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The Asian Balance of Weapons of Mass Destruction

A Quantitative and Arms Control Analysis

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Part One

Overall Nuclear Force Levels

The Nuclear Dimension – Part One

Country	Sea-Based	Land Based	Air Force
US	18 SSBM/432 SLBM (+1/16 Poseidon C-3 tubes in ex-SSBN)	550 Missiles Total	208 Active. 315 START accountable
(33,500 nuclear weapons)*		50 Peacekeeper MX	2/20 B-2A
	10 SSBN-734 with up to 24 Trident D-5 (240 SLBM)	500 Minuteman III	5/92 B-52H with up to 20 ALCM (AGM-86) each (57 combat ready)
	8 SSBN-726 with up 24 Trident C-4 (192 SLBM)		8/91 B-1B
Russia	17 SSBN/280 SLBM	740 ICBM/3,380 Whd.	74 Hvy Bomber (Start Accountable)
		180 SS-18 (RS-20 74 START-accountable Mostly Mod4/5 w/	
	3 Typhoon with 20 SS-N-20 each (60)	10 MIRV	74 Tu-95H6 with AS-15 ALCM
(62,500 nuclear weapons)*		140 SS-19 (RS-18)	15 Tu-160
	6 Delta IV with 16 SS-N-23 each (96)	Mostly Mod 3, 6 MIRV	
		24 SS-27 Topol M2	7 Tu-95 & 1 Tu-160 test
	7 Delta III with 16 SS-N-18 each (112)	with 20 entering service	aircraft.
		36 SS-24 (RS22) with	117 Tu-22M/MR (more in storage)
	1 Delta I with 12 SS-N-8 each (12)	10 MIRV 36 Rail in Russia	
	In addition, 10 SSBN and 156 missiles remain START accountable: 2 Typhoon/40 SS-N-20 1 Delta IV/16 SS-N-23 4 Delta III/64 SS-N-18 3 Delta I/36 SS-N-8	360 SS-25 (RS-12M) single warhead mobile (360) & silo launch (10) in Russia 36 SH-11 Galosh & 64 SH-08 Gazelle	
	6 Oscar II SSGN/ 24 SS-N-19		
	8 Akula SSN/ SS-N-21 1 Sierra SSN/ SS-N-21 1 Yankee SSN/SS-N-21 5 Victor III SSN/SS-N-15		

* Without nuclear warhead or weapons.

The Nuclear Dimension – Part Two

Country	Sea-Based	Land Based	Air Force
France	4 SSBN/64 SLBM	None	3/60 Mirage-2000N (ASM P)
(1,400 nuclear weapons)*	2 L'Inflexible with 16 M-4?TN-70 or 71 each		28 Super Etendard AMSP plus 16 in storage
	2 Le Triomphant with 16 M-45/TN-75 each		
United Kingdom	4 SSBN/58 SLBM	None	None
(1,100 nuclear weapons)*	4 Vanguard SSBN with up to 16 Trident D-5 each and maximum of 48 warheads per boat. (Each missile can be MIRV'd to 12 warheads, But some had only 1. Total is less than 200 operational warheads.		
China	1 Xia SSBN with 12 CSS-N-3 (J-1)	20+ CSS-4 (DF-5) MIRV ICBM	Up to 126 H-6, Some nuclear capable.
(500-1,300 nuclear weapons)*	1 Romeo SSGN?	20+ CSS-3 (DF-4) ICBM	200+ H-5?
		60-80 CSS-2 (DF-3 IRBM	
		50+ CSS-5 DF-21 IRBM	
		25L/200M DF-15 CSS-6/M-9 SRBM (600 km)	
		25 DF-11 CSS-7/M-11 SRBM (120-300 KM)	

* Estimate by Sergei Rogov
Source: Adapted by Anthony H. Cordesman from the IISS, Military Balance, 2001-2002.

Part Two

Chinese Force Trends

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

Capabilities, Intentions, and Trends

Beijing continues to emerge as an increasingly active player in the region. Therefore, it is focused on becoming a world-class industrialized power through a countrywide modernization effort, which includes economic, technological, and military components of national power. Beijing already wields significant international influence by virtue of its permanent membership on the United Nations (UN) Security Council and its economic influence. China's public support for nonproliferation regimes is motivated by several factors, including a desire to enhance its image as a responsible world power and support for nonproliferation objectives.

China's leaders have articulated that a limited but long-range nuclear capability is a key component of national strength and prestige, a capability critical to carrying out Beijing's independent foreign policy and to supporting its international status. China is qualitatively improving its nuclear arsenal through a modernization program and, by 2015, China likely will have tens of missiles capable of reaching the United States. Moreover, despite its ratification of the BWC and the CWC, China is believed to retain some biological and chemical warfare capabilities. Beijing also has under-taken a ballistic missile modernization effort. For example, it is expanding its SRBM force, which it likely views as an important tool for military and political influence in the region. It also is improving its ICBM capability by developing two road-mobile solid-propellant ICBMs and a new submarine launched ballistic missile (SLBM).

Overall funding for these programs will likely reflect, in part, China's evolving perceptions of global and regional threats and its response to changing domestic economic conditions. Beijing will be challenged to maintain the high growth rates of recent years and the defense budget is likely to vary between about 3.5 per-cent and 5 percent of China's total nominal Gross Domestic Product (GDP). Thus, funding for China's NBC and missile programs likely will increase gradually. Projecting a realistic modest growth pattern, including expected economic fluctuations, total military funding levels are expected to average between $44 and $70 billion (in constant 1998 dollars) annually between 2000 and 2004. China has made numerous nonproliferation pledges and ratified several key nonproliferation treaties and arms control regimes. In response to U.S. concerns that Chinese companies have provided support,

Nuclear Program

China currently has over 100 nuclear warheads and is increasing the size, accuracy, and survivability of its nuclear missile force. It is likely that the number of deployed Chinese theater and strategic systems will increase in the next several years. However, as its stra-tegic requirements evolve, it may change the pace of its modernization effort for its nuclear missile force (particularly if the United States deploys NMD); any warhead improvements will complement China's mis-sile modernization effort. China currently is not believed to be producing fissile material for nuclear weapons, but has a stockpile of fissile material suffi-cient to improve or increase its weapons inventory. China has ratified the NPT and signed the CTBT, and has declared it will never use its nuclear forces against a non-nuclear weapons state. China maintains a no-first- use pledge in its strategic nuclear doctrine and regards its strategic nuclear force as a deterrent against intimidation or actual attack. Thus, China's stated doc-trine reportedly calls for a survivable long-range mis-sile force that can hold a significant portion of the U.S. population at risk in a retaliatory strike. As China's strategic forces and doctrine further evolve, Beijing will continue to develop and deploy more modern ICBMs and SLBMs

Biological Program

China continues to maintain some elements of an offensive biological warfare program it is believed to have started in the 1950s. China possesses a sufficiently advanced biotechnology infrastructure to allow it to develop and produce biological agents. Its munitions industry is sufficient to allow it to weaponize any such agents, and it has a variety of delivery means that could be used for biological agent delivery. China is believed to possess an offensive biological warfare capability based on technology developed prior to its accession to the BWC in 1984. China actively participates in international efforts to negotiate a BWC compliance protocol.

Since 1984, China consistently has claimed that it never researched, produced, or possessed any biological weapons and never would do so. Nevertheless, China's declarations under the voluntary BWC declarations for confidence building purposes are believed to be inaccurate and incomplete, and there are some reports that China may retain elements of its biological warfare program.

Chemical Program

Beijing is believed to have an advanced chemical warfare program including research and development, production, and weaponization capabilities. China's chemical industry has the capability to produce many chemicals, some of which have been sought by states trying to develop a chemical warfare capability. Foreign sales of such chemicals have been a source of foreign exchange for China. The Chinese government has imposed restrictions on the sale of some chemical pre-cursors and its enforcement activities generally have yielded mixed results. While China claims it possesses no chemical agent inventory, it is believed to possess a moderate inventory of traditional agents. It has a wide variety of potential delivery systems for chemical agents, including cannon artillery, multiple rocket launchers, mortars, land mines, aerial bombs, SRBMs, and MRBMs.
Chinese military forces most likely have a good under-standing of chemical warfare doctrine, and its forces routinely conduct defensive chemical warfare training. Even though China has ratified the CWC, made its declaration, and subjected its declared chemical weapons facilities to inspections, we believe that Beijing has not acknowledged the full extent of its chemical weapons program.

Ballistic Missiles

China has continued to modernize its ballistic missile force over the last several years and its industrial base can support production of the full range of ballistic missiles. China's missile force is designed to serve as a strategic deterrent against Russia and the United States. While the ultimate extent of China's strategic modernization is unknown, it is clear that the number, reliability, survivability, and accuracy of Chinese strategic missiles capable of hitting the United States will increase during the next two decades.

China currently has about 20 CSS-4 ICBMs with a range of over 13,000 kilometers, which can reach the United States. Some of its ongoing missile modernization programs likely will increase the number of Chinese warheads aimed at the United States. For example, Beijing is developing two new-road mobile solid-propellant ICBMs. China has conducted successful flight tests of the DF-31 ICBM in 1999 and 2000; this missile is estimated to have a range of about 8,000 kilometers. Another longer-range mobile ICBM also is under development and likely will be tested within the next several years. It will be targeted primarily against the United States.
China currently has a single XIA class SSBN, which is not operational; it is intended to carry 12 CSS-NX-3 missiles; these missiles have a range greater than 1,000 kilometers. In addition, the Chinese are designing a new SSBN that will carry the JL-2 ballistic missile, which is expected to have a range of over 8,000 kilometers. The JL-2 likely will be tested in the next decade, and, when deployed, it probably will be able to target the United States from operating areas near the Chinese coast.

