Appendix 15A. World nuclear forces

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I. Introduction

Despite the efforts over the past half-century to reduce and eliminate nuclear weapons, and commitments under the 1968 Non-Proliferation Treaty (NPT)[1] to achieve this goal, the five states defined by the NPT as nuclear weapon states—China, France, Russia, the United Kingdom and the United States—continue to deploy more than 16 500 operational nuclear weapons (see table 15A.1). If all warheads are counted—deployed, spares, those in both active and inactive storage, and 'pits' (plutonium cores) held in reserve—the five nuclear-weapon states possess an estimated total of 36 500 warheads. This means that they possess over 98 per cent of the world nuclear weapon stockpile.

The US 2001 Nuclear Posture Review (NPR) and implementation of the 2002 US–Russian Strategic Offensive Reductions Treaty (SORT) will move thousands of US and Russian 'operationally deployed strategic warheads' out of declared operational status into various 'unaccountable' categories of reserve weapons.[2] Thousands of other weapons are also held in reserve. The result is that the US and Russian nuclear weapon arsenals are becoming increasingly opaque and difficult to monitor.[3]

In the USA, the 2001 NPR and subsequent defence budgets revealed plans for new ballistic missiles, strategic submarines, long-range bombers, nuclear weapons, and nuclear command and control systems. Substantial modernization is under way for virtually all parts of the US nuclear infrastructure. Similarly, Russia is modernizing its strategic nuclear forces by deploying new intercontinental ballistic missiles (ICBMs) and additional strategic bombers and developing a new generation of nuclear-powered ballistic-missile submarines (SSBNs). Importantly, under SORT, Russia has decided to retain MIRVed ICBMs (missiles equipped with multiple, independently targetable re-entry vehicles). Moreover, both states continue to underscore the importance of nuclear weapons in their national security strategies. Tables 15A.2 and 15A.3 show the composition of the US and Russian deployed nuclear forces.

The nuclear arsenals of the UK, France and China are considerably smaller than those of the USA and Russia, but these states are also modernizing their forces and remain committed to retaining their nuclear arsenals. Data on the British, French and Chinese delivery vehicles and nuclear warhead stockpiles are presented in tables 15A.4–15A.6. Despite official US predictions of a pending Chinese strategic

[1] The 1968 Treaty on the Non-proliferation of Nuclear Weapons entered into force on 5 Mar. 1970; it was extended indefinitely at the 1995 NPT Review and Extension Conference.

[2] US Department of Defense, 'Nuclear Posture Review [excerpts], Submitted to Congress on 31 December 2001', 8 Jan. 2002, p. 17, URL <http://www.globalsecurity.org/wmd/library/policy/dod/npr.htm>. The text of SORT is available at URL <http://www.state.gov/t/ac/trt/18016.htm>; the treaty will enter into force when it has been ratified by both signatories. For the implications of SORT see 'Special Section', *Arms Control Today*, vol. 32, no. 5 (June 2002), pp. 3–23.

[3] For a comprehensive analysis of proposed measures to enhance the transparency of the US and Russian nuclar arsenals, see Zarimpas, N. (ed.), SIPRI, *Transparency in Nuclear Warheads and Materials: The Political and Technical Dimensions* (Oxford University Press: Oxford, 2003).

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Table 15A.1. World nuclear forces, by number of deployed warheads, January 2003

Country	Strategic warheads	Non-strategic warheads	Total warheads
USA	5 948	1 120	**7 068**[a]
Russia	4 852	3 380	**8 232**[b]
UK	185	–	**185**
France	348	–	**348**
China	282	120[c]	**402**
India	–	–	**(30–40)**[d]
Pakistan	–	–	**(30–50)**[d]
Israel	–	–	**(~200)**[d]
Total			**~16 500**

[a] This number was scheduled to increase by 192 warheads in the spring of 2003, with the second Trident (D-5)-upgraded SSBN returning to operational status. The total US stockpile, including reserves, contains *c*. 10 600 warheads as well as 5000 plutonium pits in storage.

[b] The total Russian stockpile contains 18 000 warheads, of which *c*. 9800 are in storage and/or awaiting dismantlement.

[c] The existence of non-strategic nuclear weapons has not been confirmed by official Chinese sources.

[d] The stockpiles of India, Pakistan and Israel are thought to be only partly deployed.

nuclear build-up, few new details emerged in 2002, and it remains unclear whether China intends to deploy a significantly larger strategic nuclear force or a more modern force of relatively the same size. France is currently engaged in developing and deploying a new generation of SSBNs, submarine-launched ballistic missiles (SLBMs) and air-launched nuclear weapons. The British nuclear weapon stockpile has levelled out at slightly less than 200 warheads: the UK is the only one of the five nuclear weapon states that is not known to have new nuclear weapon systems under development.[4]

It is particularly difficult to obtain public information about the nuclear arsenals of the three states which are not parties to the NPT—India, Pakistan and Israel. The information that is available is limited and often contradictory. Tables 15A.7–15A.9 present estimates of the size of their nuclear weapon stockpiles and provide information about potential nuclear weapon delivery means.

The figures contained in the tables are estimates based on public information and contain some uncertainties, as reflected in the notes.

II. US nuclear forces

As of January 2003, the USA maintained an estimated stockpile of 7068 operational nuclear warheads, consisting of 5948 strategic and 1120 non-strategic warheads. Another 370 warheads are spares. This is a reduction of some 530 operational warheads compared to 2002, owing to the retirement of the first five MX/Peacekeeper ICBMs, the removal of two SSBNs from strategic operations and the upgrade of another to the Trident II (D-5). The warheads were not destroyed, however, but were

[4] For further information on developments in world nuclear forces see Kristensen, H. M. and Handler, J., 'World nuclear forces', *SIPRI Yearbook 2002: Armaments, Disarmament and International Security* (Oxford University Press: Oxford, 2002), pp. 525–67, and previous editions of the SIPRI Yearbook.

transferred to the reserve inventory, which as a result increased from 2700 reserve warheads in 2002 to 3230.

In addition to these over 10 600 intact warheads, about 5000 plutonium pits are stored at the Oak Ridge Y-12 Plant, in Tennessee, and at the Pantex Plant, in Texas.[5] Approximately the same number of canned assemblies (thermonuclear secondaries) are maintained as a strategic reserve. This stockpile is considerably larger than the 5949 'accountable' warheads declared by the US Department of State on 5 December 2001 at the completion of the 1991 START I Treaty.[6] The main reasons for this discrepancy are that the treaty only counts warheads on strategic launchers and attributes 'artificial' weapon loads to bombers, but does not count non-strategic weapons and warheads in the reserve. The START number is widely but incorrectly cited by the media in reports on the size of the total US nuclear arsenal.

Implementation of the Nuclear Posture Review

In 2002 the USA began to implement the decisions of the 2001 Nuclear Posture Review (NPR), which are intended to reduce the number of 'operationally deployed strategic warheads' to 1700–2200 by the end of 2012 in the following three phases:

Phase 1 (2003–2006): the number of 'accountable' warheads will be reduced by 1300 'as a result of the retirement of Peacekeeper, the Tridents and the like'.

