acquisitions, mostly from Russia, although many of its key programs have been plagued by delays. During the reporting period, New Delhi concluded a $3 billion contract with Russia to produce under license 140 Su-30 multirole fighters and continued negotiations with Moscow for 310 T-90S main battle tanks, A-50 Airborne Early Warning and Control (AWACS) aircraft, Tu-22M Backfire maritime strike bombers, and an aircraft carrier. India also continues to explore options for leasing or purchasing several AWACS systems from other entities. India also signed a contract with France for 10 additional Mirage 2000H multirole fighters and is considering offers for jet trainer aircraft from France and the United Kingdom. In addition to helping India with the development of its indigenous nuclear-powered submarine, Russia is negotiating with India the possible lease of a Russian nuclear-powered attack submarine.

Russian entities continue to supply a variety of ballistic missile-related goods and technical know-how to countries such as Iran, India, China, and Libya. Iran's earlier success in gaining technology and materials from Russian entities has helped to accelerate Iranian development of the Shahab-3 MRBM, and continuing Russian assistance likely supports Iranian efforts to develop new missiles and increase Tehran's self-sufficiency in missile production.

Russia continues to be a major supplier of conventional arms. It is the primary source of ACW for China and India, it continues to supply ACW to Iran and Syria, and it has negotiated new contracts with Libya and North Korea.
Russia continues to be the main supplier of technology and equipment to India and China's naval nuclear propulsion programs. In addition, Russia has discussed leasing nuclear-powered attack submarines to India.

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

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

Objectives, Strategies, and Resources

In his speech to the UN General Assembly on 24 September 1998, Indian Prime Minister Vajpayee noted that while India hoped to fully participate in international arms-control negotiations, it had no intention of scaling back its nuclear weapons program. He stated that, "Mindful of its deteriorating security environment which has obliged us to stand apart from the CTBT in 1996, India undertook a limited series of five under-ground tests. These tests were essential for ensuring a credible nuclear deterrent for India's national security in the foreseeable future." He also declared that "in announcing a moratorium (on further nuclear tests), India has already accepted the basic obligation of the CTBT. In 1996, India could not have accepted the obligation, as such a restraint would have eroded our capability and compromised our national security." India's goal of indigenous production for all its pro-grams is another element of New Delhi's strategy to demonstrate its technological and military achievements and to help it to establish independence from foreign suppliers and outside political influence. The Indian economy will continue to grow moderately, with the real GDP expected to grow at an aver-age annual rate of 5-6 percent for the next few years, assuming India avoids major conflicts, pursues eco-nomic reforms, and has reasonable weather. Despite the announced 28-percent nominal increase in the 2000 defense budget, some of which reflects inflation and definitional differences, military spending is expected to increase by about 2-3 percent annually in real terms over the next ten years. Future defense bud-gets likely will include a focus on investments for long-term military production self-sufficiency, including those for nuclear and missile forces, in keeping with India's overall goal of achieving independence from foreign suppliers.

Nuclear Program

On 11 and 13 May 1998, India conducted what it claimed were five nuclear explosive tests. According to Indian officials, the 11 May tests included a fission device with a yield of about 12 kilotons, a thermonuclear device with a yield of about 43 kilotons, and a third test with a yield of about 0.2 kilotons. An Indian spokesman stated that the first set of tests was intended "to establish that India has a proven capability for a weaponized nuclear program."

India claimed that its 13 May tests had yields of about 0.5 and 0.2 kilotons, which were carried out to generate additional data for computer simulations. According to the Chairman of India's Atomic Energy Commission, the tests enabled India to build "an adequate scientific database for designing the types of devices that [India] needs for a credible nuclear deter-rent." The tests triggered international condemnation and the United States imposed wide-ranging sanctions against India.

The tests were India's first since 1974, and reversed the previously ambiguous nuclear posture where Indian officials denied possession of nuclear weapons. Indian officials cited a perceived deterioration of India's security environment, including increasing Pakistani nuclear and missile capabilities and perceived threats from China, to justify the tests. India has a capable cadre of scientific personnel and a nuclear infrastructure, consisting of numerous research and development centers, 11 nuclear power reactors, uranium mines and processing plants, and facilities to extract plutonium from spent fuel. With this large nuclear infrastructure, India is capable of manufacturing complete sets of components for plutonium-based nuclear weapons, although the acquisition of foreign nuclear-related equipment could benefit New Delhi in its weapons development efforts to develop and pro-duce more sophisticated nuclear weapons. India probably has a small stockpile of nuclear weapon components and could assemble and deploy a few nuclear weapons within a few days to a week. The most likely delivery platforms are fighter-bomber air-craft. New Delhi also is developing ballistic missiles that will be capable of delivering a nuclear payload in the future.

India is in the beginning stages of developing a nuclear doctrine. In August 1999, the Indian government released a proposed nuclear doctrine prepared by a private advisory group appointed by the government. It stated that India will pursue a doctrine of credible minimum deterrence. The document states that the role of nuclear weapons is to deter the use or the threat of use of nuclear weapons against India, and asserts that India will pursue a policy of "retaliation only." The draft doctrine maintains that India "will not be the first to initiate a nuclear strike, but will respond with punitive retaliation should deterrence fail." The doc-trine also reaffirms India's pledge not to use or threaten to use nuclear weapons against states that do not possess nuclear weapons. It further states that India's nuclear posture will be based on a triad of aircraft, mobile land-based systems, and sea-based plat-forms to provide a redundant, widely dispersed, and flexible nuclear force. Decisions to authorize the use of nuclear weapons would be made by the Prime Minister or his "designated successor(s)." The draft doc-trine has no official standing in India, and the United States has urged Indian officials to distance themselves from the draft, which is nor consistent with India's stated goal of a minimum nuclear deterrent. India expressed interest in signing the CTBT, but has not done so. It has pledged not to conduct further nuclear tests pending entry into force of the CTBT. Indian officials have tied signature and ratification of the CTBT to developing a domestic consensus on the issue. Similarly, India strongly opposed the NPT as discriminatory but it is a member of the IAEA. Only four of India's 13 operational nuclear reactors currently are subject to IAEA safeguards. In June 1998, New Delhi signed a deal with Russia to purchase two light-water reactors to be built in southern India; the reactors will be under facility-specific IAEA safeguards. However, the United States has raised concerns that Russia is circumventing the 1992 NSG guidelines by providing NSG trigger list technology to India, which does not allow safeguards on all of its nuclear facilities. India has taken no steps to restrain its nuclear or missile programs. In addition, while India has agreed to enter into negotiations

to complete a fissile material cutoff treaty, it has not agreed to refrain from producing fissile material before such a treaty would enter into force.

Biological and Chemical Programs

India has many well-qualified scientists, numerous biological and pharmaceutical production facilities, and biocontainment facilities suitable for research and development of dangerous pathogens. At least some of these facilities are being used to support research and development for biological warfare defense work. India has ratified the BWC.

India: NBC Weapons and Missile Program

- *Nuclear Conducted nuclear experiment tests on 11 and 13 May 1998; claimed a total of five tests.*
- *Conducted a peaceful nuclear explosive (PNE) in 1974. Capable of manufacturing complete sets of components for plutonium-based nuclear weapons.*
- *Has small stockpile of nuclear weapons components and probably can deploy a few nuclear weapons within a few days to a week. It can deliver these weapons with fighter aircraft.*
- *Announced draft nuclear doctrine in August 1999 of no-first-use; stated intent to create triad of air-, land-, and sea-based missile delivery systems.*
- *Has signed neither the NPT nor the CTBT.*
- *Biological Has substantial biotechnical infrastructure and expertise, some of which is being used for biological warfare defense research.*
- *Ratified the Biological and Toxin Weapons Convention.*
- *Chemical Acknowledged chemical warfare program in 1997 and stated that related facilities would be open for inspection.*
- *Has sizeable chemical industry, which could be source of dual-use chemicals for countries of proliferationconcern.*
- *Ratified the CWC.*
- *Ballistic Missiles Has development and production facilities for solid- and liquid-propellant fuel missiles.*
- *Three versions of liquid-propellant*
  - *Prithvi SRBM: Prithvi I (Army) —150 kilometer range (produced)*
  - *Prithvi II (Air Force) —250 kilometer range (tested)*
  - *Dhanush (Navy) —250 kilometer range (unsuccessfully tested)*
  - *Solid-propellant Agni MRBM:*
  - *Agni tested in 1994 (estimated range 2,000 kilometers)*
  - *Agni II tested in April 1999 (estimated range 2,000 kilometers)*
- *SLBM and IRBM also under development. Is not a member of the MTCR.*
- *Is not a member of the MTCR.*
- *Other Means of Delivery*
  - *Has ship-borne and airborne anti-ship cruise missiles; none have NBC warheads.*
  - *Aircraft: fighter bombers.*
  - *Ground systems: artillery and rockets.*

India is an original signatory to the CWC. In June 1997, it acknowledged that it had a dedicated chemical warfare production program. This was the first time India had publicly admitted that it had a chemical warfare effort. India also stated that all related facilities would be open for inspection, as called for in the CWC, and subsequently, it has hosted all required CWC inspections. While India has made a commitment to destroy its chemical weapons, its extensive and well-developed chemical industry will continue to be capable of producing a wide variety of chemical agent pre-cursors should the government change its policy. In the past, Indian firms have exported a wide array of chemical products, including Australia Group-con-trolled items, to several countries of proliferation concern in the Middle East. (Australia Group-controlled items include specific chemical agent precursors, microorganisms with biological warfare applications, and dual-use equipment that can be used in chemical or

biological warfare programs.) Indian companies could continue to be a source of dual-use chemicals to countries of proliferation concern.

