

Appendix 10B. Tactical nuclear weapons

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I. Introduction

More than a decade after the end of the cold war and successive nuclear weapon reductions, thousands of tactical nuclear weapons continue to be stockpiled in the arsenals of Russia and the United States. Far from the attention of the public and low on the political agenda, tactical nuclear weapons remain outside formal arms control agreements and—because of their small size, mobility, and decentralized command and control arrangements—pose clear security threats.

Hopes for the speedy elimination of tactical nuclear weapons were raised in the early 1990s in the aftermath of unilateral reciprocal initiatives by Russia and the USA. However, recent developments have given rise to concerns that increased reliance on, and new missions for, these weapons can be expected. Such concerns are exacerbated by the continued lack of transparency surrounding their numbers and operational status.

This appendix provides an overview of the major issues and developments related to tactical nuclear weapons, focusing on publicly available information, and reviews proposals made for controlling them. Section II discusses definitions, past deployments and the current status. Section III outlines the risks and challenges associated with tactical nuclear weapons. The prospects and means for their control are examined in section IV, and section V presents the conclusions.

II. Definitions, history and current status

Definitions

The term ‘tactical nuclear weapon’ emerged early in the cold war.¹ Although ambiguous and imprecise, the term is still widely used by arms control analysts, practitioners and academics to describe different and diverse types of Russian and US nuclear weapon systems.² ‘Tactical’, in the classical military sense, predominantly denotes a

¹ Existing bilateral nuclear arms control treaties and agreements, as well as multilateral treaties of global application, such as the 1968 Non-Proliferation Treaty and the 1996 Comprehensive Nuclear Test-Ban Treaty, do not provide definitions of the terms ‘nuclear warhead’ and ‘nuclear weapon’. For the purposes of this appendix, a nuclear warhead is a mass-produced, reliable, predictable nuclear device capable of being carried by missiles, aircraft or other means. A nuclear weapon is a nuclear warhead mated and fully integrated with a delivery platform. Cochran, T. B., Arkin, W. M. and Hoenig, M. M., *Nuclear Weapons Databook, Vol. I: US Nuclear Forces and Capabilities* (Ballinger: Cambridge, Mass., 1984), p. 2.

² A distinction is sometimes made between ‘theatre’ (ranges of more than a few tens of kilometres) and ‘tactical’ nuclear weapons. However, there is no clear dividing line between these 2 categories. The term ‘theatre’ has had a perceived negative connotation in the European political debate. For a discussion of problems associated with attempts to define or categorize tactical nuclear weapons see Müller, H. and Schaper, A., ‘Definitions, types, missions, risks and options for control: a European perspective’, eds W. C. Potter *et al.*, *Tactical Nuclear Weapons: Options for Control*, UNIDIR 2000/20 (United Nations Institute for Disarmament Research: Geneva, Dec. 2000), pp. 31–35. Other terms, principally relating to the range, are frequently used: non-strategic, sub-strategic or pre-strategic (these 2 emerged from the French nuclear doctrine) and short-range.

short-range battlefield use.³ In contrast, 'strategic' denotes weapons that, if fired from Russia or the USA, would be able to reach predetermined targets on the territory of the other country.⁴

Attempting to define tactical nuclear weapons by mission or range is challenging because some types can be used to carry out strategic tasks. This applies particularly to the long-range sea-launched cruise missiles (SLCMs), air-launched cruise missiles (ALCMs) and aircraft-delivered gravity bombs in the inventories of both Russia and the USA. For instance, gravity bombs can be delivered by tactical aircraft at relatively long ranges to hit 'strategic' targets, such as major cities or nuclear missile silos.⁵ In the context of the nuclear arms reduction process, Russia, concerned with the launch capabilities of US attack submarines, viewed SLCMs as 'strategic' weapons.⁶ Moreover, what the two nuclear superpowers consider 'tactical' could be seen as 'strategic' in the context of, for example, a regional conflict between one of the superpowers and a neighbouring country.⁷

A definition based on the nuclear explosive yield of the weapon is also problematic. Tactical nuclear weapons have nominally smaller yields than most strategic weapons, as low as 0.3 kt. However, some have much higher yields than those of the bombs that destroyed Hiroshima and Nagasaki (*c.* 15 kt) or of certain strategic weapons.⁸

Definitions based on other criteria have been put forward. One analyst has defined tactical nuclear weapons as those weapons deployed with general-purpose forces, in contrast to strategic nuclear weapons, which are normally operated by special nuclear units.⁹ Others have attempted to classify them on the basis of their delivery platforms.

Any criteria chosen to differentiate tactical from strategic weapons must appropriately accommodate the purpose of the definition. In most practical cases, as in discussions about controlling them or estimating their numbers, a definition by exclusion is used, such as: 'Tactical nuclear weapons are those nuclear weapons whose deploy-

³ 'Tactical nuclear weapon employment is the use of nuclear weapons by land, sea, or air forces against opposing forces, supporting installations or facilities, in support of operations that contribute to the accomplishment of a military mission of limited scope, or in support of the military commander's scheme of manoeuvre, usually limited to the area of military operations.' US Department of Defense, *Dictionary of Military and Associated Terms*, 12 Apr. 2001 (as amended through 15 Oct. 2001), p. 426, available at URL <http://www.dtic.mil/doctrine/jel/new_pubs/jpl_02.pdf>.

⁴ For a detailed historical account see Müller and Schaper (note 2), pp. 22–33.

⁵ 'In many cases, the distinction between a tactical nuclear weapon and a strategic nuclear weapon is an artificial one. Many tactical or non-strategic nuclear weapons can be used with strategic effect against the United States, our forward-deployed forces, and our allies.' Statement by Admiral Richard W. Mies, Commander-in-Chief, United States Strategic Command, US Strategic Nuclear Force Requirements, Hearing before the Committee on Armed Services, United States Senate, 106th Congress, 2nd session, 23 May 2000 (US Government Printing Office: Washington, DC, 2000), p. 38.

⁶ Diakov, A. *et al.*, 'NATO expansion and the nuclear reductions process', Paper presented at the conference NATO Movement to the East—Security Problems for Russia and the CIS States, St Petersburg, 28–29 Apr. 1999, available at URL <<http://www.armscontrol.ru/start/publications/nato0430.htm>>.