Phase 2 (2006–2007): the number of accountable strategic warheads will be reduced further by 'taking additional operationally deployed warheads off existing ICBMs and SLBMs down to a level of about 3800' by fiscal year (FY) 2007.

Phase 3 (2008–2012): 'making the force structure decisions on how we will be bringing down the force to 1700 to 2200 operationally deployed warheads'.[7]

A comparison of the 2001 NPR decisions with those of the previous NPR, conducted by the Administration of President Bill Clinton in 1994, reveal that none of the cuts proposed by the Administration of President George W. Bush are new and that the timelines for implementing the decisions have been extended.

The 2001 NPR reaffirmed the force structure planning developed by the US Strategic Command (STRATCOM) nearly a decade ago, which recommended that the number of operational strategic warheads should not be reduced below a level of approximately 2000 and that a 'triad' of strategic forces should be retained. With regard to the latter, the 2001 NPR called for studies on a new generation of ICBMs, SSBNs and heavy bombers to replace current delivery vehicles as their service lives expire. It also announced a modernization of nuclear weapons and a significant 'revitalization' of the nuclear weapon infrastructure. In addition, the document called for improving US command, control, communication and intelligence (C3I) systems.

The NPR transfers thousands of operationally deployed strategic nuclear warheads from accountable status into various non-accountable reserve categories, and presents new definitions for the organization of the stockpile by changing the way in which warheads are categorized and counted. Under this organization nuclear weapons are

[5] For a description of the facilities in the US nuclear weapon complex see Bukharin, O., 'The changing Russian and US nuclear warhead production complexes', *SIPRI Yearbook 2002: Armaments, Disarmament and International Security* (Oxford University Press: Oxford, 2002), pp. 593–96.

[6] The 1991 US–Soviet Treaty on the Reduction and Limitation of Strategic Offensive Arms entered into force for the USA and Russia on 5 Dec. 1994. In the Protocol to Facilitate the Implementation of the START Treaty (1992 Lisbon Protocol), which entered into force on 5 Dec. 1994, Belarus, Kazakhstan and Ukraine also assumed the obligations of the former USSR under the treaty.

[7] US Department of Defense, 'Special briefing on the Nuclear Posture Review' (note 2).

maintained in the following overall categories: (*a*) Active Stockpile: operationally deployed warheads and Responsive Force warheads (see below; previously called 'the hedge'); (*b*) Inactive Stockpile: refurbished warheads (future) and non-refurbished warheads; and (*c*) Strategic Reserve: plutonium pits (primaries) and canned assemblies (secondaries).

One of the new categories created by the NPR is the 'Responsive Force'—warheads not deployed on operational systems but not considered 'inactive' warheads. Responsive Force warheads will be available to be returned to the operationally deployed force within days, months or years; the timeline varies considerably depending on the delivery platform. Bombs could be brought out of the non-deployed stockpile in days or weeks, but adding additional warheads to the ICBM force could take as long as a year for a squadron in a missile wing.

Before the START I Treaty was signed in 1991, about 5 per cent of the total stockpile was in the 'reserve' category. The Clinton Administration decided during the 1994 review that 'most weapons' removed from active status should not be destroyed but placed in reserve to maintain a 'hedge' against unforeseeable developments. If the 1993 START II Treaty[8] had been implemented, with its ceiling of 3500 'accountable' strategic warheads, it was expected that the reserve stockpile would increase to a greater than 1 : 1 ratio with the deployed stockpile. As the NPR is implemented over the next decade, the ratio is expected to increase to 1 : 3, so that by 2012 there will be more than three times as many warheads in various 'unaccountable' categories as there are operationally deployed warheads.

Non-strategic nuclear weapons

As of January 2003, the USA retained 1120 non-strategic nuclear warheads. These consisted of 800 B61 gravity bombs of three modifications and 320 Tomahawk Land-Attack Cruise Missiles (TLAM/Ns), a portion of which are in reserve or inactive. Despite the significant number of warheads, the 2001 NPR did not address non-strategic nuclear weapons.

The 800 operational B61 non-strategic nuclear bombs are earmarked for delivery by various US and NATO aircraft. Another 500 are in reserve. About 150 of the B61 bombs are deployed at nine airbases in six European NATO member states (Belgium, Germany, Italy, the Netherlands, Turkey and the UK), the only US nuclear weapons that are still forward-deployed (other than SSBNs). The aircraft of non-nuclear weapon NATO countries that are assigned nuclear strike missions with US weapons include Belgian and Dutch F-16 aircraft and German and Italian Tornado bombers. Several NATO countries currently assigned strike missions with US nuclear bombs are considering purchase of the F-35 Joint Strike Fighter.

All of the approximately 320 TLAM/N cruise missiles (with W80-0 warheads) are stored at the Strategic Weapons Facilities at Bangor, Washington, and King's Bay, Georgia, alongside strategic weapons for SSBNs. Despite some internal debate prior to the conclusion of the 2001 NPR about whether to retire the TLAM/N, the NPR announced no decision to change the status of the missile. TLAM/Ns are not deployed at sea under normal circumstances. However, if the order is given to do so, TLAM/Ns can be redeployed on attack submarines in only 30 days.

[8] The 1993 US–Russian Treaty on Further Reduction and Limitation of Strategic Offensive Arms (the START II Treaty) was ratified by the Russian and US legislatures but did not enter into force. On 14 June 2002, as a response to the the taking effect on 13 June of the USA's withdrawal from the ABM Treaty, Russia declared that it will no longer be bound by the START II Treaty.

Table 15A.2. US nuclear forces, January 2003

Type	Designation	No. deployed	Year first deployed	Range (km)[a]	Warheads x yield	Warheads
Strategic forces						
Bombers[b]						
B-52H	Stratofortress	93/56	1961	16 000	ALCM 5–150 kt	430
					ACM 5–150 kt	430
B-2	Spirit	21/16	1994	11 000	Bombs	800[c]
Subtotal		*114/72*				*1 660*
ICBMs						
LGM-30G	Minuteman III					
	Mk-12	50	1970	13 000	3 x 170 kt	150
		150			1 x 170 kt[d]	150
	Mk-12A	300	1979	13 000	3 x 335 kt	900
LGM-118A	MX/Peacekeeper[e]	40	1986	11 000	10 x 300 kt	400
Subtotal		*540*				*1 600*
SSBNs/SLBMs[f]						
UGM-96A	Trident I (C-4)	96	1979	7 400	6 x 100 kt	576
UGM-133A	Trident II (D-5)	264				
	Mk-4	n.a.	1992	> 7 400	8 x 100 kt	1 728
	Mk-5	n.a.	1990	> 7 400	8 x 475 kt	384
Subtotal		*360*				*2 688*
Strategic subtotal						*5 948*
Non-strategic forces						
B61-3, -4, -10 bombs		n.a.	1979	n.a.	0.3–170 kt	800[g]
Tomahawk SLCM		325	1984	2 500	1 x 5–150 kt	320[h]
Non-strategic subtotal						*1 120*
Total						**7 068**[i]

[a] Range for aircraft indicates combat radius, without in-flight refuelling.