Ballistic Missiles

The development of Indian and Pakistani ballistic missile capabilities has raised concerns about destabilizing efforts to develop and deploy nuclear-armed missiles. India has an extensive, largely indigenous ballistic missile program involving both SRBMs and MRBMs, and has made considerable progress with this program in the past several years. For example, India now has the Prithvi SRBM in production and successfully tested the Agni II MRBM in April 1999. India has development and production infrastructures for both solid- and liquid-propelled missiles. By striving to achieve independence from foreign suppliers, India may be able to avoid restrictions imposed by the MTCR. Nevertheless, India's ballistic missile pro-grams have benefited from the acquisition of foreign equipment and technology, which India has continued to seek, primarily from Russia.

India's Prithvi SRBM is a single-stage, liquid-fuel, road-mobile, ballistic missile, and it has been developed in three different versions. The Prithvi I has been produced for the Indian Army and has a payload of 1,000 kilograms and a range of 150 kilometers. The Prithvi II has a 500 kilograms payload and a range of 250 kilometers and was designed for use by the Indian Air Force. Another variant, called the Dhanush, is under development for the Navy and is similar to the Air Force version; it is designed to be launched from a surface vessel. The Indians conducted a flight test of the Dhanush in April 2000, which failed. India's MRBM program consists of the Agni missile, with an estimated range of about 2,000 kilometers with a 1,000 kilograms payload. An early version was tested in 1994 and India successfully tested the follow-on version, the rail-mobile Agni II, in April 1999. This missile will allow India to strike all of Pakistan as well as many key areas of China. Development also is underway for an Intermediate Range Ballistic Missile (IRBM), which would allow India to target Beijing. Lastly, an Indian submarine-launched missile, called the Sagarika, also is under development with Russian assistance. Its intended launch platform is the "Advanced Technology Vessel" nuclear submarine.

Cruise Missiles and Other Means of Delivery

India has ship-launched and airborne short-range anti-ship cruise missiles and a variety of short-range air-launched tactical missiles, which are potential means of delivery for NBC weapons. All were purchased from foreign sources including Russia and the United Kingdom. In the future, India may try to purchase more modern anti-ship cruise missiles, or try to develop the missiles themselves. However, funding priorities for such efforts will be well below that for ballistic missiles. India also has a variety of fighter air-craft, artillery, and rockets available.

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

India's Search for Weapons of Mass Destruction

Delivery Systems

- India has two main delivery options: aircraft and missiles.
  - India posses several different aircraft capable of nuclear delivery, including the Jaguar, Mirage 2000, MiG-27 and MiG-29.
  - India is upgrading 150 Mig-21Bis fighters. It has 88 Jaguars, 147 MiG-27s, and 53 MiG-23 BN/UM configured in the strike/attack mode.
  - India has 36-38 Mirage-2000Hs strike aircraft with a significant nuclear strike capability, and is considering buying and deploying 18 Mirage 2000Ds. It has 64 MiG-29s.
  - India is acquiring 40 long-range Su-30 strike aircraft; 8 have been delivered The Su-30 has a strike range of 5,000 kilometers with in-flight refueling.
  - The MiG-27 and the Jaguar are strike/attack aircraft and require little or no modification to deliver nuclear weapons. The MiG-29, Su-30 and Mirage 2000 were designed for air-to-air combat combat but could be modified to deliver air-dropped nuclear weapons using external racks.
- It can also mount a weapon on a ballistic missile. The Carnegie Endowment estimates that India has developed nuclear warheads for this purpose, but is not known to have tested such a warhead.
- India has two major families of missile systems: The Prithvi and Agni.
  - The Prithvi is a relatively short-range missile that was tested extensively during 1995-1997, with publicly announced tests on January 27, 1996 and February 23, 1997.
  - The Indian army has one Prithvi regiment with 3-5 launchers.
  - There seem to be three variants:
    - The Prithvi SS-150 is a liquid fueled missile with a 150-kilometer range and a 1,000-kg. payload. It was ordered in 1983 and became operational in 1996. It is in low-rate production. A total of 150 seem to have been produced.
    - The Prithvi SS-250 is a liquid fueled missile with a 250-kilometer range and a 500-750 kg. payload. It was ordered in 1983 and became operational in 201. It is in low-rate production. A total of 50 seem to have been produced.
    - The Prithvi SS-1350 is a liquid fueled missile with a 350-kilometer range and a 700-1,000 kg. payload.
  - Reports in 1997 indicated that India had possibly deployed, or at least was storing, conventionally armed Prithvi missiles in Punjab, very near the Pakistani border. India began test-firing the Prithvi (25) II, the Air Force version capable of targeting nearly all of Pakistan, in early 1996. In June 1997, Prithvi (150) I mobile missile systems were moved from factories in the south into Punjab, bringing many Pakistani cities within direct range of the missile.
  - India has claimed the Prithvi only has a conventional warhead. This claim seems unlikely to be true.
  - Agni, a two-stage medium-range missile:
    - It has been tested several times.
    - The original Agni I was a liquid and solid-fueled missile with a 1,500-kilometer range with a 1,000-kg. warhead.
    - In July 1997, the Indian defense ministry announced the revival of the Agni medium-range missile program.
    - Testing of the Agni II resumed on April 11 1999 and reached a range near 2,000 kilometers. The maximum range of the missile is stated to be 2,500 kilometers, but a nominal range of 2,000 seems

more likely. It is a solid fueled missile and can be launched quickly without waiting for arming or fueling. India stated in August 1999 that it was deploying the Agni II. It was first ordered in 1983, and seems to have entered production in 2000. Indian sources have said that 20 will be deployed by the end of 2001.

- India is believed to be developing the Agni III with a range of 3,700 kilometers, and possible an Agni IV with a range of 4,000-5,000 kilometers. It was first ordered in 1983, and seems to have entered production in 2000.

- India is reported to have an ICBM called the Surya under development with a range of 5,000 kilometers.

- The CIA reported in February 1999 that India's ballistic missile programs still benefited from the acquisition of foreign equipment and technology. India sought items for these programs during the reporting period from a variety of sources worldwide, including many countries in Europe and the former Soviet Union.

- The DCI Nonproliferation Center (NPC) reported in February 2000, and again in August 2000 that, “While striving to achieve independence from foreign suppliers, India’s ballistic missile programs still benefited from the acquisition of foreign equipment and technology. India sought items for these programs during the reporting period primarily from Russia. New Delhi successfully flight-tested its newest MRBM, the Agni 2, in April 1999 after months of preparations.” It also reported that, Russian entities continued to supply a variety of ballistic missile-related goods and technical know-how to Iran and were expanding missile-related assistance to Syria and India.

- India seems to be considering nuclear submarines and cruise missiles as a possible future basing mode.

  - The Indian fleet has 15 are submarines, although their operational readiness and performance is low to medicore..

  - They include a total of ten diesel-powered 'Project 877' Kilo-class submarines, known in India as the the EKM or Sindhu class, have been built with Russian cooperation under a contract between Rosvooruzhenie and the Indian Defense Ministry, with the tenth unit delivered to India in 2000. At least one is equipped with the SS-N-27 antiship cruise missiles with a range of 220 km.