⁷ In 1962 the Soviet Union stationed in Cuba several nuclear-armed SS-4 intermediate-range ballistic missiles as a response to US deployments in Europe, in particular in Turkey. These weapons, although they did not have 'strategic' ranges, were capable of reaching the USA. For a discussion of the ensuing Soviet–US crisis, which came close to a nuclear exchange, see 'The Cuban missile crisis', History and Politics Out Loud (HPOL) Archive, URL <<http://www.hpol.org/jfk/cuban/>>; and 'The Cuban missile crisis, 1962', The National Security Archive, URL <http://www.gwu.edu/~nsarchiv/nsa/cuba_mis_cri/declass.html>.

⁸ E.g., the USA's B61 Mod. 3 warhead intended for tactical missions has a yield of up to 170 kt. See section II of appendix 10A.

⁹ Sokov, N., cited in Müller and Schaper (note 2), p. 35.

ment is not regulated under the START treaties (and which have not been eliminated by the INF treaty)¹⁰.

The use of tactical nuclear weapons could result in enormous destruction and massive casualties in certain scenarios. Therefore, they should not be viewed as entirely different from or deserving less attention than their strategic counterparts. In this appendix, the term ‘tactical nuclear weapon’ is used to encompass all Russian and US battlefield and theatre nuclear weapon systems with lower than intercontinental ranges (less than 5500 km).

A brief history

Tactical nuclear weapons were first deployed by the USA in Europe, beginning in the 1950s, as a way to compensate for NATO’s perceived inferiority vis-à-vis the Soviet Union in conventional military capabilities. At first they consisted only of nuclear artillery shells. These were followed by nuclear gravity bombs and, in the late 1950s and 1960s, by the introduction of the nuclear-armed Honest John and Pershing I missiles. The maximum build-up of US tactical nuclear weapons in Europe (about 7000) occurred at the beginning of the 1970s.¹¹ Throughout most of the 1970s and 1980s, NATO maintained a broad mix of nuclear weapon systems, including atomic demolition munitions (ADMs), nuclear artillery, air-to-surface missiles (ASMs), surface-to-air missiles (SAMs), short- and intermediate-range surface-to-surface missiles (SSMs), ground-launched cruise missiles, torpedoes and gravity bombs delivered by dual-capable aircraft.¹² Gravity bombs were also deployed by the United Kingdom in the Federal Republic of Germany.¹³ Apart from those in Europe, a substantial number of nuclear weapons were deployed on board US aircraft carriers and other ships. The USA also deployed nuclear weapons in other countries, such as South Korea and Taiwan, but on a smaller scale and of a lesser diversity.¹⁴

¹⁰ Lewis, G. and Gabbitas, A., *What Should Be Done About Tactical Nuclear Weapons?*, Occasional Paper (Atlantic Council of the United States: Washington, DC, Mar. 1999), p. 4. The treaties mentioned are the 1991 Treaty on the Reduction and Limitation of Strategic Offensive Arms (START I Treaty), the 1993 Treaty on Further Reduction and Limitation of Strategic Offensive Arms (START II Treaty, not in force), and the 1987 Treaty on the Elimination of Intermediate-Range and Shorter-Range Missiles (INF Treaty). See annex A in this volume.

¹¹ Shevtsov, A. *et al.*, *Tactical Nuclear Weapons: A Perspective from Ukraine*, UNIDIR/2000/21 (United Nations Institute for Disarmament Research: Geneva, Dec. 2000), p. 1; and Wezeman, S. T., Private communication with the author. Germany hosted by far the most nuclear weapons (at the peak of NATO’s deployment it stored c. 50% of them), with 21 different types of US warheads deployed on its soil in the years since 1955. Norris, R. S., Arkin, W. M. and Burr, W., ‘Where they were’, *Bulletin of the Atomic Scientists*, vol. 55, no. 6 (Nov./Dec. 1999), p. 29.

¹² ‘NATO’s nuclear forces in the new security environment’, NATO Basic Fact Sheet, Apr. 1999, p. 2.

¹³ For a detailed description of developments and deployments of British and French nuclear weapons see Norris, R. S., Burrows, A. S. and Fieldhouse, R. W., *Nuclear Weapons Databook, Vol. V: British, French and Chinese Nuclear Weapons* (Westview Press: Boulder, Colo., 1994); and Shevtsov *et al.* (note 11), pp. 2–5.

¹⁴ In some cases, the host country was not aware of the presence of US nuclear weapons on its territory. It has been reported that non-nuclear components for nuclear warheads were stored in Japan. In 1967 the total number of tactical nuclear weapons possessed by the USA reached a peak of 20 000. For a discussion of US deployments based on a recently declassified US DOD study on the history of US tactical nuclear weapons see Norris, Arkin and Burr (note 11), pp. 26–35; and Norris, R. S., Arkin, W. M. and Burr, W., ‘How much did Japan know?’, *Bulletin of the Atomic Scientists*, vol. 65, no. 1 (Jan./Feb. 2000), pp. 11–13. It has been a long-standing official US policy not to comment specifically on where tactical nuclear weapons are stationed, primarily for security reasons but also for political reasons in the host countries. See Bacon, K. H., former US Assistant Secretary of Defense, US Department of Defense

The Soviet nuclear arsenal consisted of a large variety of land-based weapons (short-range SSMs, nuclear artillery, ADMs and SAMs), sea-based weapons (torpedoes and sea-launched anti-ship and land attack cruise missiles) and airborne systems (gravity bombs, short-range cruise missiles, depth charges and torpedoes).¹⁵ Many were stationed outside Russia, in Soviet republics that were closer to prospective theatres of operation.¹⁶ Tactical nuclear weapons were also deployed in some countries of the Warsaw Treaty Organization, probably in Bulgaria, Czechoslovakia, the German Democratic Republic, Hungary and Poland.¹⁷

The Presidential Nuclear Initiatives

Tactical warheads are the only types of warheads that the two nuclear superpowers agreed to eliminate, although without any transparency or verification arrangements.¹⁸ The Presidential Nuclear Initiatives (PNIs) of 1991–92 were formulated in the context of intensive rounds of agreements in the early 1990s. On 27 September 1991, spurred by the August 1991 failed coup in the Soviet Union and in an attempt to contain proliferation risks posed by the Soviet nuclear arsenal in such precarious political conditions, US President George Bush announced, among other arms control initiatives, his intention to unilaterally and swiftly reduce US tactical nuclear weapons and called upon Russia to reciprocate. The Bush proposals included: (a) the complete elimination of all ground-launched, short-range nuclear weapons, including those in Europe and South Korea, and the dismantlement and destruction of all such warheads; and (b) the withdrawal of all tactical nuclear weapons from US ships and submarines as

News Briefing, 20 Oct. 1999, available at URL <http://www.defenselink.mil/news/Oct1999/t10211999_t1020asd.html>.