[b] The first figure in the *No. deployed* column is the total number of B-52Hs in the inventory, including those for training, test and back-up. The second figure is the PMI (primary mission inventory) aircraft, i.e., the number of operational aircraft assigned for nuclear and conventional wartime missions.

[c] Available for both the B-52H and the B-2A.

[d] Each of the 150 Minuteman III missiles of the 90th Space Wing at F.E. Warren AFB have been downloaded from 3 to 1 W62 warhead.

[e] The first MX ICBM was deactivated on 2 Oct. 2002 and the remainder are scheduled to follow over a 36-month period, with 17 missiles dismantled in FY 2003, 17 more in FY 2004 and the final 16 in FY 2005.

[f] Of 8 Bangor-based SSBNs, 2 are under conversion to SSGN and 1 has completed Trident (D-5) refit. According to START I Treaty counting rules, C-4 missiles have been downloaded from 8 to no more than 6 warheads, but D-5 missiles are still counted as carrying 8 warheads each. SLBM warhead loading will increase later in 2003 to 2880 when the *Nevada* returns to service after Trident (D-5) upgrade. Two Atlantic-based D-5-equipped SSBNs were shifted to the Pacific in late 2002.

[g] Some 150 of these are forward-deployed in 6 European countries (Belgium, Germany, Italy, the Netherlands, Turkey and the UK). Nuclear weapons were withdrawn from Greece in 2001. Almost 500 more have been transferred to the inactive reserve.

[h] The TLAM/N is no longer deployed with the fleet but is stored on land.

[i] Another 380 warheads are spares, and just over 3000 additional intact warheads are kept in the reserve stockpile.

Sources: US Department of Defense, Various budget reports; START I Treaty MOUs, 1990 through Jan. 2003; US Department of State; Cohen, W. S., Secretary of Defense, *Annual Report to the President and the Congress* (US Department of Defense: Washington, DC, Jan. 2001), pp. 89–99, D-1; US Senate Committee on Foreign Relations, START II Treaty, Executive Report 104-10, 15 Dec. 1995; US Navy, personal communication; US Department of Defense, Various documents obtained under the Freedom of Information Act; Natural Resources Defense Council, 'NRDC Nuclear Notebook', *Bulletin of the Atomic Scientists*, various issues; and Author's estimates.

III. Russian nuclear forces

At the beginning of 2003, Russia had an estimated 8232 operational nuclear warheads, consisting of 4852 strategic and 3380 non-strategic and air defence warheads. The primary changes in 2002 involved the further overall decrease in the number of MIRVed ICBMs, which reduced the total number of deployed strategic warheads by 99.

It is difficult to estimate the size of the Russian (operational and inactive) nuclear stockpile, especially the non-strategic arsenal. Some 30 000 nuclear weapons, plus or minus several thousand, may have been in the Soviet arsenal in 1991. Estimates of the dismantlement rates of Russian warheads vary from several hundred to 1000–2000 per year. US Department of Defense (DOD) and Central Intelligence Agency (CIA) estimates suggest that Russia dismantled slightly more than 1000 warheads per year during the 1990s; that is, more than 10 000 were dismantled after 1991.[9] If so, the remaining arsenal may contain some 18 000 nuclear weapons, plus or minus several thousand. With approximately 8200 considered operational, the remaining about 9800 are weapons in storage, some or all of which are destined for dismantlement.

The number of Russian-deployed strategic nuclear warheads—4852—is lower than the 5520 warheads attributed to Russia under the START I Treaty. This is because START I counts launchers which have been deactivated or otherwise removed from service as remaining deployed with their associated warheads until several further steps have been taken to eliminate or convert them.

The signing of SORT with the USA frees Russia from nuclear planning constraints that would otherwise have been imposed by the START II Treaty, in particular its ban on MIRVed ICBMs. Moreover, SORT officially brings the number of 'operationally deployed strategic warheads' down to a level approaching the 1500 advocated by President Vladimir Putin in 2000.

The most significant development in 2002 was the decision in August to stop dismantlement of the SS-18 missile and to retain the MIRVed ICBM as the cornerstone of Russia's land-based nuclear arsenal until 2016. Even with the decision to retain SS-18s for the next decade or so, further decreases in the missile forces seem inevitable and Russia will probably be unable to keep up with the pace of US funding and modernization. In addition, the future of Russia's sea-based deterrent force is in doubt owing to financial difficulties and a shrinking SSBN fleet, and Russia was unable to send any SSBNs on patrol in 2002, according to US nval intelligence, for the first time ever.

[9] For further detail about Russia's nuclear warhead dismantlement activities and the attendant changes in the size and composition of the Russian nuclear weapon complex since the end of the cold war see Bukharin (note 5), pp. 587–93.

Table 15A.3. Russian nuclear forces, January 2003

Type	NATO designation	No. deployed	Year first deployed	Range (km)[a]	Warheads x yield	Warheads
Strategic offensive forces						
Bombers						
Tu-95MS6	Bear-H6	34	1984	6 500–10 500	6 x AS-15A ALCMs, bombs	204
Tu-95MS16	Bear-H16	30	1984	6 500–10 500	16 x AS-15A ALCMs, bombs	480
Tu-160	Blackjack	15	1987	10 500–13 200	12 x AS-15B ALCMs or AS-16 SRAMs, bombs	180
Subtotal		*79*				*864*
ICBMs						
SS-18	Satan	138	1979	11 000–15 000	10 x 500–750 kt	1 380
SS-19	Stiletto	134	1980	10 000	6 x 500–750 kt	804
SS-24 M1	Scalpel	36	1987	10 000	10 x 550 kt	360
SS-25	Sickle	342	1985	10 500	1 x 550 kt	342
SS-27	n.a.	30	1997	10 500	1 x 550 kt	30
Subtotal		*680*				*2 916*
SLBMs						
SS-N-18 M1	Stingray	96	1978	6 500	3 x 200 kt (MIRV)	288
SS-N-20	Sturgeon	40	1983	8 300	10 x 100 kt (MIRV)	400
SS-N-23	Skiff	96	1986	9 000	4 x 100 kt (MIRV)	384
Subtotal		*232*				*1 072*
Total strategic offensive forces						**4 852**
Strategic defensive forces						
SAMs						
SA-5B Gammon, SA-10 Grumble		1 200				**1 200**
Non-strategic forces						
Land-based non-strategic						
Bombers and fighters						
Tu-22M Backfire		105			AS-4 ASM,	
Su-24 Fencer		280			AS-16 SRAM, bombs	
Subtotal		*385*				*1 540*[b]
Naval non-strategic						
Attack aircraft						
Tu-22M Backfire		45			AS-4 ASM, bombs	
Su-24 Fencer		50				
Subtotal		*95*				*190*[b]
SLCMs						
SS-N-9, SS-N-12, SS-N-19, SS-N-21, SS-N-22						240
ASW weapons						
SS-N-15, SS-N-16, torpedoes		n.a.				210
Total defensive and non-strategic						**3 380**
Total						**8 232**

[a] Range for aircraft indicates operational range at maximum and standard payloads.
[b] Figure includes warheads for all the land-based and naval aircraft, respectively.