  - The FAS reports that India has a number of foreign-produced cruise missile systems in its arsenal, to include Exocet, Styx, Starbright, Sea Eagle,. It also has some indigenous cruise missile systems under development such as the Sagarika and Lakshya variant. The Sagarika is a SLCM with a potential range of 300-1000 kilomters. Its IOC is estimated to be in 2005.

  - India leased a Chiarlie-class Soviet nuclear powered attack submarine for three years beginning in 1968. It was manned by a Russian crew training Indian seamen to operate it. India then returned it to Russia in 1991, and it was decommissioned.

  - India has been working since 1985 to develop and build its own nuclear-powered submarine. It obtained plans and drawings for the Charlie II-class from the FSU in 1989. This FAS reports that the project illustrates India's industrial capabilities and weaknesses.

    - “The secretive Advanced Technology Vessel (ATV) project to provide nuclear propulsion for Indian submarines has been one of the more ill-managed projects of India. Although India has the capability of building the hull and developing or acquiring the necessary sensors, its industry has been stymied by several system integration and fabrication problems in trying to downsize a 190 MW pressurized water reactor (PWR) to fit into the space available within the submarine's hull.”

    - The Proto-type Testing Centre (PTC) at the Indira Gandhi Centre For Atomic Research. Kalpakkam, will be used to test the submarine's turbines and propellers. A similar facility is operational at Vishakapatnam to test the main turbines and gear box.

    - Once the vessel is completed, it will be equipped with Sagarika cruise missiles and an advanced sonar system.

  - India has a sea-launched cruise missile under development called the Sagarika. It has an estimated range of 300 kilometers. According to some experts, it may be a ballistic missile.

Chemical Weapons

- India has a well-developed chemical industry which produces the bulk of the chemicals India consumes domestically.
- India has long been involved in the development of chemical weapons; possibly since the early 1980s.
- The FAS reports that the Indian government has set up Nuclear, Biological and Chemical (NBC) warfare directorates in each of its military services, and an inter-Services coordination committee to monitor the program. The Indian Army established a Nuclear, Biological and Chemical (NBC) cell at Army HQ to study the effects of NBC warfare.
    - The Defence Research and Development Organisation (DRDO) is also participating in the program. Research on chemical weapons has continued in various establishments of the military and DRDO research labs. In addition, work is carried out by DRDO to design and fabricate protective clothing and equipment for troops on the battlefield in case of a chemical weapons attack.
    - The Defence Research and Development Establishment (DRDE) at Gwalior is the primary establishment for studies in toxicology and biochemical pharmacology and development of antibodies against several bacterial and viral agents. In addition, research is carried out on antibodies against chemical agent poisoning and heavy metal toxicology. Chemical agents such as Sarin and nerve gas are produced in small quantities to test on protective equipment.
    - Protective clothing and equipment are designed and manufactured amongst other places at the Defence Materials and Stores Research and Development Establishment at Kanpur. India has developed five types of protective systems and equipment for its troops as a safeguard against nuclear, biological and chemical (NBC) hazards. The development of all five types of protective systems and equipment has been completed and their induction into the service has been formally approved. The five types of protective systems and equipment are: NBC individual protective equipment, NBC collective protection system, NBC medical protection equipment, NBC detection equipment and the NBC decontamination system.
- It has probably reached the point of final development and weaponization for a number of agents no later than the mid-1980s.
- Work by the Federation of American Scientists (FAS) shos that India has a mixed history of compliance with the Chemical Weapons Convention (CWC):
    - India became one of the original signatories of the in 1993, and ratified it on 02 September 1996. The treaty came into force on April 29, 1997. India denied that it had chemical weapons during the negotiation of the CWC and when it signed it. It stated formally that it did not have chemical weapons and the capacity or capability to manufacture chemical weapons. India did so, however, knowing that he full destruction of the weapons grade chemicals would l take place only at the end of a 10-year period, and that India's large chemical industry would benefit from the unrestricted trade and technology access which would be denied to non-members of the treaty.
    - India claimed again at the Third UN Disarmament Conference, held in 1988 that India had no chemical weapons. Foreign Minister K Natwar Singh repeated this claim in 1989 in the Paris Conference of the State Parties to the Geneva Protocol of 1925, as did Minister of State Eduardo Faleiro repeated at the January 1993 Paris Conference CWC signing ceremony.
    - *However*, when India declared its stockpile of chemical weapons to the Chemical Weapons Convention in Geneva on 26 June 1997 -- the deadline for all signatories to the pact -- India filed initial declarations on "testing and development of chemical weapons and their related facilities which were developed only to deal with the situation arising out of possible use of chemical warfare against India."
    - In its required declarations under the CWC, India acknowledged the existence of a chemical warfare program. and disclosed the details of its stockpiles and the availability of manufacturing facilities on a very small scale. India pledged that all facilities related to its CW program would be open for inspection, but this

declaration kept India's chemical armory classified, since the CWC Secretariat maintains the confidentiality of such declarations.

- Some reports indicate that Indian, efforts continued for manufacturing and stockpiling chemical weapons for use against Pakistan. On 25 June 1997, however, the Indian government stated that "India will disclose to Pakistan stocks of its chemical weapons."
- In June 1999, the FAS reported that Pakistan published allegations that India had used or was planning to use chemical weapons against the Mujahideen and Pakistani army elements fighting at the Kashmir border. Former Pakistani Inter-Services Intelligence chief Gen.(retd) Hamid Gul [who had opposed Pakistani ratification of the Chemical Weapons Convention] claimed that Mujahideen had captured a very sensitive posts at Kargil and that there were clear chances that India would use chemical weapons against the Mujahideen.

Biological Weapons

- India is a signatory to the BWC of 1972.
- India has long been involved in the development of biological weapons; possibly since the early 1980s.
- India has a well-developed biotechnology research base and its production facilities include includes numerous pharmaceutical production facilities and bio-containment laboratories (including BL-3) for working with lethal pathogens. It also has qualified scientists with expertise in infectious diseases
- The FAS estimates that some of India's facilities are being used to support research and development for BW defense purposes. These facilities constitute a substantial potential capability for offensive purposes as well.
- The FAS reports that Defence Research and Development Establishment (DRDE) at Gwalior is the primary establishment for studies in toxicology and biochemical pharmacology and development of antibodies against several bacterial and viral agents. Work is in progress to prepare responses to threats like Anthrax, Brucellosis, cholera and plague, viral threats like smallpox and viral haemorrhage fever and bio-toxic threats like botulism. Researchers have developed chemical/biological protective gear, including masks, suits, detectors and suitable drugs.
- India has probably reached the point of final development and weaponization for a number of agents.
- US experts feel there is no evidence of production capability, stockpiling, or deployment.

Nuclear Weapons

  - India exploited the Atoms for Peace program the US began in 1953, and bout a heavy water reactor from Canada in 1995 that it later used to provide the Plutonium for a nuclear test in 1974. It has since developed a massive indigenous civil and military nuclear program, all of which is free from IAEA safeguards.
  - The Bahaba Atomic Research Center is the key nuclear weapons facility.
  - Three Plutonium reprocessing facilities at Tarapur, Trombay, and Kalpakkum. Can use output from Madras 1 & 2, Kakrapur 1 & 2, and Narora 1 & 2 reactors.
  - Two unsafeguarded heavy water reactors – Cirus with 40 megawatts and Dhruva with 100 megawatts at the Bahaba Atomic Research Center.
  - Mines Uranium in the area around Jaduguda.
  - Nuclear test site at Pokaran.
- India has had a clear interest in nuclear weapons since its a 1962 border clash with China and China's first test of nuclear weapons in 1964.
  - India first demonstrated its nuclear capability when it conducted a "peaceful nuclear experiment" in May 1974.

  - India probably began work on a thermonuclear weapon prior to 1980. By 1989 it was publicly known that India was making efforts to isolate and purify the lithium-6 isotope, a key requirement in the production of a thermonuclear device.
  - India relies largely on Plutonium weapons, but is experimenting with systems that could be used to make U-235. Some U-235 is useful in producing thermonuclear weapons. A pilot scale Uranium enrichment plant is located at Rattehalli in southern India, and a laser enrichment center at the Center for Advanced Technology near Indore.
  - India is experimenting with fact breeder reactors at the Indira Ghandi Atomic Research Center south of Madras.