¹⁵ The first Soviet tactical nuclear weapons appeared in the mid-1950s (the SS-3 missiles, bombs for the Il-28 and Tu-16 bombers, and nuclear artillery shells). They were later supplemented with, *inter alia*, intermediate-range missiles, other bombers and sea-launched missiles. Shevtsov *et al.* (note 11), p. 5; Safranchuk, I., 'Tactical nuclear weapons in the modern world and Russia's sub-strategic nuclear forces', no. 16 (PIR Center for Nonproliferation and Arms Control: Moscow, Mar. 2000), p. 6; and Wezeman, S. T., Private communication with the author.

¹⁶ Information concerning the total number of operational Soviet tactical nuclear weapons and their deployment was never made public. According to some estimates, when the Soviet Union collapsed in late 1991, it possessed over 15 000 warheads for tactical nuclear weapons. The majority of weapons outside Russia reportedly were in Belarus, Kazakhstan and Ukraine, with perhaps less than 5% in Georgia and the Central Asian states (Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan). Woolf, A. F., 'Nuclear weapons in Russia: safety, security, and control issues', IB98038, Congressional Research Service (CRS) Issue Brief for Congress, Washington, DC, 21 Nov. 2000, pp. 2–3, available at URL <<http://www.cnie.org/nle/inter-64.html>>. Other sources provide different numbers, e.g., c. 22 000 warheads. Arbatov, A. (Deputy Chairman of the Defence Committee of the Russian State Duma), 'Deep cuts and de-alerting: a Russian perspective', ed. H. A. Feiveson, *The Nuclear Turning Point: A Blueprint for Deep Cuts and De-Alerting of Nuclear Weapons* (Brookings Institution Press: Washington, DC, 1999), p. 320. There are also different views as to whether the Soviet Union actually deployed tactical nuclear weapons outside the territories of the 4 republics where its strategic weapons were stationed. Sokov, N., 'Tactical nuclear weapons', *Disarmament Diplomacy*, no. 21 (1998), URL <<http://www.acronym.org.uk/21tactic.htm>>.

¹⁷ Shevtsov *et al.* (note 11), p. 7.

¹⁸ The 1987 INF Treaty banned Soviet and US ground-launched cruise missiles with ranges of 500–5500 km. It thus eliminated the majority of the longer-range tactical nuclear weapons, apart from nuclear-armed sea-launched cruise missiles. The INF Treaty entered into force in June 1988 and by May 1991 the Soviet Union had completed the dismantling of all missiles covered by the treaty, a total of 1846 SS-4, SS-5, SS-20 and SS-21 ballistic missiles. Wolfsthal, J. B., Chuen, C. A. and Daughtry, E. E., *Nuclear Status Report: Nuclear Weapons, Fissile Material, and Export Controls in the Former Soviet Union* (Monterey Institute of International Studies and Carnegie Endowment for International Peace), no. 6 (June 2001), p. 32. The USA dismantled 846 missiles, including all Pershing IA and II ballistic missiles, and all land-based Tomahawk cruise missiles. Wolfsthal, Chuen and Daughtry, p. 32.

well as nuclear depth bombs for land-based naval aircraft, followed by their storage at depots in the USA (for the newer systems) or their dismantlement and the destruction of their warheads (about one-half).¹⁹

Soviet President Mikhail Gorbachev responded to the US initiatives on 5 October 1991, matching the US moves and going further in several respects: he not only agreed to remove all tactical nuclear weapons from Soviet ships, submarines and land-based naval aircraft bases but also suggested eliminating them altogether on a reciprocal basis instead of storing them. In addition, Gorbachev proposed that both sides remove tactical air-delivered bombs and missiles from forward-deployed units and store the warheads at separate bases.²⁰ Russian President Boris Yeltsin continued these initiatives by announcing on 29 January 1992 that the production of warheads for land-based tactical missiles, artillery shells and landmines had ceased and that Russia had begun to eliminate one-third of its naval tactical warheads and one-half of its nuclear SAM warheads. He stated that tactical air force weapons would be reduced by one-half and proposed removing the remaining weapons from their units and placing them in centralized storage bases on a reciprocal basis with the USA.²¹ According to an authoritative estimate, some 13 700 tactical warheads were subject to elimination in accordance with the Soviet/Russian pledges.²²

Some fragmented, largely unverifiable, official information about progress made in implementing the PNIs is available. In 2000 Russian Minister of Foreign Affairs Igor S. Ivanov announced that Russian tactical nuclear weapons had been completely removed from surface ships and multi-purpose submarines, as well as from land-based naval aircraft, and were stored at central storage facilities. He stated that one-third of all nuclear munitions for sea-based tactical missiles and naval aircraft had been eliminated, and that the destruction of nuclear warheads removed from tactical missiles, artillery shells and nuclear mines was ongoing. In addition, one-half of the number of nuclear warheads for anti-aircraft missiles and nuclear gravity bombs had been destroyed.²³ Since the early 1990s, the number of nuclear weapons earmarked for NATO in Europe has been reduced by over 85 per cent. Associated delivery systems have been reduced from 11 to 1, which is no longer maintained on alert. The USA has cancelled numerous tactical nuclear programmes and US army, marine, and navy surface and air components are no longer equipped with nuclear weapons.²⁴

¹⁹ Fieldhouse, R., 'Nuclear weapon developments and unilateral reduction initiatives', *SIPRI Yearbook 1992: World Armaments and Disarmament* (Oxford University Press: Oxford, 1992), p. 67. Appendix 2A (pp. 85–92) provides excerpts of the presidential announcements.