Sources: START I Treaty Memoranda of Understanding (MOU), 1990 through Jan. 2003; 'NRDC Nuclear Notebook', *Bulletin of the Atomic Scientists*, various issues; International Institute of Strategic Studies, *The Military Balance 2001/2002* (Oxford University Press: Oxford, 2001); Podvig, P. L. (ed.), *Russian Strategic Nuclear Forces* (MIT Press: Cambridge, Mass., 2001); *Strategic Nuclear Forces*, vol. 1, *Russia's Arms and Technologies, The XXI Century Encyclopedia* (Arms and Technologies: Moscow, 2000); US Navy, Office of Naval Intelligence, Memos on 'Russian strategic and general purpose nuclear submarine patrols' covering 1991–2001, released under the Freedom of Information Act to the Program on Science and Global Security, Princeton University; *Jane's Fighting Ships 2001–2002* (Jane's Information Group, Ltd: Coulsdon,UK, 2001); and *Combat Fleets of the World 2000–2001* (Naval Institute Press: Annapolis, Md., 2000); US National Intelligence Council, 'Foreign missile developments and the ballistic missile threat through 2015' (unclassified summary), Dec. 2001, URL <http://www.cia.gov/nic/pubs/other_products/Unclassifiedballisticmissile final.pdf>; US National Intelligence Council, *Annual Report to Congress on the Safety and Security of Russian Nuclear Facilities and Military Forces*, Feb. 2002; US Department of Defense, *Proliferation: Threat and Response,* Jan. 2001; Ivanov, I. S., Minister of Foreign Affairs of the Russian Federation, 'Statement at the Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons', New York, 25 Apr. 2000, URL <http://www.ceip.org/programs/npp/npt2000ivanov.htm>; 'Statement of the delegation of the Russian Federation at the First Session of the Preparatory Committee for the 2005 NPT Review Conference under Article VI of the Treaty', New York, 11 Apr. 2002; and Author's estimates.

IV. British nuclear forces

The UK maintains an arsenal of about 185 warheads for use by a fleet of four Trident SSBNs, consisting of 160 operational warheads and an additional 15 per cent of that number for spares. This makes the British arsenal the smallest of the five NPT-defined nuclear weapon states, even with an estimated programme cost of $18.8 billion, and it may even be exceeded in size by Israel's nuclear arsenal.

At any given time the sole British Trident submarine on patrol will carry about 40 warheads on 16 US-produced Trident II (D-5) SLBMs. The second and third SSBNs can be put to sea fairly rapidly, with similar loadings, while the fourth might take longer because of its cycle of overhaul and maintenance. Although details of British SSBN patrols are tightly guarded secrets, there are reports that some coordination takes place between the UK and France.

The UK is the only nuclear weapon state that has publicly assigned its SSBNs 'sub-strategic missions'. According to a former British Ministry of Defence official, 'A sub-strategic strike would be the limited and highly selective use of nuclear weapons in a manner that fell demonstrably short of a strategic strike, but with a sufficient level of violence to convince an aggressor who had already miscalculated our resolve and attacked us that he should halt his aggression and withdraw or face the prospect of a devastating strategic strike'.[10] Much like those of the USA and Russia, the UK's nuclear doctrine appears to encompass virtually any potential role. Speaking before Parliament's Defence Committee in March 2002, British Defence Secretary Geoff Hoon asserted that 'states of concern' armed with weapons of mass destruction 'can

[10] Ormond, D., 'Nuclear deterrence in a changing world: the view from a UK perspective', *RUSI Journal*, June 1996, pp. 15–22.

Table 15A.4. British nuclear forces, January 2003

Type	Designation	No. deployed	Year first deployed	Range (km)	Warheads x yield	Warheads in stockpile
SLBMs						
D-5	Trident II	48	1994	> 7 400	1–3 x 100 kt	185

Sources: British Ministry of Defence (MOD), *Defence White Paper 1999*, Cm 4446 (Her Majesty's Stationery Office: London, 1999); British MOD press releases and the MOD Internet site, URL <http://www.mod.uk/issues/sdr/index.htm>, British MOD, *Strategic Defence Review* (MOD: London, July 1998); British MOD, *Statement on the Defence Estimates 1996,* Cm 3223 (Her Majesty's Stationery Office: London, 1996); Ormond, D., 'Nuclear deterrence in a changing world: the view from a UK perspective', *RUSI Journal*, June 1996, pp. 15–22; Norris, R. S. *et al., Nuclear Weapons Databook, Vol. V: British, French, and Chinese Nuclear Weapons* (Westview: Boulder, Colo., 1994), p. 9; British House of Commons, *Parliamentary Debates (Hansard)*; 'NRDC Nuclear Notebook', *Bulletin of the Atomic Scientists*, various issues; and Author's estimate.

be absolutely confident that in the right conditions we would be willing to use our nuclear weapons'.[11]

V. French nuclear forces

As of January 2003, France maintained an arsenal of an estimated 348 nuclear warheads for delivery by strategic submarines, carrier-based strike aircraft and land-based bombers. France continues to modernize its nuclear forces, including construction of the third and fourth Triomphant Class SSBNs, the M51 SLBM with a new nuclear warhead, the ASMP-A (Air-Sol Moyenne Portée) cruise missile and the Rafale nuclear-capable strike aircraft. The 2002 French defence budget increases funding for nuclear forces by 13 per cent over 2001, to €2.68 billion ($2.5 billion).

The backbone of France's nuclear deterrent force consists of a fleet of four operational SSBNs of three classes: two of the new Triomphant Class SSBNs, one L'Inflexible Class SSBN and one Redoubtable Class SSBN. Three of these submarines are maintained in the operational cycle and one or two are normally 'on station' in designated patrol areas at any given time, compared with three in the early 1990s. Deployment of the M51 with a longer range from 2010 will permit French SSBNs to greatly expand their patrol zones. The four submarines carry an estimated 288 nuclear warheads.

Three squadrons with 60 Mirage 2000Ns currently have nuclear strike roles. The Mirage 2000N is scheduled to be replaced by the Rafale (B-301), which is planned to be the multi-purpose navy and air force fighter-bomber for the 21st century. Its roles include conventional ground attack, air defence, air superiority and nuclear delivery of the ASMP and/or ASMP-A. The ASMP is equipped with the 300-kt TN-81 warhead. It is estimated that France has about 60 operational ASMPs, but additional missiles may be in inactive storage. There are conflicting reports about the French inventory of missiles and warheads.