- Views differ over the reasons for the timing of India's first major series of tests. The FAS estimates that, "The nuclearisation of India has been an article of faith for the BJP. One of the few concrete steps taken by Vajpayee in his brief 13-day term as Prime Minister s in 1996 was approval for DRDO and DAE to begin preparations for a nuclear test. However, the Government fell two days before the tests could begin, and the succeeding United Front government of H.D. Deve Gowda declined to proceed. Operation Shakti was authorised two days after the Ghauri missile test-firing in Pakistan. On 08 April 1998 Prime Minister Vajpayee met with Department of Atomic Energy (DAE) chief R. Chidambaram and head of the Defence Research and Development Organisation (DRDO) A.P.J. Abdul Kalam and gave the go-ahead for nuclear weapons tests.
  - India conducted its second series of tests 24 years later on May 11, 1998.
  - India exploded five nuclear devices in underground tests between May 11 and May 13, 1998. According to Indian Prime Minister Vajpayee, the weapons included:
  - A "fission device,
  - A low-yield device, and a
  - Thermonuclear device."
  - It emplaced the devices on May 8, when scientists from DRDO and DAE arrived at the test site Pokhran
  - On 11 May 1998 India carried out three underground nuclear tests at the Pokhran range. The three underground nuclear tests carried out at 1545 hours involved three different devices - a fission device with a yield of about 12 KT, a "thermonuclear device?" with a yield of about 43 KT and a sub-kiloton device of around 0.2 kilotons. All three devices were detonated simultaneously.
  - The two tests carried out at 1221 hours on 13 May were also detonated simultaneously. The yields of the sub-kiloton devices were in the range of 0.2 to 0.6 KT." The Indian government then announced the completion of the planned series of tests.
  - These tests broke breaks an international moratorium on nuclear tests; China had conducted its last test in 1996. India deliberate scheduled activity around the test site to avoid coverage by US surveillance satellites.
- The Carnegie Endowment estimates that India has built steadily larger-scale plutonium production reactors, and facilities to separate the material for weapons use, and has approximately 400 kg of weapons-usable plutonium today. It takes about 6 kg of plutonium to construct a basic plutonium bomb, this amount would be sufficient for 65 bombs. With more sophisticated designs, it is possible that this estimate could go as high as 90 bombs.
- India officials stated in May 1998, however, that India had enough material for 125 nuclear weapons.
- The CIA reported in February 1999 that India continued to seek nuclear-related equipment, materials, and technology during the first half of 1998, some of which could be used in nuclear weapons applications. The most sought-after goods were of Russian- and UK-origin. India continues to pursue the development of advanced nuclear weapons, as evidenced by the underground nuclear tests that it conducted in May 1998. The acquisition of foreign equipment could benefit India in its efforts to develop and produce more sophisticated nuclear weapons.

- The DCI Nonproliferation Center (NPC) reported in February 2000 that India continues to pursue the development of nuclear weapons, and its underground nuclear tests in May 1998 were a significant milestone. (The US imposed sanctions against India as a result of these tests.) The acquisition of foreign equipment could benefit New Delhi in its efforts to develop and produce more sophisticated nuclear weapons. India obtained some foreign nuclear-related assistance during the first half of 1999 from a variety of sources worldwide, including in Russia and Western Europe.
- Geroge Tenet, the Director of the CIA, testified before the Senate Foreign Relations Committee on March 20, 2000 and stated that, “India and Pakistan are developing more advanced nuclear weapons and are moving toward deployment of significant nuclear arsenals. Both sides are postured in a way that could lead to more intense engagements later this year. Our concern persists that antagonisms in South Asia could still produce a more dangerous conflict on the subcontinent.”
- The FAS reports as of June 2000 that India is generally estimated as having approximately 60 nuclear weapons. Some estimates as high as 200 nuclear devices are based on estimates of plutonium that could be extracted from India's six unsafeguarded heavy-water nuclear power plants. In 1994 K. Subrahmanyam suggested that a force of 60 warheads carried on 20 Agnis, 20 Prithvis and the rest on aircraft would cost about Rs 1,000 crore over 10 years. In 1996 Sundarji suggested a cost of some Rs 2,760 crore -- Rs 600 crore for 150 warheads, Rs 360 crore for 45 Prithvis and Rs 1,800 crore for 90 Agni missiles.
- The CIA reported in August 2000 that India continues to pursue the development of nuclear weapons, and its underground nuclear tests in May 1998 were a significant milestone. The acquisition of foreign equipment could benefit New Delhi in its efforts to develop and produce more sophisticated nuclear weapons. India obtained some foreign nuclear-related assistance during the second half of 1999 from a variety of sources worldwide, including in Russia and Western Europe.

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

US CIA Estimate of Pakistani Force Developments as of September 2001

Chinese entities continued to provide significant assistance to Pakistan's ballistic missile program during the reporting period. With Chinese assistance, Pakistan is moving toward serial production of solid-propellant SRBMs, such as the Shaheen-I and Haider-I. Pakistan flight-tested the Shaheen-I in 1999 and plans to flight-test the Haider-I in 2001. Successful development of the two-stage Shaheen-II MRBM will require continued Chinese assistance or assistance from other potential sources.

Pakistan continued to acquire nuclear-related and dual-use equipment and materials from various sources—principally in Western Europe. Islamabad has a well-developed nuclear weapons program, as evidenced by its first nuclear weapons tests in late May 1998. Acquisition of nuclear-related goods from foreign sources will remain important if Pakistan chooses to develop more advanced nuclear weapons.

China, which has provided extensive support in the past to Islamabad's nuclear weapons and ballistic missile programs, in May 1996 pledged that it would not provide assistance to unsafeguarded nuclear facilities in any state, including Pakistan. We cannot rule out, however, some unspecified contacts between Chinese entities and entities involved in Pakistan's nuclear weapons development.

Pakistan continues to rely on China and France for its ACW requirements and negotiated to purchase an additional 40 F-7 fighters from China.

Beijing continues to take a very narrow interpretation of its bilateral nonproliferation commitments with the United States. In the case of missile-related transfers, Beijing has on several occasions pledged not to sell Missile Technology Control Regime (MTCR) Category I systems but has not recognized the regime's key technology annex. China is not a member of the MTCR.

In November 2000, China committed not to assist, in any way, any country in the development of ballistic missiles that can be used to deliver nuclear weapons, and to enact at an early date a comprehensive missile-related export control system.During the reporting period, however, Chinese entities provided Pakistan with missile-related technical assistance.

Pakistan has been moving toward domestic serial production of solid-propellant SRBMs with Chinese help. Pakistan also needs continued Chinese assistance to support development of the two-stage Shaheen-II MRBM. In addition, firms in China have provided dual-use missile-related items, raw materials, and/or assistance to several other countries of proliferation concern—such as Iran, North Korea, and Libya.

In the nuclear area, China has made bilateral pledges to the United States that go beyond its 1992 NPT commitment not to assist any country in the acquisition or development of nuclear weapons. For example, in May 1996 Beijing pledged that it would not provide assistance to unsafeguarded nuclear facilities. With respect to Pakistan, Chinese entities in the past provided extensive support to unsafeguarded as well as safeguarded nuclear facilities, which enhanced substantially Pakistan's nuclear weapons capability. We cannot rule out some continued contacts between Chinese entities and entities associated with Pakistan's nuclear weapons program subsequent to Beijing's 1996 pledge and during this reporting period.

China is a primary supplier of advanced conventional weapons to Pakistan, Iran, and Sudan, among others. Sudan received military vehicles, naval equipment, guns, ammunition, and tanks from Chinese suppliers in the latter half of 2000.

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

Objectives, Strategies, and Resources

Pakistan's nuclear and missile programs are part of Islamabad's effort to preserve its territorial integrity against its principal external threat and rival, India. Pakistan attaches a certain immediacy and intensity to its effort and likely will continue to improve its nuclear and missile forces. Pakistan is driven by its perceived need to counter India's conventional superiority and nuclear capability, remains fearful of India's regional and global power aspirations, and continues to seek close security ties with China as a balance. Pakistan's 1998 nuclear weapon tests and its missile tests in 1998 and 1999 likely were seen by Islamabad as necessary responses to India's tests, and as a means of bolstering its own deterrent.

Pakistan, like India, is putting emphasis on becoming self-sufficient for the production of its nuclear weapons and missiles. During the last several years Pakistan has received assistance from both China and North Korea, which will help it to achieve that goal. It has continued to seek a variety of nuclear-related and dual-use items for weapons development. However, Pakistan has less of a military production infrastructure than rival India, and thus will be forced to rely on outside support for its efforts for several years. Pakistan's economy will recover gradually from its recent fiscal crisis and the real GDP is expected to grow at an annual rate of about 3-5 percent for the next several years. This growth assumes no major war, ade-quate financial assistance from lenders to meet foreign debt obligations, and progress on economic reforms aimed at controlling the government deficit. Pakistan's defense budget will proceed on a generally upward track, with an average annual real increase of 1-2 per-cent expected over the next ten years. As part of its overall national security strategy, Pakistan likely will continue to attach budget priorities to the further development of nuclear warheads and ballistic missiles.