²⁰ Fieldhouse (note 19), p. 72.

²¹ Fieldhouse (note 19), p. 73. The USA did not respond to Russia's offers to consolidate tactical aviation weapons.

²² Arbatov (note 16), p. 319.

²³ Ivanov, I. S., Statement at the Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons, New York, 25 Apr. 2000, unofficial translation from Russian, available at URL <http://www.ln.mid.ru/website/Brp_4.nsf/e78a48070f128a7b43256999005bcbb3/ee8673747bab02eb4325699c00260990?OpenDocument>. See also remarks by Marshal Igor Sergeev, former Russian Minister of Defence, Advisor to President Putin, on strategic stability, at the Carnegie International Non-Proliferation Conference New Leaders, New Directions, 18 June 2001, available at URL <<http://www.ceip.org/files/projects/npp/resources/Conference%202001/sergeev.htm>>. For further detail on reductions of tactical nuclear weapons by Russia see appendix 10A.

²⁴ Fact Sheet: US Commitment to NPT Article VI, Bureau of Nonproliferation, US Department of State (Washington File), 1 Apr. 2000, URL <<http://usinfo.state.gov/topical/pol/arms/stories/article6.htm>>. In line with the 1994 US Nuclear Posture Review the option was retained, however, to redeploy SLCMs on attack submarines in times of crisis. See Lewis and Gabbitas (note 10), p. 7.

Since the end of the cold war, the USA has reduced its tactical nuclear warheads by over 80 per cent.²⁵

It should be noted, however, that the numbers of remaining Russian and US tactical nuclear weapons have not been officially disclosed. Given that initial inventories were never made public, the value of statements announcing the percentages by which the various force components have been reduced is limited.²⁶

The current status²⁷

Russia

All tactical nuclear weapons were withdrawn from the former Soviet territories and returned to Russia by the spring of 1992.²⁸ Assessing the composition and number of the remaining Russian tactical nuclear weapons is subject to considerable uncertainty. Frequently quoted statistics are mainly based on a few official statements, unclassified US intelligence reports and analyses by experts. Most published estimates agree that there are fewer than 4000 Russian operational warheads for air defence missiles, tactical aviation and naval weapons, but large variations have been reported in their composition. The majority of the tactical warheads, apart from gravity bombs, are believed to be consolidated at regional or central storage sites.²⁹ According to one analyst, warheads for anti-ballistic missiles and naval weapons have already been dismantled or are awaiting dismantlement.³⁰ Weapons still retained as spares and reserves, or stored prior to elimination, may number several thousand (numbers as high as 12 000 have been quoted).³¹

²⁵ Statement of Admiral Richard W. Mies, US Navy, Commander-in-Chief, United States Strategic Command, before the Senate Armed Services Committee Strategic Subcommittee on Command Posture, 11 July 2001, available at URL <http://www.senate.gov/~armed_services/statemnt/2001/010711mies.pdf>.

²⁶ The numbers of tactical nuclear weapons each side possessed in 1991 were not even disclosed at confidential meetings held in the aftermath of the parallel initiatives. Sokov (note 16). In the 1997 Founding Act, NATO and Russia established a working group on nuclear weapons in the framework of their Permanent Joint Council. The initial agenda for this group included tactical nuclear weapon transparency, safety and security issues. It is known that the 2 sides shared limited information about their tactical nuclear weapons, but such cooperation stopped following the 1999 NATO bombing of Yugoslavia. NATO continued, on many occasions, to propose exchanges of data on Russian and US tactical weapons. See NATO–Russia Establish Nuclear Weapons Working Group, NATO Briefing, 4 Dec. 1997, available at URL <<http://www.basicint.org/pjeworkinggroup.htm>>; *NATO Report on Options for Confidence and Security Building Measures, Verification, Non-Proliferation, Arms Control and Disarmament*, Press Communiqué M-NAC-2(2000)121, 14 Dec. 2000; and Kozaryn, L. D., ‘Russians say Yeltsin’s nuclear pledge fulfilled’, American Forces Press Service, URL <http://www.defenselink.mil/news/May1998/n05081998_9805086.html>.

²⁷ This section contains only a short summary. A detailed description of the current types, delivery systems and locations of tactical nuclear weapons can be found in Müller and Schaper (note 2) and on the Internet site of the Federation of American Scientists, URL <<http://www.fas.org>>. See also appendix 10A.

²⁸ On 1 Feb. 1992 Russian President Boris Yeltsin announced that the transfer of tactical nuclear weapons from Kazakhstan had been completed in Jan. On 28 Apr. 1992 Belarussian Defence Minister Pavel Koszlevsky announced that all tactical nuclear warheads in Belarus had been transferred to Russia. On 6 May 1992 Ukrainian President Leonid Kavchuk confirmed that all tactical nuclear weapons had been transferred to Russia except those on the ships and submarines of the Black Sea Fleet. US Department of State, *Arms Control and Disarmament: The US Commitment*, Pt. 5, Intermediate- and short-range nuclear forces, available at URL <<http://usinfo.state.gov/products/pubs/armsctrl/pt5.htm>>.

²⁹ The Soviet nuclear weapon storage system once comprised more than 500 sites. It has been considerably reduced, to some 90 sites. Shevtsov *et al.* (note 11), pp. 21–22.

³⁰ Sokov, N., cited in Müller and Schaper (note 2), pp. 59–60.

³¹ See appendix 10A.