In addition, China increasingly sees conventionally armed ballistic missiles, such as the solid-propellant road-mobile CSS-6, with a range of 600 kilometers, as important weapons for a regional conflict and for their political and military deterrent effect. The size of this SRBM force is expected to grow in the next several years, as China will augment it with more modern CSS-7 road-mobile solid-propellant missiles, which have a range of 300 kilometers. These missiles are expected to incorporate satellite-assisted navigation technology to improve their accuracy. While continuing to increase the number of missiles and launchers in its inventory, Beijing also is concentrating on replacing liquid-propellant missiles with mobile solid-propellant missiles, reflecting a preference for diminished maintenance and improved survivability and reliability.

Cruise Missiles and Other Means of Delivery

China produces several types of land-, sea-, and air-launched cruise missiles, which are potential means of delivery for NBC weapons. While most are short-range and are deployed for anti-ship operations, China is developing land attack cruise missiles (LACMs) as well as a submarine-launched anti-ship cruise missile; this effort appears to have a relatively high priority. China's research and development of LACMs is being aided by an aggressive acquisition of foreign technology and subsystems, particularly from Russia. The first LACM will be an air-launched version, and may be operational in the next few years. China has exported several versions of anti-ship cruise missiles to countries in the Middle East and South Asia, and to North Korea. China also has a variety of fighters, bombers, helicopters, artillery, rockets, mortars, and sprayers available as potential means of delivery for NBC weapons.

Role as Supplier

China has made numerous nonproliferation pledges since 1992, publicly supports a number of nonproliferation regimes, and has ratified several nonproliferation related treaties. China has maintained that it will not assist any country in developing nuclear weapons or the MTCR-class missiles to deliver them, and has taken numerous steps over the last several years to strengthen its control over sensitive exports. Nevertheless, Chinese entities have supported some nuclear, chemical, and missile programs in countries of proliferation concern, driven by China's overall strategic interests in South Asia and the Middle East and by

domestic economic pressures. China joined the Zangger Committee, which clarifies certain nuclear export obligations under the NPT, in October 1997 and participated in the Zangger Conversion Technology Holders meeting in February 1999.

This was China's first opportunity to participate in a discussion of this type that could result in changes to the Zangger trigger list coverage. In late 1997, China pledged not to engage in any new nuclear cooperation with Iran and to complete work on two remaining nuclear projects —a small research reactor and a zirconium production facility —in a relatively short period of time. An Agreement for Peaceful Nuclear Cooperation between the United States and China would have entered into force on 30 December 1985, but Congress intervened owing to concerns about China's nonproliferation policies and practices. Following these major and positive changes in China's approach to its nuclear nonproliferation obligations and responsibilities, the United States in March 1998 made the certifications necessary to permit peaceful U.S. nuclear cooperation, including some exports, under the U.S.-China Agreement.

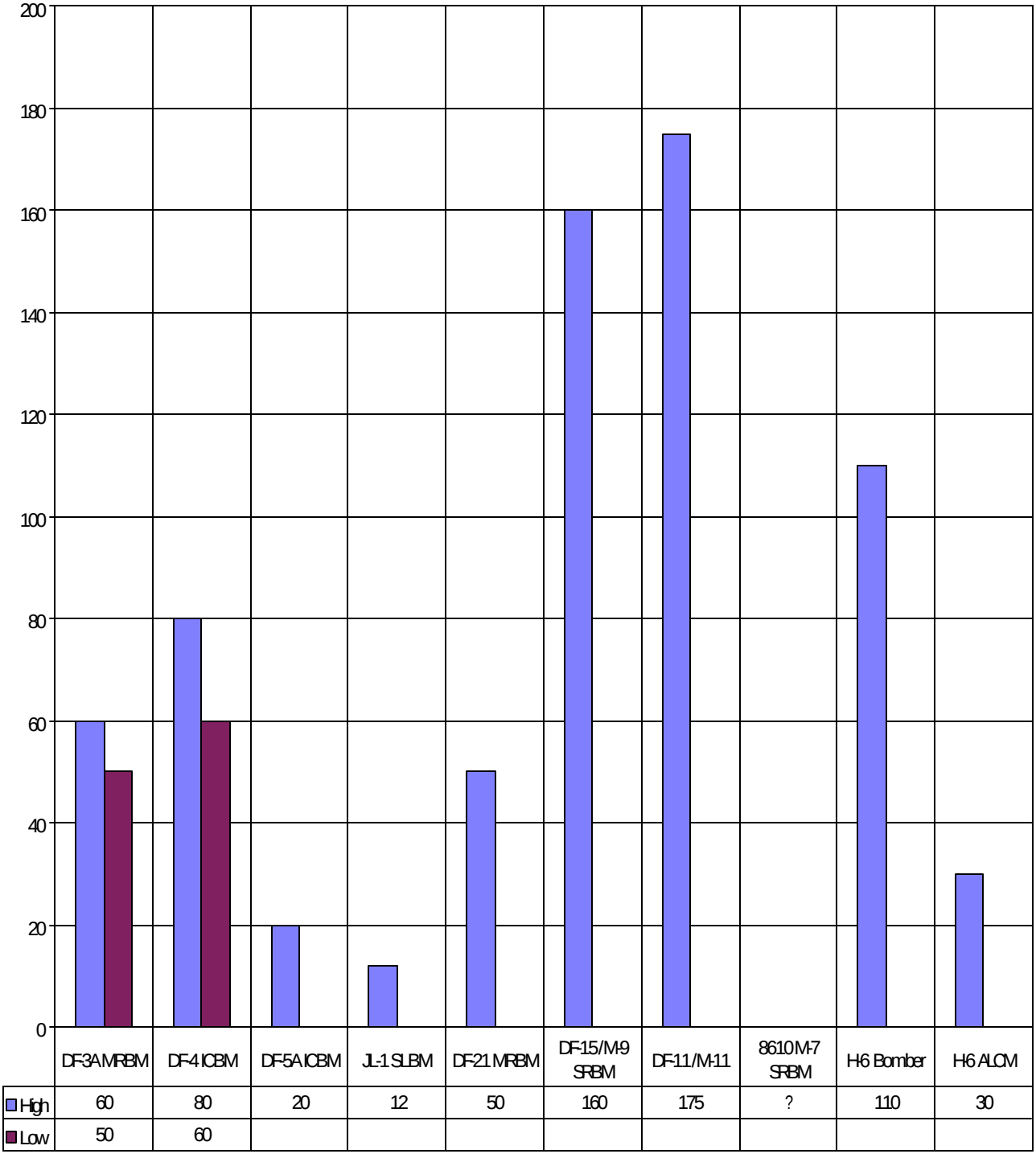
In the past, Chinese firms supplied chemical warfare-related production equipment and technology to Iran. The U.S. sanctions, imposed in May 1997 on seven Chinese entities for knowingly and materially contributing to Iran's chemical warfare program, remain in effect. In June 1998, China announced that it had expanded its chemical export controls to include 10 of the 20 Australia Group chemicals not listed on the CWC schedules.

In October 1994, China reaffirmed its commitment not to export ground-to-ground MTCR-class missiles. In November 2000, China made a clear policy commitment not to assist, in any way, other countries to develop ballistic missiles that can be used to deliver nuclear weapons, and to further improve and reinforce its export control system, including by publishing at an early date a comprehensive export control list of missile-related items, including dual-use items. This pledge provides constraints on China's missile exports. In consideration of China's commitment to strengthen its missile-related export control system, the U.S. government decided to waive sanctions required by U.S. law for past assistance by Chinese entities to missile programs in Pakistan and Iran.

…In recent years, Chinese firms have provided some important missile-related items and assistance to several countries of concern, such as Iran, Libya, and North Korea. China also has provided extensive support in the past to Pakistan's nuclear and ballistic missile pro-grams, and some ballistic missile assistance continues.

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

Chinese Deployed Nuclear-Capable Delivery Systems



	DF-3A MRBM	DF-4 ICBM	DF-5A ICBM	JL-1 SLBM	DF-21 MRBM	DF-15/M-9 SRBM	DF-11/M-11	8610 M-7 SRBM	H6 Bomber	H6 ALCM
High	60	80	20	12	50	160	175	?	110	30
Low	50	60								

Source: Adapted by Anthony H. Cordesman from IISS, Military Balance, 2001-2002, and Shirley A. Kan, China: Ballistic and Cruise Missiles, Congressional Research Service, CRS 97-391 F, September 28, 1998

Estimate of Total Chinese Nuclear Forces, 2001-2002

Type/ Designation	Launchers Deployed	First Deployed	Range (km)	Warheads x yield	Warheads
LAND - BASED MISSILES					
DF-3 (3A)	60-80	1971	2,650 (2,800)	1 x 3.3 MT	60-80
DF-4	20+	1980	4,750	1 x 3.3 MT	20
DF-5 (5A)	20+	1981	12,000 (13,000)	1 x 4-5 MT; MIRV tested	~20
DF-21 (21A)	50	1985-6	1,700 (1,800	1 x 200-300 kt	36
DF-25	0	development	1,700	n/a	0
DF-31	1	Tested in 1999	8,000	1 x 200-300 kt; 50-90 kt; MIRV?	10-20 to be built
DF-41	0	development	12,000	250 kt; MIRV	12 to be built
SEA LAUNCHED BALLISTIC MISSILES					
Julang-1	12	1986	1,700 (2150)	1 x 200-300 kt	12
Julang-2	0	development	8,000-9,000	1 x 100-200 kt	16 to be built?
AIRCRAFT					
H-6	110	1965	3,100	1-3 bomb (10kt -3MT)	110
Q-5	300	1970	400	1 bomb (10kt - 3 MT)	300
TACTICAL WEAPONS					
Artillery/SRMs				low kt	120
TOTAL				~410 MT	400

Sources for this table include: Rodney Jones and Mark McDonough, Tracking Nuclear Proliferation, 1998 (Washington D.C.: Carnegie Endowment for International Peace, 1998); William Arkin, Robert Norris, and Joshua Handler, Taking Stock: Worldwide Nuclear Deployments, 199*8* (Washington, D.C.: NRDC Nuclear Program, 1998); "Table of Chinese Nuclear Forces," Natural Resources Defense Council, nrdc.org/nuclear/nudb/datab17.asp; Center for Nonproliferaion Studies, Proliferation Challenges and Nonproliferation Opportunities for New Administrations, Occasional Paper No. 4, Monterey Institute of International Studies, September 2000; IISS, Military Balance, 2001-2002, and Department of Defense, Proliferation and Response, January 2001, p. 54-56.