However, part of this effort will depend on continuing support from China and North Korea, or on alternative sources of financial or technical aid.

Nuclear Program

As a response to India's tests, Pakistan conducted its own series of nuclear tests in May 1998. Pakistan claimed to have tested six devices, five on 28 May and one on 30 May. Dr. A. Q. Khan, a key figure in Pakistan's nuclear program, claimed the five devices tested on 28 May were boosted fission devices: a "big bomb" and four tactical weapons of low yield that could be used on small missiles. He also claimed that Pakistan could conduct a fusion or thermonuclear blast if it so desired. The United States imposed additional sanctions against Pakistan as a result of these tests. Pakistan has a well-developed nuclear infrastructure, including facilities for uranium conversion and enrichment and the infrastructure to produce nuclear weapons. Unlike the Indian nuclear program, which uses plutonium for its weapons, Pakistan's program currently is based on highly-enriched uranium. However, Pakistan also is developing the capability to produce plutonium for potential weapons use. An unsafe-guarded heavy-water research reactor built at Khushab will produce plutonium that could be reprocessed for weapons use at facilities under construction. In the past, China supplied Pakistan with nuclear materials and expertise and has provided critical assistance in the production of Pakistan's nuclear facilities. Pakistan also acquired a significant amount of nuclear-related and dual-use equipment and materials from various sources principally in the FSU and Western Europe. Acquisition of nuclear-related goods from foreign sources will remain important if Pakistan chooses to continue to develop and produce more advanced nuclear weapons, although we expect that, with the passage of time, Pakistan will become increasingly self-sufficient. Islamabad likely will increase its nuclear and ballistic missile stockpiles over the next five years.

Islamabad's nuclear weapons are probably stored in component form. Pakistan probably could assemble the weapons fairly quickly and has aircraft and possi-bly ballistic missiles available for delivery. Pakistan's nuclear weapons program has long been dominated by the military, a dominance that likely has continued under the new military government and under Pakistan's new National Command Authority (NCA), announced in February 2000. While Pakistan has yet to divulge publicly its nuclear doctrine, the new NCA is believed to be responsible for such doc-trine, as well as nuclear research and development and wartime command and control. The NCA also includes two committees that advise Pakistan's Chief Executive, General Musharraf, about the development and employment of nuclear weapons.

Pakistan remains steadfast in its refusal to sign the NPT, stating that it would do so only after India joined the Treaty. Consequently, not all of Pakistan's nuclear facilities are under IAEA safeguards. Pakistani officials have stated that signature of the CTBT is in Pakistan's best interest, but that Pakistan will do so only after developing a domestic consensus on the issue, and have disavowed any connection with India's decision. Like India, Pakistan expressed its intention to sign the CTBT, but, so far, has failed to do so. While Pakistan has provided assurances that it will not assemble or deploy its nuclear warheads, nor will it resume testing unless India does so first; it has taken no additional steps. Pakistan has agreed to enter into negotiations to complete a fissile material cutoff agreement, but has not agreed to refrain from producing fissile material before a cutoff treaty would enter into force.

Biological and Chemical Programs

Pakistan is believed to have the resources and capabilities to support a limited biological warfare research and development effort. Pakistan may continue to seek foreign equipment and technology to expand its bio-technical infrastructure. Pakistan has ratified the BWC and actively participates in compliance protocol negotiations for the treaty.

Pakistan ratified the CWC in October 1997 and did not declare any chemical agent production or development. Pakistan has imported a number of dual-use chemicals that can be used to make chemical agents. These chemicals also have commercial uses and Pakistan is working towards establishing a viable commercial chemical industry capable of producing a variety of chemicals, some of which could be used to make chemical agents. Chemical agent delivery methods available to Pakistan include missiles, artillery, and aerial bombs.

Nuclear Conducted nuclear weapon tests on 28 and 30 May 1998 in response to India's tests; claimed a total of six tests.

- *Capable of manufacturing complete sets of components for highly enriched uranium-based nuclear weapons;*
- *developing capability to produce plutonium.*
- *Has small stockpile of nuclear weapons components and can probably assemble some weapons fairly quickly. It*
- *can deliver them with fighter aircraft and possibly missiles.*
- *Has signed neither the NPT nor the CTBT.*
- *Biological Believed to have capabilities to support a limited biological warfare research effort.*
- *Ratified the BWC.*
- *Chemical Improving commercial chemical industry, which would be able to support precursor chemical production.*
- *Ratified the CWC but did not declare any chemical agent production. Opened facilities for inspection.*
- *Ballistic Missiles Has development and production facilities for solid- and liquid-propellant fuel missiles.*
- *Solid-propellant program:*
- *Hatf I rocket —80 kilometer range (produced)*
- *Hatf III —300 kilometer range; based on M-11 (being developed)*
- *Shaheen I —750 kilometer range claimed (tested)*
- *Shaheen II/Ghaznavi —2,000 kilometer range claimed (in design)*
- *Liquid-propellant program:*
- *Ghauri —1,300 kilometer range; based on No Dong (tested)*
- *Is not a member of the MTCR.*
- *Other Means of Delivery*
    - *Has ship-borne, submarine-launched, and airborne anti-ship cruise missiles; none has NBC warheads.*
    - *Aircraft: fighter-bombers.*
    - *Ground systems: artillery and rockets.*

Ballistic Missiles

Pakistan has placed a high priority on developing ballistic missiles as part of its strategy to counter India's conventional and nuclear capabilities. Pakistan has both solid and liquid-propellant ballistic missile pro-grams and, during the last several years, has received considerable assistance from China and North Korea for these efforts. Pakistan's goal is to produce increa-ingly longer-range missiles. However, Pakistan likely will continue to require significant foreign assistance in key technologies for several years. In its solid-propellant program, Pakistan has developed and produced the 80 kilometer range Hatf-1 that is now deployed with the Army. Pakistan also has developed the solid-fueled Shaheen-1 SRBM, which it tested in April 1999. According to Pakistani officials, the Shaheen-1 has a range of 750 kilometers and is capable of carrying a nuclear warhead. Pakistan also received M-11 SRBMs from China, upon which it will base its Hatf III.

Pakistan has developed and tested the liquid-propellant Ghauri medium-range ballistic missile, which is based on North Korea's No Dong MRBM. The Ghauri was successfully tested in April 1998 and 1999. Pakistani officials claimed that the Ghauri has a range of 1,500 kilometers and is capable of carrying a payload of 700 kilograms, although its range likely is the same as the No Dong, 1,300 kilometers. Also, in April 1998, the United States imposed sanctions against a Pakistani research institute and a North Korean company for transferring technology controlled under Category I of the MTCR Annex.

Following the April 1999 tests of the Ghauri and Sha-heen-1, Pakistani officials announced the conclusion "for now" of "the series of flight tests involving solid-and liquid-fuel rocket motor technologies…" and called on India to join Pakistan in a "strategic restraint regime" to limit the development of missile and nuclear weapons technology and deployment. Pakistani officials also have stated that they are developing missiles called the Ghaznavi and Shaheen-II, both with an intended range of 2,000 kilometers, which would be able to reach any target in India.

Cruise Missiles and Other Means of Delivery

Pakistan has sea- and submarine-launched short-range anti-ship cruise missiles and a variety of short-range air-launched tactical missiles, which are potential means of delivery for NBC weapons. All were pur-chased from foreign sources, including China, France, and the United States. Pakistan may have an interest in acquiring additional anti-ship cruise missiles, as well as land-attack cruise missiles, in the future but may be slowed in any such efforts by financial constraints. Pakistan also has a variety of fighter aircraft, artillery, and rockets available as potential means of delivery for NBC weapons.

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

Pakistan's Search for Weapons of Mass Destruction

Delivery Systems

- Pakistan can deliver weapons with strike aircraft or ballistic missiles.
- Pakistan has several nuclear-capable aircraft, including the F-16 and Mirage.
- Pakistan has 32 F-16A/B and 56 Mirage 5s.