[11] 'UK restates nuclear threat', BBC Online Network, 2 Feb. 2003, URL <http://news.bbc.co.uk/1/hi/uk_politics/2717939.stm>.

Table 15A.5. French nuclear forces, January 2003

Type	No. deployed	Year first deployed	Range (km)[a]	Warheads x yield	Warheads in stockpile
Land-based aircraft					
Mirage 2000N	60	1988	2 750	1 x 300 kt ASMP	50
Carrier-based aircraft					
Super Étendard	24	1978	650	1 x 300 kt ASMP	10
SLBMs					
M4.71[b]	16	1985	6 000[c]	6 x 150 kt	96
M45	32	1996	6 000[c]	6 x 100 kt	192
Total					**348**

[a] Range for aircraft assumes combat radius, without in-flight refuelling.

[b] The M4.70 with TN-70 warheads was retired in 1996.

[c] The range of M4 and M45 is listed as only 4000 km in a 2001 report from the National Defence Commission of the Assemblée Nationale.

Sources: Assemblée Nationale, Au Nom de la Commission de la Défense Nationale et des Forces Armées, sur le project de loi de finances pour 2002 (no. 3262), Tome II, Défense, 'Dissuasion Nucléaire', M. René Galy-Dejean (Député), 11 Oct. 2001, URL <http://www.assemblee-nationale.fr/budget/plf2002/a3323-02.asp>; French Ministry of Defence (MOD), 'Les fonctions opérationnelles', URL http://www.defense.gouv.fr/marine/present/dim2002/missions.htm>; French MOD, 'Nuclear disarmament and non-proliferation', *Arms Control, Disarmament and Non-Proliferation: French Policy* (La Documentation française: Paris, 2000), chapter 3, pp. 36–56; Address by M. Jacques Chirac, President of the Republic, at the École Militaire, Paris, 23 Feb. 1996; Assemblée Nationale, *Projet de loi relatif à la programmation militaire pour les années 1997 à 2002,* no. 2766 (20 May 1996), section 2.3.4, Evolution de l'équipement des forces armées (1996–2002), p. 45; Intervention de Monsieur François Mitterrand sur la politique française de dissuasion [Statement by Mr François Mitterrand on French deterrent policy], Palais de l'Elysée, 5 May 1994, pp. 4–5; Norris, R. S. *et al.*, *Nuclear Weapons Databook, Vol. V: British, French, and Chinese Nuclear Weapons* (Westview: Boulder, Colo., 1994), p. 10; *Air Actualités*, various issues; *Aviation Week & Space Technology*, various issues; 'NRDC Nuclear Notebook', *Bulletin of the Atomic Scientists*, various issues; and Author's estimates.

VI. Chinese nuclear forces

China is estimated to have an arsenal of more than 400 nuclear weapons for delivery by aircraft, land-based ballistic missiles, SLBMs and possibly also non-strategic systems, including artillery.

According to US Government reports, a build-up of Chinese nuclear forces is under way. The DOD estimated in 2002 that China currently has around 20 ICBMs capable of targeting the USA and that this number will increase to approximately 30 by 2005 and possibly to 60 by 2010.[12] This estimate followed a CIA forecast that 'the overall

[12] US Department of Defense (DOD), 'Annual Report on the Military Power of the People's Republic of China', Report to Congress pursuant to the FY 2000 National Defense Authorization Act, 2002, p. 27, available at URL <http://www.fas.org/nuke/guide/china/dod-2002.pdf>. Overall, the DOD predicts that this modernization programme 'will improve both China's nuclear deterrence by increasing the number

Table 15A.6. Chinese nuclear forces, January 2003

Type	NATO designation	No. deployed	Year first deployed	Range (km)[a]	Warheads x yield	Warheads in stockpile
Aircraft[b]						
H-6	B-6	120	1965	3 100	1–3 bombs	120
Q-5	A-5	30	1970	400	1 x bomb	30
Land-based missiles						
DF-3A	CSS-2	40	1971	2 800	1 x 3.3 Mt	40
DF-4	CSS-3	12	1980	5 500	1 x 3.3 Mt	12
DF-5A	CSS-4	20	1981	13 000	1 x 4–5 Mt	20
DF-21A	CSS-5	48	1985–86	1 800	1 x 200–300 kt	48
SLBM s						
Julang I	CSS-N-3	12	1986	1 700	1 x 200–300 kt	12
Strategic weapons						*282*
Non-strategic weapons						
Artillery/ADMs, Short-range missiles					Low kt	120
Total						**~ 402**

[a] Range for aircraft indicates combat radius, without in-flight refuelling.

[b] All figures for bomber aircraft are for nuclear-configured versions only. Hundreds of aircraft are also deployed in non-nuclear versions. The table assumes 150 bombs for the bomber force, with yields estimated at between 10 kt and 3 Mt.

Sources: US National Intelligence Council, 'Foreign missile developments and the ballistic missile threat through 2015' (unclassified summary), Dec. 2001, URL <http://www.cia.gov/nic/pubs/other_products/Unclassifiedballisticmissilefinal.pdf>; US Department of Defense (DOD), Office of the Secretary of Defense, 'Proliferation: threat and response', Washington, DC, Jan. 2001, URL <http://www.defenselink.mil/pubs/ptr20010110.pdf>; US DOD, Report to Congress Pursuant to the FY 2000 National Defense Authorization Act, 'Annual Report on the Military Power of the People's Republic of China', June 2000, URL <http://www.defenselink.mil/news/Jun2000/china06222000.htm>; Moore, F. W., *China's Military Capabilities* (Institute for Defense and Disarmament Studies: Cambridge, Mass., June 2000), URL <http://www.comw.org/cmp/fulltext/iddschina.html>; Kan, S. A. *et al., China's Foreign Conventional Arms Acquisitions: Background and Analysis,* Congressional Research Service (CRS) Report for Congress (Library of Congress: Washington, DC, 10 Oct. 2000); US State Department International Information Programs, *Pentagon Spokesman's Regular Briefing,* 12 Dec. 2000; Baker III, A. D., 'Combat fleets', *US Naval Institute Proceedings*, vol. 126 (Dec. 2000), p. 90; US DOD, National Air Intelligence Center (NAIC), *Ballistic and Cruise Missile Threat* (NAIC: Wright-Patterson Air Force Base, Ohio, Apr. 1999); Norris, R. S. *et al., Nuclear Weapons Databook, Vol. V: British, French, and Chinese Nuclear Weapons* (Westview: Boulder, Colo., 1994); US Central Intelligence Agency, various documents; 'NRDC Nuclear Notebook', *Bulletin of the Atomic Scientists*, various issues; and Author's estimates.

size of Chinese strategic ballistic missile forces' over the next 15 years would increase to 75–100 warheads, deployed 'primarily against the United States'.[13] By

of warheads that can target the United States as well as improving its operational capabilities for contingencies in the East Asia'.