1. There are varying reports as to the number of DF-5 (CSS-4) missiles in China's inventory. Unconfirmed reports by anonymous intelligence officials have placed the number as high as 24, while the International Institute for Strategic Studies places the total count at 7. See Bill Gertz, "China adds 6 ICBMs to arsenal," *The Washington Times*, July 21, 1998, p. A1, and "China Targets Nukes at U.S.:CIA Missile Report contradicts Clinton," *Washington Times*, May 1, 1998, p. A1; Most recently, Robert Walpole, National Intelligence Officer for Strategic and Nuclear Programs placed the number at "about 20." in remarks given at the Carnegie Endowment, September 17, 1998.

2. Recent reports have claimed that China is increasing its ballistic missile force aimed at Taiwan. (see Bill Gertz, "Chinese Missiles Menace Taiwan," *Washington Times*, February 11, 1999. The report claimed that China had produced 150 M-9 and M-11 (short-range ballistic missiles) and was facing the majority of the force toward Taiwan. It should be noted that these are non-nuclear systems, and are not represented in this chart.

3. 310 MT is a good estimate for the yield of China's ballistic missile forces. The bombs, however, with a range of 10kt to 3MT pose a slight problem. We estimate the bomb force to have a yield of approximately 100 megatons.

4. China's first test of the mobile three-stage DF-31 intercontinental ballistic missile (ICBM) took place on August 2, 1999, at Wuzhai, 250 miles southwest of Beijing.

Chinese Missile Programs and Developments[1]

Type	Chinese Name	US Name	No. Deployed	Range (Km)	Warhead (Kg)	CEP (M)	Launch Platform	Fuel	Status
ICBM	DF-4[1]	CCS-3	20+	4,750	2200 (3.3 megaton warhead)	1370	cave	liquid	in service 1980
ICBM	DF-5A[2]	CSS-4	20+	13,000	3,200 (4-5 megaton warhead)	500	hardened silos	liquid	in service 1981
ICBM	DF-31[3]	-	1	8000	700	?	land-mobile	solid	2002
ICBM	DF-41[4]	-	-	12,000	800	?	land-mobile	solid	2005
MRBM	DF-3A[5]	CSS-2	60-80	2800	2150 (3.3 megaton warhead)	1000	land-mobile	liquid	in service 1971
MRBM	DF-21/ 21A[6]	CSS-5	50	1800	600-800 (200-300 kiloton warhead)	?	Mobile-TEL	solid	in service
MRBM	DF-25[7]	-	-	1700	2000	?	land-mobile	solid	after 2000
SLBM	JL-1[8]	CSS-N-3	12	1700	600 (200-300 kiloton warhead)	?	Xia SSBN	solid	in service
SLBM	JL-2[9]	-	-	8000-10,000	700	?	094 SSBN	solid	after 2005
SRBM	DF-15[10] M-9	CSS-6	160+	600	500 (50-350 kiloton warhead)	300	Mobile TEL	solid	in service 1995
SRBM	DF-11[11] M-11	CSS-7	175	120-300	500-800	?	Mobile TEL	solid	in service 1995
SRBM	8610[12]	CSS-8	?	150	190	?	Mobile	solid	in service

[1] Adapted from work by Shirley A. Kan in China: Ballistic and Cruise Missiles, Congressional Research Service, CRS 97-391 F, September 28, 1998

[2] Deployed since 1981, most targeted on the US. Gyroplatform inertial guidance with on-board computer and storable liquid fuel. Deployed in hardened underground silos. Normally kept unfueled and without warheads

[3] Possible MIRVing capability. Booster tested in 1998.

[4] Supposedly road, rail, river mobile.

[5] Deployed since 1971, strap-down inertial guidance. Reaction time 110 minutes. China sold 36 to Saudi Arabia.

[6] Same fuel and guidance as JL-1. Automatic command-control-firing system from TEL. Reports of terminal guidance, possible radar. May be a DF-21A.First regiment deployed in 1985.

[7] Land mobile for truck transfer from semi-hardened sites to launch sites. No reports of test firings. One report that development has been abandoned

[8] All on one Jia submarine. Deployed since 1983, successful underwater launch tests in 1988. Operational status uncertain. Gyroplatform inertial guidance with on-board computer.

[9] To be deployed on new 094 SSBN with 16 tubes each. First SSBN that could target US from waters near China.

[10] Launch from mobile TEL with preparation time of 30 minutes. Strap-down inertial guidance with on-board computer with terminal velocity correction. May be seeking GPS guidance. Four fired in Taiwan crisis in 1995. Three landed in general target area, one crashed prematurely. Four more fired in Taiwan crisis in 1996. Four landed in general target area. Some reported indicate that 20-30 more had been prepared for firing.

[11] US imposed sanctions on China and Pakistan because this system was sold to China.

M-71	(mod HQ-2 SAM)	launcher

Note: High side of range deployed is generally most likely to be correct with the exception of the JL-1. Low side reflects doubt as to actual operational reliability of systems Chinese regard as deployed and combat operational. DF: Dong Feng means "East Wind." JL: Julang means "Giant Wave." According to "The Bulletin of the Atomic Scientist, Chinese Nuclear Forces, 2000," China canceled the development of a sixth type of Dong Feng missile, the DF, it has begun developing a new mobile. Solid-propellant ICBM. The nuclear capability of the 600-kilometer range M-9 and the 300-kilometer range m-11 is unconfirmed. The Chinese define missile ranges as follows: short range, <1,000 kilometers; medium-range,1,000-3,000 kilometers; long-range,3,000-8,000 kilometers; and intercontinental range,>8,000 kilometers

1 Deployed since 1980. Response time of 2.5 hours, strap-down inertial guidance. Stored in caves and mountainside tunnels.

2 Deployed since 1981, most targeted on the US. Gyroplatform inertial guidance with on-board computer and storable liquid fuel. Deployed in hardened underground silos. Normally kept unfueled and without warheads

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Adapted from Jason D. Ellis and Todd M. Koca, "China Rising: New Challenges to the US Security Posture," Strategic Forum, No. 175, October 2000, IISS, Military Balance, 2001-2002, and Department of Defense, Proliferation and Response, January 2001, p. 54-56.

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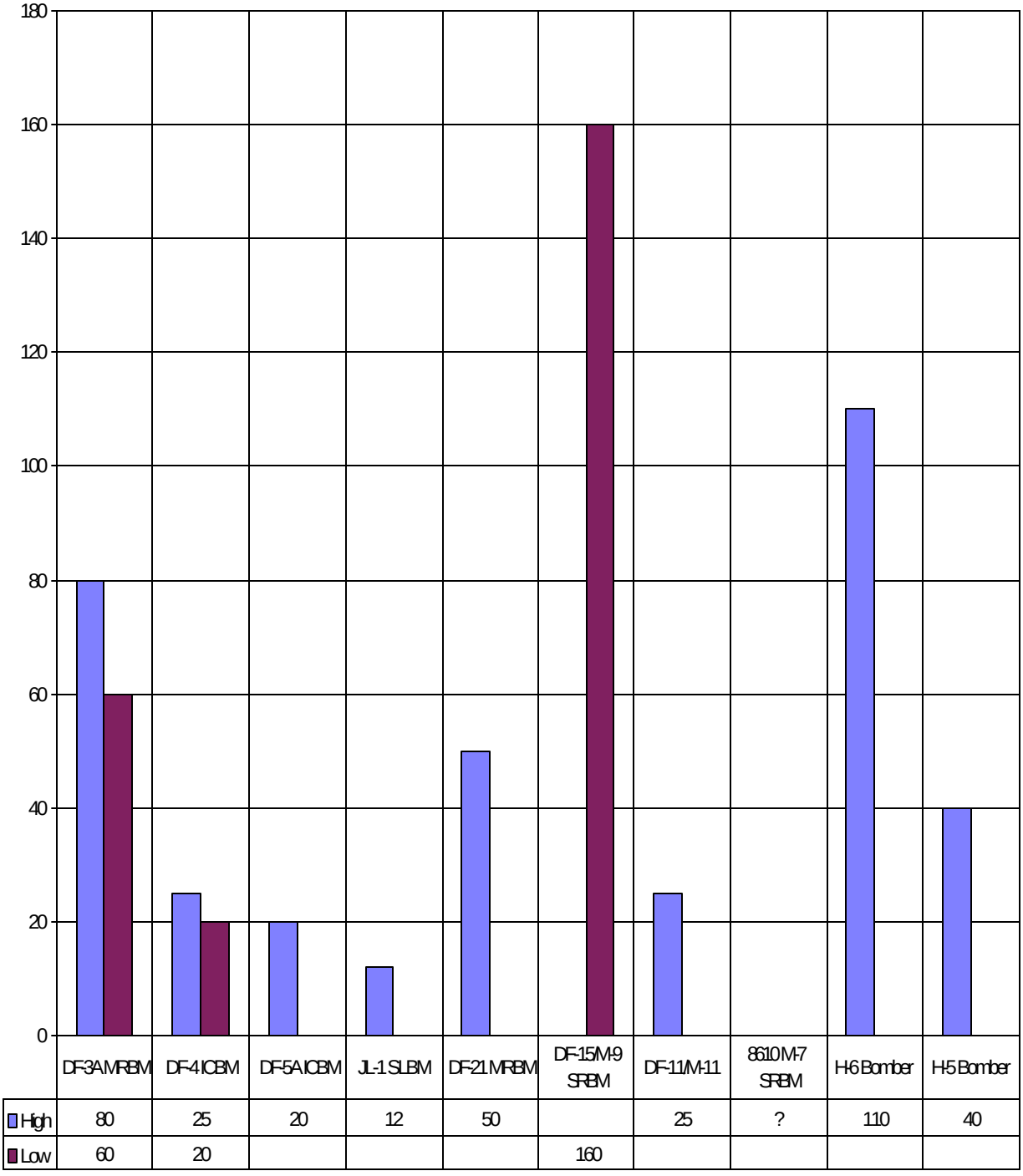
12 Unconfirmed reports that Iran has acquired this missile technology.