- The FAS reports that there are open-source reports suggesting that several of the A-5 *Fantan* have been equiped to deliver air-dropped atomic weapons. Other reports have suggested that F-16 aircraft have practiced the "toss-bombing" technique that would be used to deliver nuclear weapons.
  - Its other aircraft are 15 aging Mirage IIIEPs with a nominal strike range of 500 kilometers, 30 Mirage 1110s, and low-grade Chinese-made fighters.
  - It is developing several different ballistic missile systems:

- The Chinese M-11 (CSS-7), with a range of 280 km.
  - China exported 30 M-11 missiles to Pakistan in 1992.

- The Carnegie Endowment reports that in 1996, a U.S. National Intelligence Estimate (NIE) estimated, Pakistan had roughly three dozen M-11 missiles. The NIE reportedly stated that these were stored in canisters at the Sargodha Air Force Base, along with maintenance facilities and missile launchers; that the missiles could be launched in as little as 48 hours, even though the missiles had not been used in actual training exercises; and that two teams of Chinese technicians had been sent to Pakistan to provide training and to help unpack and assemble the missiles. In addition, the document reportedly surmised that Pakistan probably had designed a nuclear warhead for the system, based on evidence that Pakistan had been working on such an effort for a number of years. As noted earlier, however, Pakistan had not conducted a full-scale test of any nuclear explosive device, nor had it flight-tested a prototype nuclear warhead with the M-11.
- The Carnegie Endowment reports that in late August 1996, a U.S. intelligence finding was leaked to the press: Using blueprints and equipment supplied by China, Pakistan reportedly had in late 1995 begun construction of a factory to produce short-range missiles based on the Chinese-designed M-11.
- The factory, located near Rawalpindi, was expected to be operational in one or two years. It was not clear whether the facility would be able to build complete missiles, or whether it would manufacture some components and use imported parts to produce complete systems.
  - The missile uses a solid propellant and has a 700 kilogram payload.
- The Haft 1A is a 100 kilometer range missile which was tested on February 7, 2000. It is a development of the Haft 1, which had a range of 80 kilometers with a 500 kilogram payload.
- The Hatf 2 is a solid propellant missile with a range of 350 kilometers with a 500-kilogram payload.
  - It seems be a development based on the Chinese M-11.
  - It was ordered in 1994 and began low-rate production in 1996.
- The Hatf 3 is a solid propellant missile with a range of 550 kilometers, although some sources put its range at 600-800 kilometers.
  - It was ordered in 1994 and is still developmental.
  - Some experts believe it is based on the Chinese M-9 design.
  - Others that it is an indigenous two-stage missile similar to the earlier Haft 2, but with a large first-stage solid fuel assembly.

  - In July 1997, Pakistan reportedly tested the Hatf-3 ballistic missile, as a riposte to India's semi-deployment of the Prithvi missile in Punjab. The launch location showed it could strike Lahore.

- The Haft-4, or Shaheen I, is believed to be a solid-propellant missile with a 750 kilometer range based upon the Chinese M-9. It has a 1,000 kilogram payload.
  - Ground tests of the Haft-4 were made in 1997 and 1998. It was flight tested on April 15, 1999.
  - It was ordered in 1994, and some reported claim low-rate production started in 1999.
  - It was flight tested again in February 2000, and was displayed during the march at the Pakistan Day celebration on March 23, 2000.
  - The Shaheen I and Haft 4 are identical.
- Shaheen II is also known as the Haft 7.
  - It is supposed to have a range of 2,500 kilometers.
  - It was displayed during the march at the Pakistan Day celebration on March 23, 2000.
- The Pakistani government claims it has a range of 2,500 kilometers and a payload of 1,000 kilograms.
- It is built by Pakistan's Atomic Energy Commission's National Development Complex, which is under the direction of Dr. Samar Mubarak Mund.
- It uses a transporter-erector-launcher vehicle similar to the Russian MAZ-547V, which was once used to transport the SS-20.
- Pakistan's Space and Upper Atmosphere Research Company may also be involved in its manufacture.
- Pakistan said the missile would be tested shortly.
- The Gauri I and II missiles are built by AQ Khan Research Laboratories at Kahuta.
- The Ghauri I (Haft 5) is an medium-range missile Ghauri (Haft 5), with a range of 1,300-1500 km with a 500-700 kg payload. It is capable of reaching most cities in India.
  - Development began in 1993, with North Korean assistance.
  - The initial test version of the missile was the Ghauri I (Haft V) with a maximum range of 1,500 kilometers and a 500-750 kilogram payload.
  - Various statements indicate that it is similar to the North Korean No Dong and Iranian Shahab 3. Some analyst feel it is similar to the Chinese M-9, but the Ghauri is a 16,000 kg. missile and the M-9 is only a 6,000 kg. system.
  - It had its first test flight on April 6, 1998, and flew 1,100 kilometers (900 miles). It was fired from a site near Jhelum in the northeast to an area near Quetta in the southwest. It uses a TEL launcher – a system Pakistan had not previously demonstrated.
  - Delivery is believed to have begun in 1998. It is believed to have been deployed in May 1998, with 5-10 missiles in the 47th artillery brigade.
  - It is believed to have both "conventional" (BCW?) warheads and a 30-40 KT nuclear payload.
  - A version for a satellite booster may be in development.
  - Pakistan stated in late May 1998 that it was ready to equipment the Ghauri with nuclear weapons.
  - The Ghauri was tested again on April 14, 1999. Territorial limits mean that Pakistan can only test to a maximum range of 1,165 kilometers on its own soil. This time, Pakistan seems to have tested the Ghauri II with a range of 2,000-2,300 kilometers and a 750-1,000 kg. payload.
- The Ghauri II (Haft-6) is sometimes credited with a range of up to 3,000 kilometers.

  - Some US experts believe it has a maximum range of 2,300 kilometers, but can only go 2,000 kilometers with its present nuclear warhead.
  - The missile was ordered in 1993 and limited production began in 1999.
  - It is a liquid fueled missile and takes sometime to prepare, possibly making it vulnerable to Indian strikes.
  - The Carnegie Endowment reports that China is reported to be constructing a factory to build similar missiles.
- The Ghauri III (Haft-7) is sometimes credited with a range of up to 3,000 kilometers.
  - The missile was ordered in 1993 and is still; developmental.
- Pakistan recovered a US cruise missile that went astray during the US attack on Afghanistan in late August 1998.
- The CIA reported in February 1999 that Chinese and North Korean entities continued to provide assistance to Pakistan's ballistic missile program. Such assistance is critical for Islamabad's efforts to produce ballistic missiles.
- In April 1998, the United States imposed sanctions against Pakistani and North Korean entities for their role in transferring Missile Technology Control Regime Category I ballistic missile-related technology.
- The DCI Nonproliferation Center (NPC) reported in February 2000 that Chinese and North Korean entities continued to provide assistance to Pakistan's ballistic missile program during the first half of 1999. Such assistance is critical for Islamabad's efforts to produce ballistic missiles. In April 1998, Pakistan flight-tested the Ghauri MRBM, which is based on North Korea's No Dong missile. Also in April 1998, the US imposed sanctions against Pakistani and North Korean entities for their role in transferring Missile Technology Control Regime Category I ballistic missile-related technology. In April 1999, Islamabad flight-tested another Ghauri MRBM and the Shaheen-1 SRBM.
  - The US intelligence community reported on July 1, 2000 that China continued to aid Pakistan in building long-range missiles, and had stepped up its shipments of specialty steels, guidance systems, and technical expertise. They also stated that Pakistan's newest missile factory seemed to follow Chinese designs.
- The CIA reported in August 2000 that Chinese entities provided increased assistance to Pakistan's ballistic missile program during the second half of 1999. North Korea continued to provide important assistance as well. Such assistance is critical for Islamabad's efforts to produce ballistic missiles. In April 1998, for example, Pakistan flight-tested the Ghauri MRBM, which is based on North Korea's No Dong missile. As a result, the US imposed sanctions against Pakistani and North Korean entities in April 1998 for their role in transferring Missile Technology Control Regime Category I ballistic missile-related technology. In April 1999, Islamabad flight-tested another Ghauri MRBM and the Shaheen-1 SRBM and can be expected to respond to another successful Indian missile test (e.g., Agni-II or Prithvi-II) with a new test flight of a Ghauri or Shaheen missile.