While there is little doubt that the large number and diversity of Russian tactical nuclear weapons are of concern, it should be noted that most of them are likely to reach obsolescence within a few years.³² Therefore, the rate of warhead re-manufacturing and the production of new weapon systems are of crucial importance.³³

The USA and NATO

On 2 July 1992 President Bush announced that the USA had completed the withdrawal of its ground- and sea-launched tactical nuclear weapons.³⁴ According to published estimates the USA currently possesses fewer than 1000 operational tactical nuclear warheads, consisting of some 650 B61 gravity bombs (including those stationed in NATO countries) and 320 nuclear-armed Tomahawk SLCMs, which are stored in depots for possible redeployment on attack submarines. An additional several hundred B61s may be in storage awaiting dismantlement.³⁵

Following the drastic reductions made since the early 1990s, according to various estimates, about 150–180 US-produced and -owned B61 gravity bombs of variable yields are still deployed in seven European countries and Turkey for use on US or NATO allies' dual-capable aircraft.³⁶ The readiness requirements of such aircraft have been reduced from minutes at the height of the cold war to weeks today.³⁷ At present, these are the only nuclear weapons located outside the territory of a nuclear weapon state.³⁸ NATO storage sites underwent a massive reduction by about 80 per cent between 1991 and 1993 as entire weapon systems were eliminated and the aggregate number of weapons was reduced. However, a new, more secure and sur-

³² According to Alexei Arbatov, most Russian tactical warheads earmarked for elimination under the 1991–92 PNIs were to be dismantled anyway because their design lives would have expired (note 16), p. 319. See also Rowny, E. L., Additional Commentary, in Lewis and Gabbitas (note 10), p. 29.

³³ The re-manufacturing of warheads after the end of their design life is presumably taking place but may be slow because assembly–disassembly facilities are handling the dismantlement of a backlog of strategic and tactical warheads. According to one estimate, in 2000 actual warhead production amounted to c. 200–300 warheads per year, the same rate as in the USA. See Timerbaev, R., 'Dealing with cold war nuclear legacy: Russian perspective', *Yaderny Kontrol (Nuclear Control) Digest*, vol. 5, no. 3 (summer 2000), p. 29. Reportedly, Russian officials contend that they have begun to dismantle tactical warheads at a rate of c. 2000 per year, but this number cannot be independently confirmed. See Woolf (note 16).

³⁴ US Department of State (note 28).

³⁵ See appendix 10A.

³⁶ Although officially unacknowledged, these airbases reportedly are: Araxos (Greece), Aviano and Ghedi-Torre (Italy), Büchel, Stangdalem and Ramstein (Germany), İnçirlik (Turkey), Klein Brogel (Belgium), Lakenheath (United Kingdom) and Volkel (Netherlands). Butcher M. *et al.*, *Questions of Command and Control: NATO, Nuclear Sharing and the NPT*, British American Security Information Council (BASIC); and Berlin Information-center for Transatlantic Security (BITS), PENN (Project on European Nuclear Non-proliferation) Research Report 2000.1, Mar. 2000, p. 43.

³⁷ NATO Basic Fact Sheet (note 12), p. 6.

³⁸ In the mid-1960s, NATO established the system of 'nuclear sharing', which in essence remains unchanged in its basic functions. It enables non-nuclear weapon state members of NATO to participate in nuclear decision making and discussions about NATO's nuclear policy and doctrine. The European NATO allies on whose territories US tactical nuclear weapons are stationed have bilateral nuclear cooperation agreements with the USA. Although such weapons remain under full custody and control of the US forces and cannot be armed without a US Presidential Order, in time of war control can be handed over to allied forces. There is a controversy as to whether NATO nuclear sharing arrangements are in full compliance with Articles I and II of the NPT. For a discussion see Butcher *et al.* (note 35); and 'NATO nuclear sharing and the NPT—questions to be answered', PENN Research Note 97.3, BASIC–BITS–Centre for European Security and Development (CESD)–Austrian Study Center for Peace and Conflict Research (ASPR), June 1997, available at URL <<http://www.basicint.org/natonpt.htm>>.

vivable weapon storage system has been installed.³⁹ Press reports in early 2001 to the effect that tactical nuclear weapons had been removed from the Araxos airbase in Greece remain unconfirmed by the Greek Government or NATO.⁴⁰

III. Risks and challenges

The presence of a large number of tactical nuclear weapons poses unique dangers because of their physical characteristics, prescribed missions, the absence of monitoring or control by formal agreements, and the lack of transparency regarding their status and deployment. Analysts have argued that their ‘very existence in national arsenals increases the risk of proliferation and reduces the nuclear threshold’.⁴¹ The risks associated with tactical nuclear weapons can be grouped as follows.

Safety and security. The small size and portability of some weapons (e.g., ADMs), the lack of sophisticated electronic safeguards (permissive action links) against unauthorized use among older systems, combined with their wide dispersal, forward basing and movement with conventional forces, and pre-delegation of launch authority to local commanders make them vulnerable to theft and use by terrorists or to accidental detonation. Concerns have frequently been expressed about the level of physical safety, security and control of stored Russian tactical nuclear weapons.⁴² Particularly in the early years after the demise of the Soviet Union, the large number of tactical nuclear weapons redeployed in Russia from former Soviet territories and the unavailability of adequate storage facilities, combined with political turmoil and unrest in the military, raised fears about the custodial security of the weapons. However, some accounts claim that their safety is in fact satisfactory.⁴³ The consolidation of Russian nuclear weapons in the early 1990s to a smaller number of storage facilities has rad-

³⁹ *NATO Handbook* (NATO Office of Information and Press: Brussels, 2001), p. 54, available at URL <<http://www.nato.int/docu/handbook/2001/hb0206.htm>>; and Bacon (note 14). Photographs released by the US Air Force (USAF) show that at least some storage vaults in Europe can hold 2 weapons. A maximum of 428 US nuclear weapons can be deployed on all bases and 360 weapons on all bases currently operational. The USAF plans to modernize the nuclear weapon storage systems in Europe in order to keep them operational beyond 2005. If upgraded, the storage systems can remain in use until 2018. *PENN Newsletter*, no. 14 (May 2001), p. 8, available at URL <<http://www.bits.de/main/penntoc.htm>>. See also appendix 10A.

⁴⁰ *Athens News*, ‘Araxos warheads removed’, 18 Jan. 2001, p. A01; and [‘US nuclear weapons removed’], *De Standaard Online*, 18 Jan. 2001 (in Flemish).

⁴¹ Potter, W. C. and Sokov, N., ‘The nature of the problem’, eds Potter *et al.* (note 2), p. 4.