Chinese Deployed Nuclear-Capable Delivery Systems



	DF-3A MRBM	DF-4 ICBM	DF-5A ICBM	JL-1 SLBM	DF-21 MRBM	DF-15/M-9 SRBM	DF-11/M-11	8610/M-7 SRBM	H-6 Bomber	H-5 Bomber
High	80	25	20	12	50		25	?	110	40
Low	60	20				160				

Source: Adapted by Anthony H. Cordesman from IISS, Military Balance, 2001-2002, and Shirley A. Kan, China: Ballistic and Cruise Missiles, Congressional Research Service, CRS 97-391 F, September 28, 1998

US Intelligence Estimates of Chinese Modernization – January 2001

The US National Intelligence Council report summarizes the Chinese ballistic missile threat to the US as follows:[i]

- "Chinese strategic nuclear doctrine calls for a survivable long-range missile force that can hold a significant portion of the US population at risk in a retaliatory strike.
- China's current force of about 20 CSS-4 ICBMs can reach targets in all of the United States.
- Beijing also is developing two new road-mobile, solid propellant ICBMs.
  - It conducted the first flight test of the mobile DF-31 ICBM in August 1999; we judge it will have a range of about 8,000 km and will be targeted primarily against Russia and Asia.
  - We expect a test of a longer range mobile ICBM within the next several years; it will be targeted primarily against the United States.
- China is developing the JL-2 SLBM, which we expect to be tested within the next decade. The JL-2 probably will be able to target the United States from launch areas near China.
- By 2015, China will likely have tens of missiles targeted against the United States, having added a few tens of more survivable land- and sea-based mobile missiles with smaller nuclear warheads—in part influenced by US technology gained through espionage.
- China has had the technical capability to develop multiple RV payloads for 20 years. If China needed a multiple-RV (MRV) capability in the near term, Beijing could use a DF-31-type RV to develop and deploy a simple MRV or multiple independently targetable reentry vehicle (MIRV) 1 for the CSS-4 in a few years. MIRVing a future mobile missile would be many years off.
- China is also significantly improving its theater missile capabilities and is increasing the size of its SRBM force deployed opposite Taiwan.
- We assess that an unauthorized launch of a Chinese strategic missile is highly unlikely."

A Department of Defense report makes the following comments about Chinese attitudes and force developments:[ii]

- "Although the PLA is still decades from possessing a comprehensive capability to engage and defeat a modern adversary beyond China's boundaries, Beijing believes that the PLA can develop *asymmetric* abilities in certain niches--such as advanced cruise missiles and conventional short-range ballistic missiles (SRBMs). Asymmetric warfare generally is defined as attacks by a weaker or more technologically backward opponent on a stronger foe's vulnerabilities using unexpected or innovative means, while avoiding the adversary's strengths. China's effort to "leapfrog" generations of technology in weapons programs is often times perceived as an effort to develop new and surprising capabilities, but most of the actual programs are derivative of efforts already well underway in more developed countries. Rather than technological breakthroughs, Beijing's military modernization effort could more accurately be described as a focus on *asymmetric engagement* capabilities. China is seeking to identify innovative tactics and employment parameters for systems and technologies which the PLA has successfully employed or can be reasonably expected to employ in the next two decades.
- "… Beijing's military modernization program, underway for the past two decades, is designed to prepare the PLA to conduct regional active defensive warfare in support of Chinese economic interests and sovereignty claims--a doctrinal shift away from a focus on the large-scale, land-based guerrilla warfare of Mao's classic "People's War." Chinese doctrine and tactics, however, still bear the indelible mark of Mao's teachings, particularly as they apply to concentration of power by a technologically inferior force at select times and places on the battlefield to overcome a foe armed with superior weapons.
- "Rather than shifting priority resources from civil infrastructure and economic reform programs to an across-the-board modernization of the PLA, Beijing is focusing on those programs and assets which will give China the most effective means for exploiting critical vulnerabilities in an adversary's military capabilities. This approach potentially will give Beijing the "credible intimidation" needed to accomplish political and military goals without having to rely on overwhelming force-on-force superiority. China's modernization programs thus seek to realize short-term improvements in anti- surface warfare (ASuW) and precision strike and longer term advances in missile defense, counter- space, and information warfare (IW). Concurrently, the PLA is acquiring weapons that would be useful in countering potential adversaries operating on naval platforms or from bases in the East and South China Seas, particularly stand-off weapons such as anti-ship cruise missiles (ASCMs) and long-range land-attack cruise missiles (LACMs), as well as SRBMs. Beijing also is working to address problems associated with integrating advanced weapons systems into their inventory; and weaknesses in command, control,

communication, computers, and intelligence (C4I); training; and logistics, so as to improve the PLA's overall warfighting capability.

- "As demonstrated in military exercises in the Taiwan Strait in 1995 and 1996, China views its growing conventionally armed ballistic missile force as a potent military and political weapon to influence Taiwan's populace and their leaders. New LACM designs, when operational, will increase China's capability to strike regional targets accurately with conventional warheads. These kinds of weapons systems will play an increasingly important role in modern combat. By 2005, the PLA likely will have deployed two types of SRBMs and a first generation LACM. An expanded arsenal of accurate, conventional SRBMs and LACMs targeted against critical facilities, such as key airfields and C4I nodes, will complicate Taiwan's ability to conduct military operations.

- *"Short-Range Ballistic Missiles (SRBMs)*. Within the next several years, the size of China's SRBM force is expected to grow substantially. The PLA currently has one regimental-sized CSS-6 (DF-15/M-9) SRBM unit deployed in southeastern China. The CSS-6 is a solid propellant, road mobile missile which can deliver a 500-kilogram conventional payload to a maximum range of 600 km. The CSS-X-7 SRBM—better known by its export designator, the M-11—also is a solid propellant, road-mobile SRBM with an estimated range of 300 km. This missile, however, has not yet entered the PLA's inventory; and an improved, longer range version may be under development. Moreover, both the CSS-6 and the CSS-X-7 are expected to incorporate satellite-assisted navigation technology to improve their accuracy. In an armed conflict with Taiwan, China's SRBMs likely would target air defense installations, airfields, naval bases, C4I nodes, and logistics facilities.

- *"Land -Attack Cruise Missiles (LACMS)*. China also is developing LACMs. These missiles appear to have a relatively high development priority. Chinese research and development of LACMs is being aided by an aggressive effort to acquire foreign cruise missile technology and subsystems, particularly from Russia. The first LACM to enter production probably would be air-launched and could be operational early in the next century.

- *"Antiship Cruise Missiles (ASCMs)*. Technological improvements to the C-801/SARDINE and the C-802/ SACCADE are providing a gradual upgrade to China's current force of antiquated, first generation, CSS-N-1/SCRUBBRUSH ASCMs. Despite the obsolescence of many of its ships, its lack of operational experience and its inability to resupply ASCMs at sea, the PLA Navy could assemble a sizeable ASuW force against Taiwan and, most likely, saturate the Taiwan Navy with barrages of ASCMs. In addition, B-6D bombers subordinate to the PLA Naval Air Force (PLANAF) are capable of firing the C-601/KRAKEN ASCM. The Navy's new FB-7 bomber likely will carry C-801/C-802 ASCMs. China's ASCM capability is expected to improve further with the planned acquisition of two Russian-built SOVREMENNYY-class destroyers armed with the SS-N-22/SUNBURN ASCM.

- "… Within the next several years, the size of China's SRBM force is expected to grow substantially. An expanded arsenal of conventional SRBMs and LACMs targeted against critical facilities, such as key airfields and C4I nodes, will complicate Taiwan's ability to conduct military operations. By 2005, China will have deployed both the CSS-6 and CSS-7 SRBM. In addition, the PLA could have a first generation, air-launched LACM in its inventory. Should Beijing choose escalation, a rapid transition from relatively low-intensity blockade operations to massive missile strikes would be a likely step, particularly as a pretext to an invasion. These missile attacks most likely would be high-volume, precision strikes against priority military and political targets, including air defense facilities, airfields, Taiwan's C2 infrastructure, and naval facilities. China, however, could encounter problems coordinating missile firings with other concurrent military operations, such as air and maritime engagements. Exclusive Taiwan reliance on active missile defenses and associated BM/C3I, however, will not sufficiently offset the overwhelming advantage in offensive missiles which Beijing is projected to possess in 2005.