Chemical Weapons

- Pakistan has long been involved in the development of chemical weapons; possibly since the early 1980s.
- It has probably reached the point of final development and weaponization for a number of agents.
- No evidence of production capability,but Pakistan's market for industrial chemicals is expanding gradually, with production of chemicals largely confined to soda ash, caustic soda, sulfuric and hydrochloric acid, sodium bicarbonate, liquid chlorine, aluminum sulfate, carbon black, acetone and acetic acid. Although imports account for most of the market, local production is expected to increase as new plants come on stream. There are over 400 licensed pharmaceutical companies in Pakistan, including 35 multinationals who have over 60 percent of the market share. Approximately one-third of Pakistan's total consumption of pharmaceutical is imported. Major suppliers include the United States, the U.K,, Germany, Switzerland, Japan, Holland and France

- Pakistan ratified the CWC on 28 October 1997. The CWC was neither discussed in the parliament nor brought before the Federal Cabinet. It claimed that it did have chemical weapons capabilities to declare under the Convention. Although Pakistan did not admit to the manufacture of chemical weapons, it uses and consumes a chemicals that can be utilised for producing chemical weapons, and would would have been denied access to such dual-use chemicals if it has not joined the CWC
- The Federation of American Scientists reports that Pakistan has manufactured weapons for blister, blood, choking and nerve agents according to Indian intelligence estimates. China may be an supplier of technology and equipment to Pakistan. India claims that Pakistan used chemical weapons against Indian soldiers in Siachen in 1987.
- In 1992 India declared to Pakistan that it did not possess chemical weapons, and India and Pakistan issued a declaration that neither side possessed or intended to acquire or use chemical weapons.
- Pakistan is now obligated under the CWC to open all its installations for inspection. At the first stage, the team of UN inspectors visited the Wah Ordinance Factory on 19 February 1999to assess whether Pakistan was producing chemical weapons. The FAS states that according to one published report, "the Pakistani government had dismantled the chemical plant in the factory, the earth was dug up quite deeply after the plant was dismantled, and it was followed by a leveling of the land."

Biological Weapons

- Pakistan has long been involved in the development of biological weapons; possibly since the early 1980s.
- It has probably reached the point of final development and weaponization for a number of agents.
- No evidence of production capability, but has a well-developed bioligical and biotechnical R&D and production base by the standards of a developing nation.
- Pakistan has singed the BWC, and is participating in the negotiations to develop a verification protocol. It has opposed artificial deadlines and an emphasis on creating a comprehensive verification regime that could not be based on consensus.

Nuclear Weapons

    - According to the Carnegie Endowment, Pakistan began its nuclear weapons program in 1972, in the aftermath of the 1971 war with India. The program accelerated after India' s nuclear test in May 1974, and made substantial progress by the early 1980s.

- Carnegie reports that the program was expedited by the return to Pakistan in 1975 of Dr. Abdul Qadeer Khan, a German-trained metallurgist, who was employed at the classified URENCO uranium-enrichment plant at Anselmo in the Netherlands in the early 1970s. Dr. Khan brought to Pakistan personal knowledge of gas-centrifuge equipment and industrial suppliers, especially in Europe, and was put in charge of building, equipping, and operating Pakistan's Kahuta enrichment facility.
- Pakistan halted further production of weapons-grade uranium in 1991, temporarily placing a ceiling on the size of its stockpile of highly enriched uranium (HEU). It has made efforts to expand other elements of its nuclear weapons program, however, including work on weapons design, on unsafeguarded facilities to produce plutonium and, possibly, on facilities to increase the production capacity for weapons-grade uranium.
- The United States terminated economic and military aid to Pakistan in 1977 and 1979 in an effort to force it to halt its nuclear weapons program.
- According to work by the Federation of American Scientists,
    - President Ayub Khan took initial steps in 1965, but , Pakistan's Atomic Energy commission was founded some 15 years after the Indian program. Zulfiqar Ali Bhutto was the founder of Pakistan's Nuclear Program, initially as Minister for Fuel, Power and Natural Resources, and later as President and Prime Minister.

  - Pakistan's nuclear program was launched in earnest shortly after the loss of East Pakistan in the 1971 war with India, when Bhutto initiated a program to develop nuclear weapons with a meeting of physicists and engineers at Multan in January 1972.

- Bhutto reacted strongly to India's successfully test of a nuclear "device" in 1974, and called for an must develop its own "Islamic bomb." Pakistan's activities were initially centered in a few facilities. A.Q. Khan founded the Engineering Research Laboratories at Kahuta in 1976, which later to became the Dr. A. Q. Khan Research Laboratories (KRL).
  - Almost all of Pakistan's nuclear program was and remains focused on weapons applications.
  - Initially, Pakistan focused on plutonium. In October 1974 Pakistan signed a contract with France for the design of a reprocessing facility for the fuel from its power plant at Karachi and other planned facilities. However, France withdrew at the end of 1976, after sustained pressure by the United States.
- In 1975, Dr Abdul Qadeer Khan provided for uranium enrichment centrifuges plans stolen from URENCO, and lists of sources of the necessary technology. Pakistan initially focused its development efforts on highly enriched uranium (HEU), and exploited an extensive clandestine procurement network to support these efforts. Plutonium involves more arduous and hazardous procedures and cumbersome and expensive processes.
- In 1981, a US State Department cable was leaked that stated that "We have strong reason to believe that Pakistan is seeking to develop a nuclear explosives capability…Pakistan is conducting a program for the design and development of a triggering package for nuclear explosive devices." In 1983, the US declassified an assessment that concluded that "There is unambiguous evidence that Pakistan is actively pursuing a nuclear weapons development program…We believe the ultimate application of the enriched uranium produced at Kahuta, which is unsafeguarded, is clearly nuclear weapons."
  - Chinese assistance in the development of gas centrifuges at Kahuta was indicated by the presence of Chinese technicians at the facility in the early 1980s. The uranium enrichment facility began operating in the early 1980s, but suffered serious start up problems. In early 1996 it was reported that the A.Q. Khan Research Laboratory had received 5,000 ring magnets, which can be used in gas centrifuges, from a subsidiary of the China National Nuclear Corporation.
  - Pakistan's became increasingly dependent on China grew as Western export controls and enforcement mechanisms became more stringent. This Chinese assistance predated the 1986 Sino-Pakistani atomic cooperation agreement, with some critical transfers occurring from 1980 through 1985. Pakistan Foreign Minister Yakub Khan was present at the Chinese Lop Nor test site to witness the test of a small nuclear device in May 1983, giving rise to speculation that a Pakistani-assembled device was detonated in this test.
  - At some point near the signing of the 1986 Sino-Pakistani atomic cooperation agreement, Pakistan seems to have embarked on a parrallel Plutonium program. A heavy water reactor at Khushab was built with Chinese assistance and is the central element of Pakistan's program for production of plutonium and tritium for advanced compact warheads. The Khushab facility, like that at Kahuta, is not subject to IAEA inspections. Khushab, with a capacity variously reported at between 40 and 70 MWT, was completed in the mid-1990s, with the start of construction dating to the mid-1980s.
- China has played a major role in many aspects of Pakistan's nuclear program:
  - is reported to have provided Pakistan with the design of one of its warheads, as well as sufficient HEU for a few weapons. The 25-kiloton design was the one used in China's fourth nuclear test, which was an atmospheric test using a ballistic missile launch. This configuration is said to be a fairly sophisticated design, with each warhead weighing considerably less than the unwieldy, first-generation US and Soviet weapons which weighed several thousand kilograms.
    - Pakistan purchased of 5,000 custom-made ring magnets from China, a key component of the bearings that support high-speed rotation of centrifuges. Shipments of the magnets, which were sized to fit the specific type of centrifuge used at the Kahuta plant, were apparently made between December 1994 and mid-1995. It was not clear whether the ring magnets were intended for Kahuta as a "future reserve supply," or whether they were intended to permit Pakistan to increase the number of uranium-enrichment centrifuges, either at Kahuta or at another location.