⁴² Woolf (note 16); and Woolsey, R. J., ‘Putin’s futile warhead-rattling’, *Washington Post*, 26 June 2001, p. A17. For an extensive discussion of the security of Russian ADMs (the so-called ‘suitcase nuclear bombs’) see Parrish, S., ‘Are suitcase nukes on the loose? The story behind the controversy’, CNS Reports, Center for Non-Proliferation Studies, Monterey Institute of International Studies, URL <<http://cns.miiis.edu/pubs/reports/lebedlg.htm>>. Following the 11 Sep. 2001 terrorist attacks against the USA there have been renewed concerns about the custodial security of Russian tactical nuclear weapons and about the possibility of their acquisition by the al-Qaeda network. See, e.g., McCloud, K. and Osborne, M., ‘WMD terrorism and Usama bin Laden’, CNS Reports, Center for Non-Proliferation Studies, Monterey Institute of International Studies, URL <<http://cns.miiis.edu/pubs/reports/binladen.htm>>; Dolnik, A., *America’s Worst Nightmare? Osama bin Laden and Weapons of Mass Destruction* (PIR Center Nonproliferation and Arms Control Hotline: Moscow, 12 Sep. 2001), p. 3; and ‘The specter of nuclear terror’, Editorial/Op-Ed, *New York Times*, 19 Nov. 2001, URL <<http://www.nytimes.com/2001/11/19/opinion/19MON1.html>>.

⁴³ Habiger, E., Commander-in-Chief, United States Strategic Command, US Department of Defense News Briefing, 16 June 1998, URL <http://www.defenselink.mil/news/Jun1998/t06231998_t616hab2.html>; Moscow ITAR-TASS, ‘Foreign Minister denies al-Qa’idah has Russian nuclear devices’, Foreign Broadcast Information Service, *Daily Report—Central Eurasia (FBIS-SOV)*, FBIS-SOV-2001-1112, 12 Nov. 2001; and Moscow ITAR-TASS, ‘Defense Ministry to control nuclear warheads by 2003’, FBIS-SOV-2001-1119, 19 Nov. 2001.

ically increased their safety and security. Despite numerous press reports, there has been no credible claim of the evidence of the theft or attempted theft of Russian nuclear warheads or their components; nevertheless, episodes of serious proliferation concern may have occurred that are unknown outside government, police or intelligence circles.⁴⁴

Missions and proliferation. Tactical nuclear weapons are predominantly intended to be used in nuclear war-fighting. Given that their yield is smaller than that of most strategic weapons, their engagement in a conflict could be more easily contemplated because of the false perception that damage would be localized. In addition, their deployment in times of crisis increases the likelihood of pre-emptive strikes and a nuclear exchange. An escalation to general nuclear war is thus possible.

In recent years, there has been interest in both Russia and the USA in expanding the roles and missions of tactical nuclear weapons. Both countries have indicated that they would consider using tactical nuclear weapons against targets in non-nuclear weapon states with chemical or biological weapon capabilities. Giving an expanded role to nuclear weapons in military planning serves to legitimize their use and encourages de facto or aspiring nuclear weapon states to follow suit, leading to a worldwide build-up.

Arms control and disarmament. The large number of tactical nuclear weapons, asymmetries in the stockpiles of Russia and the USA, the uncertainties surrounding their operational status, the difficulties with appropriately defining them, and the absence of any meaningful controls and transparency present significant challenges for arms control and hinder disarmament. These problems will become more pronounced after deeper reductions in strategic weapons have been achieved.

Recent developments concerning tactical nuclear weapons

In the aftermath of the 1991–92 PNIs, both Russia and the USA have in general exercised restraint with regard to their tactical nuclear weapons. No new weapon systems have been produced and no credible evidence of large-scale redeployment has been recorded. However, there have been indications, principally in Russia but also in the USA, of a revived, albeit controversial, interest in such weapons in their security debates.

Russia's strategic nuclear forces are rapidly declining and funding for their modernization is scarce. Russia's conventional capabilities, as evidenced in the conflicts in the republic of Chechnya, are weak. Tactical nuclear weapons are increasingly seen by Russia as a means to offset these weaknesses. Some Russian experts and planners, recognizing NATO's conventional superiority and concerned about the eastward enlargement of the alliance, have called for the abandonment of the informal regime of the 1991–92 PNIs, the production of a new generation of tactical nuclear weapons, and their redeployment in Belarus and Kaliningrad and on ships in the Baltic Sea region.⁴⁵ Such calls were strengthened after the 1999 NATO bombing of Yugoslavia.

⁴⁴ Zarimpas, N., 'The illicit traffic in nuclear and radioactive materials', *SIPRI Yearbook 2001: Armaments, Disarmament and International Security* (Oxford University Press: Oxford, 2001), p. 506; and Albright, D., Buehler, K. and Higgins, H., 'Bin Laden and the bomb', *Bulletin of the Atomic Scientists*, vol. 58, no. 1 (Jan./Feb. 2002), p. 23.

⁴⁵ 'After 2000 . . . NATO aircraft would be capable of destroying 60% of Russia's fixed and 15% of its mobile ICBM launchers.' Arbatov (note 16), p. 322. For an analysis of Russian concerns see Lewis and Gabbitas (note 10), pp. 15–19; and Sokov, N., 'Tactical nuclear weapons elimination: next step for arms control', *Nonproliferation Review*, vol. 4, no. 2 (winter 1997), pp. 17–27.