- "…Despite anticipated improvements to Taiwan's missile and air defense systems, by 2005, the PLA will possess the capability to attack Taiwan with air and missile strikes which would degrade key military facilities and damage the island's economic infrastructure. China will continue to give priority to long-range precision-strike programs. Similarly, despite improvements in Taiwan's ability to conduct ASW operations, China will retain the capability to interdict Taiwan's SLOCs and blockade the island's principal maritime ports. Should China invade Taiwan, such an operation would require a major commitment of civilian air and maritime transport assets, would be prolonged in duration, and would not be automatically guaranteed to succeed. In the end, any of these options would prove to be costly to Beijing--politically, economically, diplomatically, and militarily.

- "Beyond 2005, development of a modern military force capable of exerting military influence within the region, achieving deterrence against potential enemies, preserving independence of action in domestic and foreign affairs, protecting the nation's economic resources and maritime areas, and defending the sovereignty of the nation's territory will remain one of China's national priorities. Beijing will strive to create a smaller, more modern, better trained, more professional, and better logistically supported force, with an emphasis on air, naval and missile forces. China will continue to improve its regional force projection capabilities, but will not possess the conventional military capabilities to exert global influence.

- "The PLA will field large numbers of increasingly accurate SRBMs and introduce LACMs into its inventory. China's naval forces will continue their transition from a large coastal defense force to a smaller, more modern force able to conduct

limited sea control operations against regional opponents in the East and South China Seas. China's air force will continue to assimilate greater numbers of fourth generation aircraft into its inventory, upgrade its regional IADS, and expand its airborne refueling and AEW capabilities. China will retain a numerical advantage over Taiwan in terms of both personnel and weapons."

CIA Estimate of Chinese Missile Force Trends – January 2002

China has been modernizing its long-range strategic missile force since the mid-1980s, shifting from reliance primarily on silo-based liquid-propellant CSS-4s to mobile solid-propellant systems. The Intelligence Community projects that by 2015, the total number of Chinese strategic warheads will rise several-fold, though it will remain still well below the number of Russian or US forces.

The Intelligence Community projects that Chinese ballistic missile forces will increase several-fold by 2015, but Beijing's future ICBM force deployed primarily against the United States—which will number around 75 to 100 warheads—will remain considerably smaller and less capable than the strategic missile forces of Russia and the United States.

Proliferation of ballistic missile-related technologies, materials, and expertise—especially by Russian, Chinese, and North Korean entities—has enabled emerging missile states to accelerate the development timelines for their existing programs, acquire turnkey systems to gain previously non-existent capabilities—in the case of the Chinese sale of the M-11 SRBM to Pakistan—and lay the groundwork for the expansion of domestic infrastructures to potentially accommodate even more capable and longer range future systems.

Strategic Missile Forces

China's current ICBM force consists of large, liquid-propellant missiles armed with single nuclear warheads. Of these ICBMs, about 20 are CSS-4 silo-based missiles that can reach targets in the United States. The Chinese also have about a dozen CSS-3 ICBMs that are almost certainly intended as a retaliatory deterrent against targets in Russia and Asia. China also has a medium-range SLBM (the CSS-NX-3/JL-1).

Beijing is concerned about the survivability of its strategic deterrent against the United States and has a long-running modernization program to develop mobile, solid-propellant ICBMs. The IC projects that by 2015, most of China's strategic missile force will be mobile.

China has three new, mobile, solid-propellant strategic missiles in development—the road-mobile CSS-X-10 ICBM (also called the DF-31), which is now in the flight-test stage; a longer range version of the DF-31; and the JL-2 SLBM. This modernization effort, which dates from the mid-1980s, forms the foundation of Beijing's efforts to field a modern, mobile, and more survivable strategic missile force.

- China could begin deploying the DF-31 ICBM during the first half of the decade.
- Beijing could begin deploying the DF-31 follow-on ICBM and JL-2 SLBM in the last half of the decade.

China has had the capability to develop and deploy a multiple reentry vehicle system[3] for many years, including a MIRV system. The IC assesses that China could develop a multiple RV system for the CSS-4 ICBM in a few years. Chinese pursuit of a multiple RV capability for its *mobile* ICBMs and SLBMs would encounter significant technical hurdles and would be costly.

The IC has differing projections of the overall size of Chinese strategic ballistic missile forces over the next 15 years, ranging from about 75 to 100 warheads deployed primarily against the United States. MIRVing and missile defense counter-measures would be factors in the ultimate size of the force. In addition, China would have about two dozen shorter range DF-31 and CSS-3 ICBMs that could reach parts of the United States.

Theater Ballistic Missile Force: China maintains a robust CSS-5 MRBM force and continues to increase the capabilities of its SRBM force deployed opposite Taiwan.

Conventionally Armed Ballistic Missiles: China's leaders calculate that conventionally armed ballistic missiles add a potent new dimension to Chinese military capabilities, and they are committed to continue fielding them at a rapid pace. Beijing's growing SRBM force provides China with a military capability that avoids the political and practical constraints associated with the use of nuclear-armed missiles. The latest Chinese SRBMs provide a survivable and effective conventional strike force and expand conventional ballistic missile coverage.

The IC projects an SRBM force in 2005 of several hundred missiles

CIA Estimate of Chinese Role in Proliferation: January 30, 2002

- Beijing continued 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 could be used to deliver nuclear weapons, and to enact at an early date a comprehensive missile-related export control system.
- The CIA reported on January 30, 2002 that Chinese entities continued to provide 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.
- In October 1997, China gave the United States assurances regarding its nuclear cooperation with Iran. China agreed to end cooperation with Iran on supply of a uranium conversion facility and undertake no new cooperation with Iran after completion of two existing projects—a zero-power reactor and a zirconium production plant. The Chinese appear to have lived up to their UCF pledge, but we are aware of some interactions between Chinese and Iranian entities that have raised questions about its "no new nuclear cooperation" pledge. According to the State Department, the Administration is seeking to address these questions with appropriate Chinese authorities.
- Prior to the reporting period, Chinese firms had supplied dual-use CW-related production equipment and technology to Iran. The US sanctions imposed in May 1997 on seven Chinese entities for knowingly and materially contributing to Iran's CW program remain in effect. Evidence during the current reporting period shows Iran continues to seek such assistance from Chinese entities.
- China is a primary supplier of advanced conventional weapons to Pakistan and Iran, among others. Beijing and Islamabad also have negotiated the sale of an additional 40 F-7 fighters for delivery to Pakistan.

Part Three

North Korean Force Trends

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

Objectives, Strategies, and Resources

Despite the June 2000 summit meeting and meetings between high level U.S. and North Korean officials on the one hand, and economic turmoil and continued food shortages on the other, we believe North Korea remains committed to maintaining strong military forces. These forces continue to be deployed close to the border with South Korea in an offensively oriented posture, and North Korea's NBC and missile programs likely remain key components of its overall security strategy. The most likely large-scale regional war scenario over the near term, which would involve the United States, would be on the Korean peninsula. In recent years, North Korea has continued to pose a com-plex security challenge to the United States and its allies. Prior to the 1994 Agreed Framework, North Korea is believed to have produced and diverted sufficient plutonium for at least one, and possibly two, nuclear weapons. In addition, although North Korea froze the production of plutonium in 1994, there are concerns that North Korea is continuing with some elements of a nuclear weapons program. North Korea also possesses stockpiles of chemical weapons, which could be used in the event of renewed hostilities on the peninsula. Research and development into biological agents and toxins suggest North Korea may have a biological weapons capability. North Korea has hundreds of ballistic missiles available for use against targets on the peninsula, some of which are capable of reaching tar-gets in Japan. Its missile capabilities are increasing at a steady pace, and it has progressed to producing medium-range ballistic missiles (MRBMs). North Korea also has continued development of even longer-range missiles that would be able to threaten areas well beyond the region, including portions of the continental United States. As a result of U.S. diplomatic efforts, however, the Democratic People's Republic of Korea (DPRK) has maintained a moratorium on launches of long-range missiles for over one year.

Lastly, North Korea's willingness to sell its ballistic missiles and related missile technologies and, potentially, share its NBC expertise are major proliferation concerns. North Korea's centrally planned economic system has been crippled over the past decade and is unable to meet the most basic needs of its people, although there is limited evidence that the economic decline may have slowed. Certainly, international food aid administered through the United Nations World Food Program has played a significant role in alleviating the food crisis. North Korea likely will continue to require inter-national food assistance for the foreseeable future. The regime continues with its decades old policy to fund its military programs, including NBC and missile forces, at the expense of its civil economy.

Nuclear Program

The 1994 Agreed Framework between the United States and North Korea froze nuclear weapons material production at the Yongbyon and Taechon facilities. However, the United States believes North Korea pro-duced and diverted sufficient plutonium for at least one nuclear weapon prior to the agreement. (In any event, North Korea will have to satisfy the Interna-tional Atomic Energy Agency (IAEA) as to its exact plutonium holdings before key nuclear components can be delivered for the two light-water reactors that are to be provided under the Agreed Framework.) North Korea removed spent fuel from the Yongbyon reactor in 1994. Had Pyongyang reprocessed the spent fuel from the Yongbyon reactor, it could have pro-duced enough plutonium for several nuclear weapons. As part of the Agreed Framework, the IAEA has main-tained a continuous presence at Yongbyon, and IAEA personnel have monitored canning of the spent fuel from the reactor. The canning of all accessible spent fuel rods and rod fragments, which was carried out by a team from the United States, under the auspices of the Department of Energy (DOE), was completed in April 2000. The U.S. team maintains a presence at the site to continue maintenance activities. In 1998, the United States became concerned about an underground construction project at Kumchang-ni, in northern North Korea. The site was believed to be large enough to house a plutonium production facility and possibly a reprocessing plant. Through successful negotiations, U.S. officials were permitted to visit the facility at Kumchang-ni in May 1999. Based on the 1999 team's findings, it was concluded that the facility as then concurrently configured, was not suited to house graphite-moderated reactors or reprocessing operations. A second visit to Kumchang-ni was conducted in May 2000, during which the team found no evidence to contradict the 1999 conclusions. In the summer of 1999, the United States dispatched former Secretary of Defense William Perry to consult with North Korea on key U.S. security concerns such as its nuclear and missile programs. In the North Korea Policy Review, Dr. Perry concluded that the nuclear freeze instituted at Yongbyon's facilities remained in effect, although the U.S. remains concerned about possible continuing North Korean interest in a nuclear weapons program. Moreover, there is some evidence that North Korea has tried to procure technology that could have applications in its nuclear program. North Korea has ratified the NPT. It has not signed the Comprehensive Test Ban Treaty (CTBT). Dr. Perry recommended that the U.S. should seek the complete and verifiable cessation of testing, production, and deployment of missiles exceeding the parameters of the MTCR, and the complete cessation of export sales of such missiles and the equipment and technology associated with them.