[13] US National Intelligence Council, 'Foreign missile developments and the ballistic missile threat through 2015' (unclassified summary), Dec. 2001, URL <http://www.cia.gov/nic/pubs/other_products/Unclassifiedballisticmissilefinal.pdf>.

comparison, a CIA estimate from 1999 had concluded that by 2015 China would probably have added 'a few tens' of more survivable land- and sea-based mobile missiles with smaller warheads and that 'tens of missiles' would be targeted against the USA.[14] A DOD report from 2000 stated that China did not seem to have aspirations for a large strategic force and, although modernization is under way, '[its] strategic force is really quite small'.[15]

China has three new ballistic missiles in development: the road-mobile DF-31 (CSS-X-10) ICBM, a longer-range version of the DF-31, and the Julang II (Great Wave) SLBM. Development of these missiles began in the mid-1980s.

Allegations of Chinese theft of US nuclear warhead designs have fuelled speculation that China may soon deploy missile systems with multiple warheads. The CIA estimates that China has for many yearshad the technical capability to develop and deploy MRV (multiple re-entry vehicle) payloads, including a MIRV system, but has not done so.[16] If China needed an MRV capability in the short term, according to the CIA, one option might be to use a DF-31-type RV to develop and deploy a simple MRV or MIRV capability on existing DF-5 ICBMs. The CIA has concluded that 'Chinese pursuit of a multiple RV capability for its *mobile* ICBM and SLBMs would encounter significant technical hurdles and would be costly'.[17]

China has had great difficulty in developing a sea-based nuclear deterrent. A new SSBN project, designated Project 094, has begun with one submarine under construction. However, operational deployment of the Project 094 system may be many years away.

Non-strategic weapons

Information on Chinese non-strategic nuclear weapons is limited and contradictory. There is no confirmation of their existence from official Chinese sources. Several low-yield nuclear tests conducted in the late 1970s and a large military exercise in June 1982 simulating the use of non-strategic nuclear weapons suggest that they may have been developed.

According to the US Defense Intelligence Agency (DIA), non-strategic weapons may consist of atomic demolition munitions (ADMs, nuclear landmines), aircraft bombs and short-range ballistic missiles. In 1984 the DIA did not believe that Chinese ground forces had been equipped with artillery-fired nuclear projectiles, although this capability could have been added later.

[14] US National Intelligence Council, 'Foreign missile developments and the ballistic missile threat to the United States through 2015', Sep. 1999, URL <http://www.cia.gov/nic/pubs/other_products/foreign_missle_developments.htm>.

[15] Bacon, K. H., Assistant Secretary of Defense (Public Affairs), DOD News Briefings, 12 Sep. 2000, URL <http://www.defenselink.mil/news/Sep2000/t09122000_t0912asd.html>, and 12 Dec. 2000, URL <http://www.defenselink.mil/news/Dec2000/t12122000_t1212asd.html>.

[16] A MRV system releases 2 or more RVs along the missile's linear flight path to a single target, which land in a relatively confined area at about the same time. The more sophisticated and flexible MIRV system can manoeuvre multiple RVs to several different release points to provide targeting flexibility against several independent targets over a much wider area and longer period of time.

[17] Central Intelligence Agency (note 13), (emphasis in original).

Table 15A.7. Indian nuclear forces, January 2003

Type	Range (km)[a]	Payload (kg)	Status
Ballistic missiles			
Prithvi I (SS-150)[b]	150	800	Deployed with Indian Army; may have a nuclear delivery role
Agni I	1 200–1 500	1 000	'A few' missiles held in storage since 1998; status unclear
Agni II	2 000–2 500[c]	1 000	In low-rate initial production; scheduled to enter service by 2004
Agni SR[d]	700–1200	1 000	Test-launched on 25 Jan. 2002 and 9 Jan. 2003; scheduled to enter service by 2004
Agni III	3 500– 5 000	?	Under development
Aircraft[e]			
Mirage 2000H Vajra	1 850	6 300	Aircraft reportedly has been certified for delivery of nuclear gravity bomb
Jaguar IS Shamsher	1 400	4 760	Widely speculated that some of the 4 squadrons in service may have a nuclear delivery role

[a] Missile payloads may have to be reduced in order to achieve maximum range. Aircraft range is for illustrative purposes only; actual mission range will vary according to flight profile and weapon loading.

[b] The most recent flight test took place on 26 Mar. 2003, at the Chandipur test range.

[c] An upgraded version currently under development may have a range of 3500 km, possibly with a reduced payload.

[d] Some Indian sources refer to this missile's designation as the Agni I.

[e] Other aircraft in the Indian Air Force's inventory which are potentially suitable for a nuclear role are the MiG-27 and the Su-30MKI.

Sources: Albright, D., 'India's and Pakistan's fissile material and nuclear weapons inventories, end of 1999', Background Paper, Institute for Science and International Security (ISIS), 11 Oct. 2000, URL <http://www.isis-online.org/publications/southasia/stocks1000.html>; Albright, D., Berkhout, F. and Walker, W., SIPRI, *Plutonium and Highly Enriched Uranium 1996: World Inventories, Capabilities and Policies* (Oxford University Press: Oxford, 1997); Bharat Rakshak, Consortium of Indian military websites URL <http://www.bharat-rakshak.com>; Lennox, D. (ed.), *Jane's Strategic Weapon Systems* (Jane's Information Group, Ltd: Coulsdon, UK, 2003); US Central Intelligence Agency, *Unclassified Report to Congress on the Acquisition of Technology Relating to Weapons of Mass Destruction and Advanced Conventional Munitions*, 1 January through 30 June 2002', Apr. 2003, URL <http://www.cia.gov/cia/publications/bian/bian_apr_2003.htm>; US National Intelligence Council, 'Foreign missile developments and the ballistic missile threat through 2015' (unclassified summary), Dec. 2001, URL <http://www.cia.gov/nic/pubs/other_products/Unclassified ballisticmissilefinal.pdf>; World Nuclear Association, 'India and Pakistan', Information and Issues Brief, Nov. 2002, URL <http://www.world-nuclear.org/info/inf53.htm>; *Indian Express,* various issues; *Times of India*, various issues; and Author's estimates.

VII. Indian nuclear forces

It is difficult to estimate the size and composition of India's nuclear arsenal. Published estimates vary widely, ranging from several dozen up to 150 weapons. The cautious estimate presented here is that India's nuclear stockpile contains 30–40 weapons. Some of these may be stored in unassembled form, with the plutonium core kept separately from the non-nuclear ignition components.

There is considerable uncertainty in published estimates of the total amount of weapon-grade plutonium that India has produced and, hence, in estimates of the number of nuclear weapons that it could have built.[18]

A number of factors contribute to the uncertainty in estimating India's inventory of fissile material. First, there are different assessments of the lifetime operating capacity of the CIRUS and Dhruva plutonium production reactors (i.e., of their reliability and efficiency). According to the World Nuclear Association, in the 1990s India's nuclear power reactors had some of the world's lowest operating capacity factors.[19] Second, it is not clear that India has used all of its available weapon-grade plutonium to fabricate nuclear weapons, as some analysts have assumed. Finally, there are different views on how to take into account the losses and draw-downs of nuclear material that occur during production, processing and testing.