In addition, the abandonment of the Soviet no-first-use pledge in 1993 and the revision of the Russian military doctrine in 2000 have widened the role and salience of tactical nuclear weapons in Russian military planning.⁴⁶

Decisions taken at the 29 April 1999 Russian Security Council meeting, chaired by President Boris Yeltsin, reportedly included a resolution providing guidance for the development and use of tactical nuclear weapons.⁴⁷ Vladimir Putin, then Secretary of the Russian Security Council, commenting on the meeting, emphasized that Russia would comply with its obligations, unilateral or otherwise, to reduce its nuclear forces. The decisions of the Security Council probably pertained to the development of new low-yield nuclear munitions to be delivered by strategic launchers, including the modernization of existing weapons to reduce their yield.⁴⁸

In the USA a small but vocal group consisting mainly of leading scientists at the Los Alamos and Sandia national laboratories, and backed by some conservative politicians and government officials, have been lobbying for the development of new, low-yield, earth-penetrating nuclear warheads (known as 'mini-nukes').⁴⁹ Coupled with high-precision delivery systems, the main purpose of such devices would be to destroy hardened or deeply buried underground targets, arguably with minimal collateral damage.⁵⁰ Congressional legislation from 1994 prohibits all research and development leading to a precision nuclear weapon with a yield of less than 5 kt, clearly recognizing that the existence of such weapons would blur the line separating nuclear and conventional warfare.⁵¹ An analysis based on the nuclear tests conducted in the 1960s as part of the US Plowshare Program⁵² concluded that 'the use of any nuclear weapon capable of destroying a buried target that is otherwise immune to conventional attack will necessarily produce enormous numbers of civilian casualties'.⁵³ It has recently been revealed that the US defence and energy departments have com-

⁴⁶ 'Russia's military doctrine', *Arms Control Today*, vol. 30, no. 4 (May 2000), pp. 29–38; and Trenin, D., 'Russia and the future of nuclear policy', ed. B. Schmitt, *Nuclear Weapons: A New Great Debate*, Chaillot Papers 48 (Institute for Security Studies–Western European Union: Paris, July 2001), p. 115.

⁴⁷ Khripunov, I., 'Russia's MINATOM struggles for survival: implications for US–Russian relations', *Security Dialogue*, vol. 31, no. 1 (Mar. 2000), p. 57.

⁴⁸ Safranchuk (note 15), pp. 4–5.

⁴⁹ Although initiatives and studies regarding earth-penetrating and low-yield nuclear weapons have a long history, recent proposals notably include: Younger, S. M. (Associate Laboratory Director for Nuclear Weapons, Los Alamos National Laboratory), *Nuclear Weapons in the Twenty-first Century*, LA-UR-00-2850 (Los Alamos National Laboratory: Los Alamos, N. Mex., 27 June 2000); and Robinson, C. P. (President and Director, Sandia National Laboratories), 'A White Paper: pursuing a new nuclear weapons policy for the 21st century', 22 Mar. 2001, available at URL <<http://www.sandia.gov/media/whitepaper/2001-04-Robinson.htm>>.

⁵⁰ The strategic B61 Mod. 11 earth-penetrating gravity bomb with various yields, which can also be delivered by tactical aircraft, was added to the US arsenal in 1997. It was the first new capability since 1989, despite US assurances that no new nuclear weapons were being developed. For an analysis see Mello, G., 'New bomb, no mission', *Bulletin of the Atomic Scientists*, vol. 53, no. 3 (May/June 1997), pp. 28–32. Since no changes were introduced into the nuclear explosive package, the US national laboratories do not consider the B61 Mod. 11 as a new design.

⁵¹ US National Defense Authorization Act for Fiscal Year 1994, Public Law 103-160, sec. 3136, Prohibition on Research and Development of Low-Yield Nuclear Weapons, URL <http://www.fcnl.org/issues/arm/sup/tesban_nukfurse.htm>. Two US Republican senators, Wayne Allard of Colorado and John Warner of Virginia, included a provision to the 2001 Defense Authorization Bill to pave the way for a new generation of nuclear weapons. See URL <http://www.fcnl.org/issues/arm/sup/min_allard52400.htm>.

⁵² See, e.g., 'Researching atoms for peace', URL <http://www.sandia.gov/recordsmgmt/apr2001_pg2.htm>.

⁵³ Nelson, R. W., 'Low-yield earth penetrating nuclear weapons', Federation of American Scientists, Public Interest Report, Jan./Feb. 2001, p. 2, URL <<http://www.fas.org/faspir/2001/v54n1/weapons.htm>>.

pleted an initial study on how existing nuclear weapons could be modified to attack hardened and deeply buried complexes. These departments also continue to assess the requirements for such a weapon and have formed a joint planning group to define the scope for a possible design feasibility and cost study. However, no decision has been made to go ahead with a programme to design a new or modified nuclear weapon for hardened targets.⁵⁴ In addition, given the rapid advance of conventional weapons technology, few in the US military appear interested in nuclear weapons for new missions.⁵⁵

The production of a new generation of tactical nuclear weapons would undermine the efforts to control them and would be contrary to the spirit of the 1968 Non-Proliferation Treaty (NPT) as well as to the pledges of the nuclear weapon states to reduce their forces. Moreover, new warheads would probably require testing and would thus undermine the 1996 Comprehensive Nuclear Test-Ban Treaty (CTBT).

Arms control developments

Shortcomings of informal, non-legally binding reductions

The 1991–92 Presidential Nuclear Initiatives were timely, significant and courageous arms control steps. However, while warranted by the extraordinary geopolitical situation of the early 1990s, they are not without flaws. First, they are not legally binding and therefore easy to modify, reverse or violate, in particular since they do not contain any verification or transparency measures regarding compliance. Second, because lengthy consultations did not take place, the two parties may have interpreted and carried out their obligations in different ways. Third, there are no mechanisms to resolve disputes, ensure cooperation and provide continuity. Fourth, they do not prohibit the modernization or manufacture of new warheads. Although the initiatives undoubtedly resulted in the consolidation of—and substantial net reductions in—tactical nuclear weapon systems, they did not eliminate existing asymmetries and thereby contributed to unpredictability and instability in the nuclear relations of Russia and the USA. This unpredictability is further exacerbated by the lack of transparency.

The START framework

Following the announcement and implementation of the PNIs, tactical nuclear weapons were largely ignored on the bilateral arms control agenda.⁵⁶ Nevertheless, in the mid-1990s presidents Bill Clinton and Boris Yeltsin agreed to exchange data on warhead and material stockpiles and on a number of occasions confirmed their com-

⁵⁴ Pincus, W., 'Nuclear strike on bunkers assessed', *Washington Post*, 20 Dec. 2001, p. A29; and Report to Congress on the Defeat of Hard and Deeply Buried Targets, submitted by the Secretary of Defense in conjunction with the Secretary of Energy in response to Section 1044 of the Floyd D. Spence National Defense Authorization Act for Fiscal Year 2001, PL 106–398, July 2001. The US Department of Energy budget request for FY 2003 called for completion of the preliminary study on the modification of existing nuclear weapons for hard target operations. Nuclear Threat Initiative (NTI): Global Security Newswire, 11 Feb. 2002, URL <http://www.nti.org/d_newswire/issues/newswires/2002_2_11.html#3>; and Pincus, W., 'Nuclear plans go beyond cuts', *Washington Post*, 19 Feb. 2002, p. A13.