Biological Program

North Korea has acceded to the Biological and Toxin Weapons Convention (BWC), but nonetheless has pursued biological warfare capabilities since the 1960s.Pyongyang's resources include a rudimentary (by Western standards) biotechnical infrastructure that could support the production of infectious biological warfare agents and toxins such as anthrax, cholera, and

plague. North Korea is believed to possess a munitions-production infrastructure that would allow it to weaponize biological warfare agents and may have biological weapons available for use.

Chemical Program

Like its biological warfare effort, we believe North Korea has had a long-standing chemical warfare program. North Korea's chemical warfare capabilities include the ability to produce bulk quantities of nerve, blister, choking, and blood agents, using its sizeable, although aging, chemical industry. We believe it possesses a sizeable stockpile of these agents and weapons, which it could employ should there be renewed fighting on the Korean peninsula.

North Korea is believed to be capable of weaponizing such stocks for a variety of delivery means. These would include not only ballistic missiles, but also artillery and aircraft, and possibly unconventional means.

In fact, the United States believes that North Korea has some long-range artillery deployed along the demilitarized zone (DMZ) and ballistic missiles, some of which could deliver chemical warfare agents against forward-based U.S. and allied forces, as well as against rear-area targets.

North Korean forces are prepared to operate in a contaminated environment; they train regularly in chemical defense operations and are taught that South Korean and U.S. forces will employ chemical munitions. North Korea has not signed CWC, nor it is expected to do so in the near future.

Ballistic Missiles

During the last several years, North Korea has made substantial progress with its ballistic missile forces in the areas of research and development, testing, deployment, and, most worrisome, exports. Despite efforts on the part of the United States and its East Asian allies to constrain North Korea's missile development, Pyongyang continues to move ahead.

North Korea produces SCUD B and SCUD C short-range ballistic missiles (SRBMs) as well as the No Dong MRBM. North Korea has over 500 SCUD missiles of various types in its inventory, and enough No Dong missiles for its own use as well as for export. In any attack on the South Korea, Pyongyang could use its missiles in an attempt to isolate the peninsula from strategic reinforcement. In addition, North Korea's No Dong missiles, with their 1,300 kilometer range, are capable of striking targets throughout the peninsula as well as in nearly all of Japan.

In August 1998, North Korea launched a three-stage Taepo Dong 1 system, which it characterized as a space launch vehicle (SLV) attempting to orbit a small satellite. The launch demonstrated several of the key technologies required to develop an ICBM, including stage separation. The existence of a third stage itself was an unanticipated development in the North Korean ballistic missile program. With the Taepo Dong 1, North Korea has now demonstrated the capability to reach the entire territory of South Korea and Japan, as well as large portions of China and Russia. Potentially, a three-stage Taepo Dong 1 SLV could deliver a light payload to the United States, although with very poor accuracy.

North Korea also has moved forward with the development of other longer-range missiles, which has become a matter of growing international concern. North Korea is developing the Taepo Dong 2 (ICBM), which could deliver a several-hundred kilogram pay-load to Alaska or Hawaii, and a lighter payload to the western half of the United States. A three stage Taepo Dong 2 could deliver a several-hundred kilogram pay-load anywhere in the United States. North Korea is much more likely to weaponize the more capable Taepo Dong 2 than the three-stage Taepo Dong 1 as an ICBM. During 1999, there were indications that North Korea would test the Taepo Dong 2, but Pyongyang in September 1999, announced it would refrain from testing long-range missiles while high-level talks to improve bilateral relations with the U.S. are ongoing. The DPRK subsequently reaffirmed the moratorium in June 2000, and again, in writing, in the October 2000 Joint Communique issue at the conclusion of Vice Marshal Jo Myong Rok's visit to Washington. During Secretary Albright's historic trip to Pyongyang 23-25 October, she discussed with DPRK Chairman Kim Jong Il a range of missile-related issues, including Kim's idea of trading long-range missile restraint for launches, outside DPRK borders, of DPRK civil satellites on non-DPRK boosters. However, significant issues remain to be resolved.

Cruise Missiles and Other Means of Delivery

North Korea has several types of short-range land-, air- and sea-launched anti-ship cruise missiles, which are potential means of delivery for NBC weapons. In the past, North Korea has produced two versions of anti-ship cruise missiles based on Soviet and Chinese designs; these have ranges of about 100 kilometers. In the future, North Korea may try to modify some of these anti-ship missiles to extend their range or acquire the technology to do so. Moreover, it may try to develop or purchase land attack cruise missiles. North Korea also has a variety of fighters, bombers, helicopters, artillery, rockets, mortars, and sprayers available as potential means of delivery for NBC weapons.

Role as Supplier

During the last several years, North Korea has been a major proliferator of ballistic missiles and related technologies. The sale of No Dong missile technology to Iran has created an immediate, serious and growing capability to target U.S. forces, and our allies in the Middle East. North Korea also has provided missile technology to Pakistan. Further, these sales have had an impact on the strategic balance in the Middle East and in South Asia. In addition, these exports could lead to additional proliferation. For example, were states like Iran or Pakistan to become missile producers, they in turn could sell the missiles to other states of concern, further upsetting regional balances of power. In the past, North Korea also has brokered deals for missle-related technologies and components produced by third parties for customers in the Middle East. Pyongyang attaches a high priority to the development and sale of ballistic missiles, equipment, and related technology, as these exports are one of the North's major sources of hard currency, which fuel continued missile development and production.

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

The Uncertain Status of North Korean Force Developments

- There is no debate within the US intelligence community over the fact that North Korea has long had large stocks of chemical and biological weapons, and has deployed them in warheads that can be used in its Scud and extended range Scud missiles. There is more debate over whether North Korean has nuclear weapons and is continuing its nuclear weapons development and production program.

- The first major reports of North Korea's nuclear program began in 1993, when analysts found satellite reconnaissance evidence that a North Korean nuclear reprocessing center at Yongbyon had gone had begun to process plutonium. This led to a diplomatic confrontation and talks where the Clinton administration obtained a North Korean pledge to freeze plutonium production at the site. In exchange, the United States, South Korea and Japan agreed to give the North oil and technical assistance to build a peaceful nuclear power program. The agreement called for international monitoring of the Yongbyon site, and Energy Department experts were allowed to encase the spent fuel rods at the center to ensure that they could not be used for warheads. Before this production freeze, however, North Korea was able to produce about 26 pounds of weapons-grade plutonium. As a result, a consensus developed that North Korea could produce one or two bombs.

- The current debate focuses on what North Korean has done since that time. The Clinton Administration initially declared that North Korea had agreed to freeze its entire nuclear program. It later became clear, however, that the agreement covered only Yongbyon and did not preclude nuclear activity at other sites. North Korea then dumped radioactive nuclear fuel out of the heavy water reactor into a cooling pool in order to replace it with fresh fuel rods. The US intelligence community estimated that the spent fuel rods contained enough plutonium for 10 nuclear warheads, and this raised serious questions as to whether North Koreans was covertly going on with its nuclear program.

- A report in the *New York Times*, which has been informally confirmed by several US experts, indicates that the Defense Intelligence Agency (DIA) began to report that it had detected a series of other secret sites, many of them underground, that analysts suspected were related to an ongoing nuclear program. By the late-1990's, DIA and the National Imagery and Mapping Agency, compiled a list of at least 10 potential sites which raised questions about their function without providing clear evidence of any weapons activity.

- One installation, at Kumchangri, was believed to house an underground nuclear reactor and plutonium reprocessing operation. In May 1999, this led the US to pressure North Korea to allow an inspection of the installation which had the same visual signatures as if North Korea was installing an underground a reactor, including the water supplies for water cooling. When North Korea did allow inspection, however, the US only found a series of empty tunnels with no large underground chamber able to hold a nuclear reactor. Another inspection in May 2000 had the same result.

- The *Times* reported that some intelligence experts feel the US gave North Korea too much warning before inspecting the site, making it possible for the North Koreans to hide its purpose. However, State Department officials became leary of the DIA estimates, another installation DIA suspected proved to be nothing more that an underground storage site for the memorabilia of the North Korean leadership.