In addition, there continues to be a debate about whether one of the nuclear explosive tests carried out by India in May 1998 used non-weapon grade plutonium (either in the form of reactor-grade plutonium or a mix of isotopes closer to weapon-grade plutonium). If the test gave confidence that this material could be used for weapons, then India may see the large holdings of plutonium associated with its civilian unsafeguarded power reactors as being a potential part of its military nuclear programme.

According to Dr A. P. J. Abdul Kalam, Director General of the Defence Research and Development Organization (DRDO), India possesses both fusion (thermonuclear) and fission nuclear weapons. Many Western experts have questioned whether India in fact has achieved a thermonuclear capability. They point to seismic data which suggest that India's test of a 'thermonuclear device' in May 1998 had a significantly smaller yield than was claimed and probably was not successful.[20]

India is widely believed to be working to expand its nuclear stockpile. There have been no official statements specifying the size of the stockpile required for the 'credible minimum deterrence' posture called for in India's nuclear doctrine.[21]

Ballistic and cruise missiles

India has extensive, largely indigenous development and production infrastructures for both short- and medium-range ballistic missiles. Several of these missiles are

[18] One widely cited report estimated that, at the end of 1999, India had an inventory of 240–395 kg of weapon-grade plutonium. This would have been sufficient to manufacture 45–95 nuclear weapons, assuming that each weapon would require 4.5 kg of plutonium. Albright, D., 'India's and Pakistan's fissile material and nuclear weapons inventories, end of 1999', Background Paper, Institute for Science and International Security (ISIS), 11 Oct. 2000, URL <http://www.isis-online.org/publications/southasia/stocks1000.html>.

[19] World Nuclear Association, 'India and Pakistan', Information and Issues Brief, Nov. 2002, URL <http://www.world-nuclear.org/info/inf53.htm>.

[20] 'India has fusion, fission bombs: Abdul Kalam', *The Hindu* (Internet edn), 13 Nov. 2001, URL <http://www.hinduonnet.com/thehindu/2001/11/13/stories/02130001.htm>.

[21] For further detail about Indian's nuclear doctrine see chapter 5 in this volume.

believed to have a nuclear role.

The first test launch of a shorter-range version of the Agni II missile took place on 25 January 2002. The Agni SR, which India press reports refer to as the Agni I, is a single-stage solid-fuel missile that uses the first-stage engine of the Agni II. It was reportedly developed to meet a perceived need for a missile with a range between that of the short-range Prithvi II (250 km) and the longer-range Agni II (2500 km) missiles.

Work on development of the naval leg of India's 'triad' of nuclear forces is proceeding slowly. Efforts continue to be made to overcome design and engineering problems on a ship-launched version of the Prithvi SS-250 short-range ballistic missile, designated the Dhanush. The most recent test was carried out on 21 September 2001, when a missile flew 150 km with a 500-kg payload. Some reports suggest that the Dhanush project may be a technology demonstration programme.

The DRDO is carrying out advanced design work on a naval missile, designated Sagarika, that may have a nuclear role. The Sagarika has been described by some sources as a cruise missile; however, an unclassified CIA report and credible reports in the Indian press indicate that it is a submarine-launched ballistic missile (SLBM). According to the CIA report, the new SLBM will not be ready for deployment before the next decade. Its intended launch platform is believed to be an indigenous nuclear-powered submarine designated the Advance Technology Vessel (ATV). The ATV programme, which has been under way for two decades, remains plagued by serious design and development problems.

There are reports that the DRDO is developing an ICBM known as Surya, based on an indigenous space launch vehicle.

VIII. Pakistani nuclear forces

It is difficult to estimate the size and composition of Pakistan's nuclear arsenal. As is the case with India, one of the key uncertainties is how much weapon-usable fissile material Pakistan has produced. It is known that Pakistan has pursued a gas centrifuge uranium-enrichment method to produce the material for its nuclear weapons, at the Abdul Qadeer Khan Research Laboratories in Kahuta. However, estimates vary as to how much weapon-grade uranium has been produced, in part because of conflicting reports about the number of centrifuges that Pakistan has in operation.

It is estimated here that Pakistan has manufactured 30–50 nuclear weapons. Some of these weapons are probably stored in unassembled form at dispersed locations. In February 2000, Pakistan's military government announced the establishment of a National Command Authority to manage the country's nuclear forces.[22]

Pakistan is said to be working to increase the size of its nuclear arsenal. According to a leading Pakistani nuclear physicist who is not part of the country's military nuclear programme, scientists 'have been working in three shifts over the past three years since the Kargil crisis' [in 1999] to accelerate production of weapon-grade uranium.[23] If this and similar reports are true, Pakistan may have been able to manufacture more HEU cores for use in nuclear weapons than previously thought; the size of its overall arsenal may even exceed that of India.

[22] For further detail about Pakistan's evolving nuclear doctrine and the command and control arrangements for its nuclear forces, see chapter 5 in this volume.

[23] Pervez Hoodbhoy, quoted by Hussain, Z., 'Pakistan has secretly built up nuclear arsenal', *The Times,* 27 May 2002, p. 1.

Pakistan may also be developing a capability to build plutonium-based nuclear weapons. The unsafeguarded 50-MW(t) heavy water reactor in the Khushab district of Punjab, which became operational in the spring of 1998, has the capability to produce 10–15 kg of weapon-grade plutonium annually. It is also capable of producing tritium, which can be used to 'boost' the explosive yield of fission weapons.

There continues to be concern about the custodial security of Pakistan's nuclear arsenal. A senior Indian official claimed in early 2003 that Pakistan was hiding some of its nuclear weapons in 'tunnels and caves' in the Chagai hills of Baluchistan—an area in which al-Qaeda is reported to be regrouping.[24] Rumours also persist that some Pakistani nuclear scientists sympathetic to radical Islam have attempted to transfer nuclear weapon technology and weapon-usable material illicitly to radical groups in other countries.

Ballistic missiles

During 2002 Pakistan conducted flight tests of three types of nuclear-capable ballistic missiles. Pakistan's missile programmes have received considerable technical assistance from China and North Korea in the past; this cooperation is believed to be ongoing.

On 25 May 2002, against the background of mounting tensions with India, Pakistan test-launched a Ghauri II (Hatf-5A) medium-range ballistic missile from a mobile launcher near Basti Jarh. It was the third flight test carried out in the Ghauri programme. According to Pakistani officials, the missile carried a mock nuclear warhead which successfully hit its target in the Baluchistan desert.