- As of the mid-1990s it was widely reported that Pakistan's stockpile consisted of as many as 10 nuclear warheads based on a Chinese design.
  - Pakistan now has extensive nuclear facilities:
  - There is a 50-70 megawatt research and Plutonium production reactor at Khushab.
  - The main Plutonium extraction plant is at Chasma, and is not under IAEA inspection. Pakistani Institute of Nuclear Science and Technology has pilot plants for plutonium extraction that are not under IAEA control.
  - The Khan Research Laboratory at Kahuta is a large-scale Uranium enrichment plant not under IAEA control.
  - The Carnegie Endowment reports that Pakistan has continued work on its 40-MWt, heavy-water research reactor at Khushab, with Chinese assistance, Pakistan reported completed its Khushab reactor in 1996, but it has not been fueled, apparently because of Pakistan's inability to procure (or produce) a sufficient supply of unsafeguarded heavy water.
  - Khushab has not been placed under IAEA controls. It is estimated to be capable of generating enough plutonium for between one and two nuclear weapons annually. Once operational, it could provide Pakistan with the country's first source of plutonium-bearing spent fuel free from IAEA controls. Not only would this increase Pakistan's overall weapons production capabilities by perhaps 20-30 percent (assuming that the Kahuta enrichment plant can produce enough weapons-grade uranium for three to four weapons per year), but the availability of plutonium would permit Pakistan to develop smaller and lighter nuclear warheads. This in turn might facilitate Pakistan's development of warheads for ballistic missiles. In addition, Pakistan might employ the Khushab reactor to irradiate lithium-6 to produce tritium, a material used to "boost" nuclear weapons so as to improve their yield-to-weight efficiency.
  - Weapons-grade plutonium from the Khushab reactor's spent fuel could be extracted at the nearby Chasma reprocessing plant, if that facility becomes operational, or at the pilot-scale New Labs reprocessing facility at the Pakistani Institute of Nuclear Science and Technology (PINSTECH) in Rawalpindi—both facilities being outside IAEA purview.
  - China is reported to be assisting Pakistan with completing a facility linked to the Khushab reactor and thought to be either a fuel fabrication plant or a plutonium separation (reprocessing) plant. Pakistan previously was not thought to have a fuel fabrication facility to manufacture fuel for the new reactor.
  - The status of Pakistan's reprocessing capabilities at New Labs in Rawalpindi and at the Chasma site has not been clear from published sources. A classified U.S. State Department analysis prepared in 1983 said that the New Labs facility was "nearing completion" at that time; thus the facility could well be available for use today. Reports on the Chasma reprocessing facility in the early 1990s suggested that it was progressing, but probably still several years from completion. According to an analysis by the CIA quoted in the press, as of April 1996, China was providing technicians and equipment to help finish the facility. According to reports of August 1997, however, U.S. officials believe that, while some Chinese assistance and equipment may have trickled into the Chasma reprocessing project, the reprocessing complex at Chasma "is an empty shell." If this description is correct, Pakistan may have only the laboratory-scale reprocessing capability at New Labs and may be further from major plutonium reprocessing activities than once thought.
  - Pakistani specialists also pursued efforts to improve the Kahuta enrichment plant and, possibly, to expand the country's capacity to enrich uranium. A uranium weapon needs roughly 15 kilograms of U-235 with 93% enrichment.
- On 28 May 1998 Pakistan announced that it had successfully conducted five nuclear tests. These tests came slightly more than 2 weeks after India carried out 5 nuclear tests of its own, and after many warnings by Pakistani officials that they would respond to India (the two countries have fought 3 wars). In addition, Pakistan's President Rafiq Tarar declared a state of emergency, citing "threat by external aggression to the security of Pakistan."

- According to the announcement, the results were as expected, and there was no release of radioactivity. The Pakistan Atomic Energy Commission claimed that the five nuclear tests conducted on Thursday measured up to 5.0 on the Richter scale, with a reported yield of up to 40 KT (equivalent TNT). According to some reports the detonations took place over a two-hour period. One device was said to be a boosted uranium device, with the four other tests being low yield sub-kiloton devices. On 30 May 1998 Pakistan tested one more nuclear warhead with a yield of 12 kilotons.
- The tests were conducted at Balochistan, bringing the total number of claimed tests to six. It has also been claimed by Pakistani sources that at least one additional device, initially planned for detonation on 30 May 1998, remained emplaced underground ready for detonation.
- These claims cannot be independently confirmed by seismic means. Indian sources have said that as few as two weapons were actually detonated, each with yields considerably lower than claimed by Pakistan. Three of the tests on May 28, however, may have been subkiloton, The two larger tests indicate one may have been a test of a boost weapon of 25-36 kilotons. The second has a claimed yield of 12 KT, and a seismic signature of 7-8 KT. The FAS indicates that seismic data showed at least two and possibly a third, much smaller, test in the initial round of tests at the Ras Koh range.
- The single test on 30 May provided a clear seismic signal, although Pakistan claimed a 12 KT yield and the data indicate 1-3 KT.
    - Pakistan's Foreign Minister announced on May 29, 1999 that Pakistan was a nuclear power.
    - He stated that "Our nuclear weapons capability is solely meant for national self defense. It will never be used for offensive purposes." He also stated, however, that "We have nuclear weapons, we are a nuclear power…we have an advanced missile program" and that Pakistan would retaliate "with vengeance and devastating effect" against any attack by India.
    - He claimed that Pakistan had tested five nuclear devices in the Chagi Hills in Western Pakistan on May 28, 1998. It is not clear that Pakistan tested this many, and it may simply have claimed to have tested as many as India had earlier.
    - Pakistani scientists (Dr. Abdul Qadeer and Samar Mubrik) said at the time that Pakistan would need 60-70 warheads to have a credible deterrent.
    - Pakistan announced in February 2000 that it was creating a new National Command Authority to control its long-range missiles and nuclear program. It is responsible for policy and strategy, and "will exercise employment and development control over all the strategic forces and strategic organizations."
    - It is colocated with the Joint Strategic Headquarters.
    - A new Strategic Plans Division has been created under a Lt. General, and acts as a secretariat for the NCA. The NCA has two committees.
    - The Employment Control Council determines the shape and use of the nuclear arsenal. It is chaired by the head of state with the Foreign Minister as Deputy Chairman. It includes the Chairman of the Joint Chiefs, the service chiefs, the Director General of the Strategic Plans Division, and other scientific, technical, and political representatives as are required by the committee.
    - The Development Council supervises the development of nuclear and missile forces and related C4I systems. It is chaired by the head of government with the Chairman of the Joint Chiefs as a Deputy and the service chiefs, Director General Strategic Plans Division, and scientific and technical representatives are members.
    - The Carnegie Endowment estimates that Pakistan has over 200 kg of weapons-grade highly-enriched uranium — enough to construct fifteen to twenty-five nuclear weapons (India could build about seventy). Pakistan is thought to have received a workable nuclear bomb design from China in the early 1980s, and to have conducted a "cold test" — a full test, but without a core of weapons-grade material — of this design in 1986.

  - The CIA reported in February 1999 that Pakistan sought a wide variety of dual-use nuclear-related equipment and materials from sources throughout the world during the first half of 1998. Islamabad has a well-developed nuclear weapons program, as evidenced by its first nuclear weapons tests in late May 1998. (The United States imposed sanctions against Pakistan as a result of these tests.) Acquisition of nuclear-related goods from foreign sources will be important for the development and production of more advanced nuclear weapons.
  - The CIA reported in February 1999 that Pakistan China had provided extensive support in the past to Pakistan's WMD programs, and some assistance continues.
  - The DCI Nonproliferation Center (NPC) reported in February 2000 that Pakistan acquired a considerable amount of nuclear-related and dual-use equipment and materials from various sources-principally in the FSU and Western Europe-during the first half of 1999. Islamabad has a well-developed nuclear weapons program, as evidenced by its first nuclear weapons tests in late May 1998. (The US imposed sanctions against Pakistan as a result of these tests.) Acquisition of nuclear-related goods from foreign sources will be important if Pakistan chooses to develop more advanced nuclear weapons. China, which has provided extensive support in the past to Islamabad's WMD programs, in May 1996 promised to stop assistance to unsafeguarded nuclear facilities-but we cannot rule out ongoing contacts.

- George Tenet, the Director of the CIA, testified before the Senate Foreign Relations Committee on March 20, 2000 and stated that, "India and Pakistan are developing more advanced nuclear weapons and are moving toward deployment of significant nuclear arsenals. Both sides are postured in a way that could lead to more intense engagements later this year. Our concern persists that antagonisms in South Asia could still produce a more dangerous conflict on the subcontinent."
- The CIA reported in August 2000 that Pakistan continued to acquire nuclear-related and dual-use equipment and materials from various sources—principally in Western Europe—during the second half of 1999. Islamabad has a well-developed nuclear weapons program, as evidenced by its first nuclear weapons tests in late May 1998. Acquisition of nuclear-related goods from foreign sources will be important if Pakistan chooses to develop more advanced nuclear weapons. China, which has provided extensive support in the past to Islamabad's WMD programs, in May 1996 promised to stop assistance to unsafeguarded nuclear facilities—but we cannot rule out ongoing contacts.

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