- This eventually led Secretary of State Madeleine K. Albright and Lt. Gen. Patrick Hughes, director of the DIA, to clash over intelligence report suggesting that North Korea had built a storage installation that housed components for nuclear warheads. State Department officials indicated that DIA was reporting an over-pessimistic picture. DIA indicated in turn that the State Department was too willing to overlook reports of suspicious activity. In their view, the failure of a single inspection does not mean the United States should stop pressing the North Koreans about suspect installations, including the building suspected of housing warhead components. Some of the debate focused on an installation DIA suspected of being a storage building for components of nuclear warheads. The identity and exact location of this center, whose existence has not been released, but the Times reports that intelligence on the storage center was obtained at least three years ago, and was based not only on spy satellite photographs and intercepted communications, but also on "human intelligence" -- spies -- reporting to DIA.[iii]

- What is clear is that North Korea is steadily acquiring more advanced missile forces in spite of major economic problems, its rapproachment talks with South Korea in June 2000, and its agreements to suspend the test firing of long-range missiles in September 1999 and June 2000. It has tested a booster that could allow it to develop missiles that could strike the US, and it has had a serious nuclear weapons development effort in the past. As Table III.5 shows, North Korea also has a wide range of missile programs. It also has already deployed large numbers of shorter-range missiles with chemical and probably biological warheads. These include extended range Scud-type missiles with ranges over 1,300 kilometers. The US intelligence community also reported in June 2000 that North Korea did not suspend any other aspects of development and production after it agreed to suspend missile tests in September 1999.

- North Korea launched a multistage Taepo Dong-1 missile across Japan on August 31, 1998 -- in an effort to place a satellite in orbit. The mission failed, but the United States and its allies were surprised and shocked by the missile's 2,000-kilometer range. David J. Osias, an officer of the Defense Intelligence Agency, stated that "The third stage concerns us. Nobody knew

they had it," during a national media update April 26-27, 1998 at the Army Space and Missile Defense Command headquarters.[iv]

- North Korea has limits. The Tapeo Dong 1 test was a failure, and the missile was anything but an advanced design. The first stage was modified from a liquid-fueled Scud and the second from the No Dong. Both are 1960s technology. The third stage was a small, solid-fueled rocket designed to put a small satellite into space. It was too small to carry a nuclear weapon or an effective biological payload and dispersal system, and the system was so inherently inaccurate that it was unclear it had growth potential to hit a city-sized target. US experts feel that North Korea has since abandoned work on the Taepo Dong-1 missile, and is now developing the Taepo Dong-2. This missile is a two-stage system that uses a cluster of No Dong engines in the first stage and a single No Dong in the second stage. It has never been tested.[v]

- Furthermore, North Korea agreed to suspend further tests of long-range missiles in September 1999 -- largely as a result of the negotiating efforts of former Secretary of Defense William Perry,.[vi] This agreement was reached after the NIC report was written, and was renewed in June 2000.. However, US intelligence community also reported in June 2000 that North Korea did not suspend any other aspects of development and production after it agreed to suspend missile tests in September 1999.

- A CIA report in August 2000 also summarized the state of proliferation in North Korea as follows,[vii]

- P'yongyang continues to acquire raw materials from out-of-country entities to produce WMD and ballistic missiles. During the reporting period, there were increased reflections of North Korean procurement of raw materials and components for its ballistic missile programs from various foreign sources, especially through firms in China. North Korea produces and is capable of using a wide variety of chemical and possibly biological agents, as well as their delivery means.

- During the second half of 1999, Pyongyang sought to procure technology worldwide that could have applications in its nuclear program, but we do not know of any procurement directly linked to the nuclear weapons program. We assess that North Korea has produced enough plutonium for at least one, and possibly two, nuclear weapons. The United States and North Korea are nearing completion on the joint project of canning spent fuel from the Yongbyon complex for long-term storage and ultimate shipment out of the North in accordance with the 1994 Agreed Framework. That reactor fuel contains enough plutonium for several more weapons.

- P'yongyang continues to seek conventional weapons via the gray market. In 1999, for example, North Korea acquired MiG-21 fighter aircraft from Kazakhstan.

- …Throughout the second half of 1999, North Korea continued to export significant ballistic missile-related equipment and missile components, materials, and technical expertise to countries in the Middle East, South Asia, and North Africa. P'yongyang attaches a high priority to the development and sale of ballistic missiles, equipment, and related technology. Exports of ballistic missiles and related technology are one of the North's major sources of hard currency, which fuel continued missile development and production.

- These factors help explain why the report of the National Intelligence Council has seen North Korea as presenting the most serious near term threat to the US, and why this threat has been used as the rationale for setting early deadlines for the deployment of a US NMD system:[viii]

- "After Russia and China, North Korea is the most likely to develop ICBMs capable of threatening the United States during the next 15 years.

- North Korea attempted to orbit a small satellite using the Taepo Dong-1 SLV in August 1998, but the third stage failed during powered flight; other aspects of the flight, including stage separation, appear to have been successful.

- If it had an *operable* third stage and a reentry vehicle capable of surviving ICBM flight, a converted Taepo Dong-1 SLV *could* deliver a light payload to the United States. In these cases, about two-thirds of the payload mass would be required for the reentry vehicle structure. The remaining mass is probably too light for an early generation nuclear weapon but could deliver biological or chemical (BW/CW) warfare agent.

- Most analysts believe that North Korea *probably will test* a Taepo Dong-2 this year, unless delayed for political reasons. A two-stage Taepo Dong-2 could deliver a several-hundred kilogram payload to Alaska and Hawaii, and a lighter payload to the western half of the United States. A three-stage Taepo Dong-2 could deliver a several-hundred kilogram payload anywhere in the United States.

- North Korea is much *more likely* to weaponize the more capable Taepo Dong-2 than the three-stage Taepo Dong-1 as an ICBM."

- These comments are particularly striking in view of the fact North Korea launched a multistage Taepo Dong-1 missile across Japan on August 31, 1998 -- in an effort to place a satellite in orbit. The mission failed, but the United States and its allies were surprised and shocked by the missile's 2,000-kilometer range. David J. Osias, an officer of the Defense

Intelligence Agency, stated that "The third stage concerns us. Nobody knew they had it," during a national media update April 26-27, 1998 at the Army Space and Missile Defense Command headquarters.[ix]

- The fact remains, however, that the Korean test was a failure, and that the missile was anything but an advanced design. The first stage was modified from a liquid-fueled Scud and the second from the No Dong. Both are 1960s technology. The third stage was a small, solid-fueled rocket designed to put a small satellite into space. It was too small to carry a nuclear weapon or an effective biological payload and dispersal system, and the system was so inherently inaccurate that it was unclear it had growth potential to hit a city-sized target. US experts feel that North Korea has since abandoned work on the Taepo Dong-1 missile, and is now developing the Taepo Dong-2. This missile is a two-stage system that uses a cluster of No Dong engines in the first stage and a single No Dong in the second stage. It has never been tested.[x]
- Furthermore, North Korea agreed to suspend further tests of long-range missiles in September 1999 -- largely as a result of the negotiating efforts of former Secretary of Defense William Perry,.[xi] This agreement was reached after the NIC report was written, and was renewed in June 2000.

CIA Estimate of North Korean Missile Force Trends – January 2002

North Korea has hundreds of Scuds and No Dong missiles and continues to develop the longer range Taepo Dong-2, which will enable the North to target the United States. In May 2001, however, Kim Chong-il unilaterally extended the North's voluntary flight-test moratorium—in effect since 1999—until 2003, provided negotiations with the United States proceeded.

North Korea has extended until 2003 the missile launch moratorium it announced late in 1999, although the North continues to work on the Taepo Dong-2 program. The Taepo Dong-2—capable of reaching parts of the United States with a nuclear weapon-sized payload—may be ready for flight-testing. The initial test likely would be conducted in a space launch configuration. Iran also is pursuing a longer range missile capability.

North Korea has assumed the role as the missile and manufacturing technology source for many programs. North Korean willingness to sell complete systems and components has enabled other states to acquire longer range capabilities earlier than otherwise would have been possible—notably the sale of the No Dong MRBM to Pakistan. The North also has helped countries to acquire technologies to serve as the basis for domestic development efforts—as with Iran's reverse-engineering of the No Dong in the Shahab-3 program. Meanwhile, Iran is expanding its efforts to sell missile technology.

Ballistic Missile Programs

Taepo Dong-2. The multiple-stage Taepo Dong-2—capable of reaching parts of the United States with a nuclear weapon-sized payload—may be ready for flight-testing. The North probably also is working on improvements to its current design.

The Taepo Dong-2 in a two-stage ballistic missile configuration could deliver a several-hundred-kg payload up to 10,000 km—sufficient to strike Alaska, Hawaii, and parts of the continental United States. If the North uses a third stage similar to the one used on the Taepo Dong-1 in 1998 in a ballistic missile configuration, then the Taepo Dong-2 could deliver a several-hundred-kg payload up to 15,000 km—sufficient to strike all of North America. A Taepo Dong-2 flight test probably would be conducted as an SLV with a third stage to place a small payload into the same orbit the North Koreans tried to achieve in 1998.

No Dong. The 1,300-km-range No Dong remains the longest-range ballistic missile North Korea has deployed.

WMD Payload Options: The Intelligence Community judged in the mid-1990s that North Korea had produced one, possibly two, nuclear weapons, although the North has frozen plutonium production activities at Yongbyon in accordance with the Agreed Framework of 1994. North Korea also has chemical and biological weapons programs.

In April 2001, P'yongyang signed a Defense Industry Cooperation Agreement with Russia, laying the groundwork for potential arms sales and transfers to North Korea. Actual sales and deliveries, however, will be dependent on P'yongyang's ability to pay.

During the second half of 2001, P'yongyang continued its attempts to procure technology worldwide that could have applications in its nuclear program. We assess that North Korea has produced enough plutonium for at least one, and possibly two, nuclear weapons. Spent fuel rods canned in accordance with the 1994 Agreed Framework contain enough plutonium for several more weapons.

Foreign Assistance: North Korea is nearly self-sufficient in developing and producing ballistic missiles and has demonstrated a willingness to sell complete systems and components that have enabled other states to acquire longer range capabilities earlier than would otherwise have been possible and to acquire the basis for domestic development efforts.