The Ghauri II is very similar to the Ghauri I, possibly featuring an improved motor assembly. Both missiles are based on North Korea's No-dong 1/2 missile technology and reportedly have been developed with extensive design and engineering assistance from North Korea. A Ghauri III missile, with a design range of 3 000 km, is reportedly under development at the Khan Research Laboratories in Kahuta.

Pakistani defence sources indicate that the Ghauri I/II entered into serial production in late 2002. It was formally handed over to the Pakistani Army for 'full operational use' on 12 January 2003. Pakistan has announced that both versions can carry a nuclear warhead.

On 27 May 2002, Pakistan carried out the first flight test of the Ghaznavi (Hatf-3) short-range ballistic missile. The single-stage, solid-fuelled missile is believed to have been under development since 1997 and may have a nuclear role.

On 4 October 2002, Pakistan announced that it had carried out a 'routine' test launch of a Shaheen I (Hatf-4) ballistic missile at the Somiani test range. The test was followed by a second flight-test conducted four days later, on 8 October. The Shaheen I has been declared to be nuclear-capable and was formally inducted into Pakistani Army service at a ceremony in March 2003.

Analysts remain divided over whether the single-state solid-fueled Shaheen I is a version of the Chinese M-9 missile or an improved Chinese M-11 missile. It uses the same wheeled transporter–erector–launcher (TEL) as the Ghaznavi.

A follow-on Shaheen II ballistic missile, with a design range exceeding 2000 km, has yet to be flight-tested. The two-stage Shaheen II is believed to use the Shaheen I

[24] Indian National Security Advisor Brajesh Mishra, quoted in 'Pak hiding nukes in Chagai caves, tunnels: Brajesh', *Indian Express* (Internet edn), 10 Feb. 2003, URL <http://www.indianexpress.com/archive_full_story.php?content_id=18161>.

Table 15A.8. Pakistani nuclear forces, January 2003

Type/Designation	Range (km)[a]	Payload (kg)	Status
Aircraft			
F-16A/B	1 600	4 500	32 aircraft, deployed in 3 squadrons; most likely aicraft in the inventory to have a nuclear delivery role
Ballistic missiles[b]			
Ghaznavi (Hatf-3)	290	500	First flight test on 27 May 2002; expected to be operational by 2004
Shaheen I (Hatf-4)	600–800	750–1 000	Operational; entered service with Pakistani Army in Mar. 2003
Ghauri I (Hatf-5)	1 300–1 500	700–1 000	Operational; entered service with Pakistani Army in Jan. 2003
Ghauri II (Hatf-5A)	1 600–1 800	1 500	Flight-tested on 25 May 2002
Shaheen II (Hatf-6?)	>2 000	750–1 000	Under development; has not been flight-tested

[a] Missile payloads may have to be reduced in order to achieve maximum range. Aircraft range is for illustrative purposes only; actual mission range will vary according to flight profile and weapon loading.

[b] Pakistan acquired a number of M-11 ballistic missiles from China in the 1990s; however, it not known whether these missiles have a nuclear role.

Sources: Albright, D., 'India's and Pakistan's fissile material and nuclear weapons inventories, end of 1999', Background Paper, Institute for Science and International Security (ISIS), 11 Oct. 2000, URL <http://www.isis-online.org/publications/southasia/stocks1000.html>; Lennox, D. (ed.), *Jane's Strategic Weapon Systems* (Jane's Information Group, Ltd: Coulsdon, UK, 2003); PakistaniDefence.com (unofficial Internet site of the Pakistani armed forces), URL <http://www.pakistanidefence.com>; US Central Intelligence Agency, *Unclassified Report to Congress on the Acquisition of Technology Relating to Weapons of Mass Destruction and Advanced Conventional Munitions*, 1 January through 30 June 2002', Apr. 2003, URL <http://www.cia.gov/cia/publications/bian/bian_apr_2003.htm>; US National Intelligence Council, 'Foreign missile developments and the ballistic missile threat through 2015' (unclassified summary), Dec. 2001, URL <http://www.cia.gov/nic/pubs/other_products/Unclassifiedballisticmissilefinal.pdf>; World Nuclear Association, 'India and Pakistan', *Information and Issues Brief*, Nov. 2002, URL <http://www.world-nuclear.org/info/inf53.htm>; *Dawn* (Islamabad), various issues; and Author's estimates.

missile as its second stage. According to the CIA, the successful development of the missile will require continued assistance from Chinese entities or other sources.[25]

[25] US Central Intelligence Agency, 'Unclassified report to Congress on the acquisition of technology relating to weapons of mass destruction and advanced conventional munitions, 1 January through 30 June 2002', Apr. 2003, URL <http://www.cia.gov/cia/publications/bian/bian_apr_2003.htm>.

Table 15A.9. Israeli nuclear forces, January 2003

Type	Range (km) [a]	Payload (kg)	Status
Aircraft			
F-16A/B/C/D/I Falcon	1 600	5 400	205 aircraft in the inventory; some are believed to be certified for nuclear weapon delivery
F-15I Thunder	3 500	11 000	25 aircraft in the inventory; some may have a long-range nuclear delivery role
Ballistic missiles			
Jericho I	500	450–650	Operational, *c*. 50–100 missiles; first deployed in 1973
Jericho II	1 500–1 800	750–1 000	Operational; *c*. 50 missiles; first deployed in 1990

[a] Missile payloads may have to be reduced in order to achieve maximum range. Aircraft range is for illustrative purposes only; actual mission range will vary according to flight profile and weapon loading.

Sources: Cohen, A., *Israel and the Bomb* (Columbia University Press: New York, 1998); Albright, D., Berkhout, F. and Walker, W., SIPRI, *Plutonium and Highly Enriched Uranium 1996: World Inventories, Capabilities and Policies* (Oxford: Oxford University Press, 1997); Lennox, D. (ed.), *Jane's Strategic Weapon Systems* (Jane's Information Group, Ltd: Coulsdon,UK, 2003); and Author's estimates.

IX. Israeli nuclear forces

Israel is widely considered to be a de facto nuclear weapon state. Like India and Pakistan, it is not a party to the NPT.

Despite some debate on the subject in 2000 in the Knesset (Parliament), Israel continues to maintain its long-standing policy of nuclear ambiguity in which it neither officially confirms nor denies that it possesses nuclear weapons. However, Israel is believed to have achieved a nuclear weapon capability in the 1960s. Most estimates claim that Israel currently maintains up to approximately 200 nuclear weapons. This means that it may have a larger nuclear arsenal than the UK, which is one of the five legally recognized nuclear weapon states under the NPT.

Many analysts believe that Israel maintains a recessed nuclear arsenal (i.e., one that is stored but not armed, requiring some preparation before use); hence, the warheads for Israel's purported nuclear weapon delivery systems may not actually be deployed. These delivery systems are believed to be strike aircraft and land-based ballistic missiles. Some analysts believe that Israel also possesses a non-strategic nuclear arsenal, possibly consisting of nuclear artillery shells and atomic demolition munitions or landmines (ADMs).