Role as Proliferator: Throughout the first half of 2001, North Korea continued to export significant ballistic missile–related equipment, components, materials, and technical expertise to countries in the Middle East, South Asia, and North Africa. P'yongyang attaches a high priority to the development and sale of ballistic missiles, equipment, and related technology. Exports of ballistic missiles and related technology are one of the North's major sources of hard currency, which fuel continued missile development and production.

North Korean Missile Programs and Developments

Type	Names	Range (KM)	Warhead (Kg)	Stages	Service Status
SRBM	Hawsong 5, Scud B	302-340	1000	1	Since 1985
	Storable liquid fuel; TEL launch Sold to Iran and a number of other states.				
SRBM	Hwasong 6, Scud C	500	770	1	Since 1989
	Storable liquid fuel; TEL launch. Sold to Iran and Syria. Deployed in hardened, underground shelters in North Korea.				
MRBM	No Dong 1, Rodong 1, Scud D	1,350	1200	1	Since 1997
	Storable liquid fuel; Uses missile-erector-launcher (MEL). Seems similar to Shihab 3 in Iran and Ghauri program In Pakistan. First test over East China Sea in May 1993, but did not go over 500 kilometers. Iranian and Pakistani observers present at test. Estimate 50-100 missiles no produced.				
IRBM	Taep'o-Dong 1, No-Dong 2. Rodong 2, Scud X	1,500-2,200	700-1,000	2	1998?
	Some reports is similar to the Chinese DF-3.				
SLV	Taep'o-Dong 1 Space Launch-Vehicle	4,000	50-100	3	1998
	Partially successful test launch on August 23, 1998. Claim launched small satellite.				
ICBM	Taep'o-Dong 2, No Dong 3	4,000-6,000	700-1,000	2	2000+
ICBM	?	6,000+	100-500	3	?

Source: Adapted from Joseph S. Bermudez, Jr., "The Rise and Rise of North Korea's ICBMs, International Defense Review, 7/1999, pp. 57-61.

Part Four

Indian Force Trends

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.

CIA Estimate of Indian Missile Force Trends – January 2002

New Delhi believes that a nuclear-capable missile delivery option is necessary to deter Pakistani first use of nuclear weapons and thereby preserve the option to wage limited conventional war in response to Pakistani provocations in Kashmir or elsewhere. Nuclear weapons also serve as a hedge against a confrontation with China. New Delhi views the development, not just the possession, of nuclear-capable ballistic missiles as the symbols of a world power and an important component of self-reliance.

Missile Programs

Growing experience and an expanding infrastructure are providing India the means to accelerate both development and production of new systems. New Delhi is making progress toward its aim of achieving self-sufficiency for its missile programs, but it continues to rely on foreign assistance.

Converting the Indian SLV into an ICBM?

Rumors persist concerning Indian plans for an ICBM program, referred to in open sources as the Surya. Some Indian defense writers argue that possession of an ICBM is a key symbol in India's quest for recognition as a world power and useful in preventing diplomatic bullying by the United States. Most components needed for an ICBM are available from India's indigenous space program. India could convert its polar space launch vehicle into an ICBM within a year or two of a decision to do so.

* The 150-km-range Prithvi I SRBM continues to be India's only deployed ballistic missile.

* The Prithvi II SRBM is a modified Prithvi I with an increased range of 250 km.

* The Agni series, which probably will be deployed during this decade, will be the mainstay of India's nuclear-armed missile force.

The Sagarika SLBM probably will not be deployed until 2010 or later.

Foreign Assistance

India continues to push toward self-sufficiency, especially in regard to its missile programs. Nevertheless, New Delhi still relies heavily on foreign assistance.

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 gener-ate 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 and Weapons of Mass Destruction

Delivery Systems

- 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 budgets 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.
- The CIA reported in September 2001 that 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.
- The CIA reported on January 30, 2002 that 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. New Delhi received the first two MiG-21-93 fighter aircraft, and Hindustan Aeronautics Limited will now begin the licensed upgrade of 123 more aircraft. During the reporting period, New Delhi concluded an $800 million contract with Russia for 310 T-90S main battle tanks, as well as a smaller contract for KA-31 helicopters. India is in negotiations with Russia for nuclear submarines and an aircraft carrier, and it also continues to explore options for leasing or purchasing several AEW systems. The Indian air force has reopened the competition for jet trainer aircraft and is considering bids from the Czech Republic, France, Italy, Russia, and the United Kingdom.
    - 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. Reporting on these systems differs sharply by source. Estimates based on NGO sources indicate that,
    - 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.
- Estimates based on NGO sources indicate that the Agni is,
- 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 Department of Defense reported in January 2001 that,
  - 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 programs 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.
  - 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.

- The CIA summarized India's missile development programs in January 2002 by stating that:
  - New Delhi believes that a nuclear-capable missile delivery option is necessary to deter Pakistani first use of nuclear weapons and thereby preserve the option to wage limited conventional war in response to Pakistani provocations in Kashmir or elsewhere. Nuclear weapons also serve as a hedge against a confrontation with China. New Delhi views the development, not just the possession, of nuclear-capable ballistic missiles as the symbols of a world power and an important component of self-reliance.
  - Growing experience and an expanding infrastructure are providing India the means to accelerate both development and production of new systems. New Delhi is making progress toward its aim of achieving self-sufficiency for its missile programs, but it continues to rely on foreign assistance.
  - Converting the Indian SLV into an ICBM? Rumors persist concerning Indian plans for an ICBM program, referred to in open sources as the Surya. Some Indian defense writers argue that possession of an ICBM is a key symbol in India's quest for recognition as a world power and useful in preventing diplomatic bullying by the United States. Most components needed for an ICBM are available from India's indigenous space program. India could convert its polar space launch vehicle into an ICBM within a year or two of a decision to do so.
  - The 150-km-range Prithvi I SRBM continues to be India's only deployed ballistic missile.
  - The Prithvi II SRBM is a modified Prithvi I with an increased range of 250 km.
  - The Agni series, which probably will be deployed during this decade, will be the mainstay of India's nuclear-armed missile force.
  - The Sagarika SLBM probably will not be deployed until 2010 or later.
  - India continues to push toward self-sufficiency, especially in regard to its missile programs. Nevertheless, New Delhi still relies heavily on foreign assistance.
  - 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 Charlie-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.

- The CIA reported in September 2001 that 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.

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.
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    - 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.

- The US Department of Defense reported in January 2001 that,
  - 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 war-fare 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.

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.
- The US Department of Defense reported in January 2001 that, 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..

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 y ears 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.

- The Department of Defense summarized developments as follows in January 2001,

  - 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 produce 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 air-craft, 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 doctrine 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 safe-guards. 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.
- The CIA reported in September 2001 that 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.

Missile Defenses

- The CIA reported on January 30, 2002 that India signed a $270 million contract with Israel for the Barak-1 missile defense systems.

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

Part Five

Pakistani Force Trends

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, adequate 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 percent 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 possibly 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 doctrine, 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 increasingly 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.

CIA Estimate of Pakistani Missile Force Trends – January 2002

- Pakistan sees missile-delivered nuclear weapons as a vital deterrent to India's much larger conventional forces, and as a necessary counter to India's nuclear program. Pakistan pursued a nuclear capability more for strategic reasons than for international prestige.
- **Ballistic Missile Programs**: Since the 1980s, Pakistan has pursued development of an indigenous ballistic missile capacity in an attempt to avoid reliance on any foreign entity for this key capability. Islamabad will continue with its present ballistic missile production goals until it has achieved a survivable, flexible force capable of striking a large number of targets throughout most of India.
- Pakistan's missiles include:
  - The short-range Hatf I, which Pakistan also is attempting to market, as it is relatively inexpensive and easy-to-operate.
  - M-11 missiles that Pakistan acquired from China in the 1990s. (The M-11 SRBM—called the Hatf III in Pakistan—is a single-stage, solid-propellant missile capable of carrying a payload at least 300 km.)
  - Ghauri/No Dong MRBMs that Pakistan acquired from North Korea.
  - The Shaheen I, a Pakistani-produced single-stage, solid-propellant SRBM.
  - The Shaheen II, a road-mobile two-stage solid-propellant MRBM that Pakistan is developing. (Based on several mockups publicly displayed in Pakistan, the Shaheen II probably would be able to carry a 1,000-kg payload to a range of about 2,500 kilometers.)
- Foreign Assistance: Foreign support for Pakistan's ambitious solid-propellant ballistic missile acquisition and development program has been critical.
- During 2001, 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.

Pakistan and Nuclear Weapons

Delivery Systems

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. 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.
- The CIA reported on January 30, 2002 that 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 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.

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.

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

[i] National Intelligence Council, "Foreign Missile Developments and the Ballistic Missile Threat to the United States Through 2015, (September 1999 (www.cia.gov/cia/publications/nie/nie99).

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[iii] New York Times, August 5, 2000, p. A-1.

[iv] Douglas J. Gilbert,. "Missile Threats Growing as Nation Pursues Defense," American Forces Press Service, May 7, 1999.

[v] New York Times, p. A-10.

[vi] For further details, see Review of United States Policy Toward North Korea: Findings and Recommendations, Unclassified Report by Dr. William J. Perry, U.S. North Korea Policy Coordinator and Special Advisor to the President and the Secretary of State, Washington, DC, October 12, 1999; and Testimony Before the Senate Foreign Relations Committee, Subcommittee on East Asian and Pacific Affairs, Washington, DC, October 12, 1999.

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[x] New York Times, p. A-10.

[xi] For further details, see Review of United States Policy Toward North Korea: Findings and Recommendations, Unclassified Report by Dr. William J. Perry, U.S. North Korea Policy Coordinator and Special Advisor to the President and the Secretary of State, Washington, DC, October 12, 1999; and Testimony Before the Senate Foreign Relations Committee, Subcommittee on East Asian and Pacific Affairs, Washington, DC, October 12, 1999.