⁵⁵ Schwartz, S. I., 'The new-nukes chorus tunes up', *Bulletin of the Atomic Scientists*, vol. 57, no. 4 (July/Aug. 2001), p. 35; and *PENN Newsletter*, no. 15 (Nov. 2001), p. 3, available at URL <<http://www.bits.de/main/pennnoc.htm>>.

⁵⁶ START I contains a non-legally binding commitment concerning ceilings for SLCM deployment.

mitment to transparency and irreversibility in nuclear reductions. Moreover, they set up a joint working group to explore various transparency options, including verified warhead dismantlement. However, such commitments were never implemented.⁵⁷ At their Helsinki summit meeting in March 1997, the two presidents agreed that, in the context of the START III negotiations, but as separate issues, their experts would explore, 'possible measures relating to nuclear long-range sea-launched cruise missiles and tactical nuclear systems, to include appropriate confidence-building and transparency measures'.⁵⁸ This statement clearly reflected a compromise between the Russian desire to pursue the issue of US SLCM reductions and the US goal of increasing transparency in the Russian nuclear arsenal. It marked a significant departure from the previous exclusive focus on strategic systems and raised, for the first time, the prospect of including tactical nuclear weapons in formal bilateral arms control. The 1997 agreement to start a dialogue on tactical nuclear weapons was fragile because it was reached within a complicated and controversial framework of mutual concessions and linkages involving developments related to the 1972 Treaty on the Limitation of Anti-Ballistic Missile Systems (ABM Treaty) and the 1993 START II Treaty. Progress was undermined by problems in the strategic nuclear field and bilateral consultations lasted for less than two years, that is, until early 1999.⁵⁹

The Kaliningrad controversy

Indicative of the lack of transparency surrounding tactical nuclear weapons and of the absence of instruments to monitor compliance with the PNIs is the controversy over allegations published in the media that, for the first time since the end of the cold war, Russia had, since June 2000, been redeploying battlefield nuclear weapons in the small Russian exclave of Kaliningrad.⁶⁰ There was speculation that these redeployments were Russia's response to NATO's eastward enlargement and constituted an attempt to compensate for Russia's rapidly deteriorating conventional forces. Doubts about the accuracy of the allegations persisted, principally because of the timing of the alleged deployment.⁶¹ Estonia, Latvia, Lithuania and Poland expressed concern, sought clarification from Russia or demanded inspections.⁶² The US Administration and NATO made no public statements. Several high-level Russian officials, including President Putin, have categorically denied that tactical nuclear weapons are stationed

⁵⁷ An account is given in Goodby, J., 'Transparency and irreversibility in nuclear warhead dismantlement', ed. Feiveson (note 16), pp. 171–92.

⁵⁸ Joint Statement on Parameters on Future Reductions in Nuclear Forces, The White House, Office of the Press Secretary, 21 Mar. 1997, available at URL <<http://www.ceip.org/files/projects/npp/resources/summits6.htm#parameters>>.

⁵⁹ Pikayev, A., 'Towards increasing transparency of reduced nuclear arsenals?', Draft paper prepared for the SIPRI Workshop on Nuclear Transparency, Paris, 8–9 Feb. 2001.

⁶⁰ Gertz, B., 'Russia transfers nuclear arms to Baltics', *Washington Times*, 3 Jan. 2001, p. 1; Pincus, W., 'Russia moving warheads', *Washington Post*, 4 Jan. 2001, p. A16, available at URL <<http://washingtonpost.com/wp-dyn/articles/A16331-2001Jan3.htm>>; and Gertz, B., 'Satellites pinpoint Russian nuclear arms in Baltics', *Washington Times*, 15 Feb. 2001, p. 1, available at URL <<http://intranet.ceip.org/library/clippings/e20010215satellites.htm>>. The articles, citing anonymous US intelligence and defence officials, alleged that Russia had redeployed nuclear warheads in Kaliningrad in order to deploy them in a new, short-range missile, known as the SS-21 Tochka. They also reported that a Tochka missile was test fired in Kaliningrad in Apr. 2000. The Tochka can carry either a nuclear or a conventional warhead.

⁶¹ See Sokov, N., 'The tactical nuclear weapons controversy', *Jane's Defence Weekly*, vol. 35, no. 5 (31 Jan. 2001), pp. 16–17.

⁶² Gertz, *Washington Times*, 15 Feb. 2001 (note 60).

in Kaliningrad; nevertheless, Russia noted that there are no legal restrictions on such redeployments.⁶³

IV. Prospects and means for further reductions

Influential individuals, commissions and international forums have recently voiced their deep concerns about the absence of progress towards ending the deployment of tactical nuclear weapons and further reducing the remaining arsenals.⁶⁴ Although largely ignored during the 1995 NPT Review and Extension Conference, tactical nuclear weapons received particular attention at the 2000 NPT Review Conference. Several countries, including NATO member states, raised the need to include them in arms reductions agreements. The European Union called for all tactical nuclear weapons to be brought into future reduction and disarmament arrangements 'with the objective of their reduction and eventual complete elimination'.⁶⁵ Indeed, the nuclear weapon states agreed, for the first time in this forum, to further reduce tactical nuclear weapons as practical steps towards the implementation of Article VI of the NPT.⁶⁶

Several authoritative analyses have detailed useful plans and proposals for dealing with the problem of tactical nuclear weapons.⁶⁷ Among them, some of the most frequently discussed are formalization of the 1991–92 PNIs, transparency measures and data exchanges, negotiated and unilateral reductions, agreements on numerical limitations, the creation of nuclear weapon-free zones, a global prohibition, removal of US gravity bombs from Europe and consolidation at secure storage facilities, or a combination of several of these proposals.

Two important factors affect the prospects for a further limitation of tactical nuclear weapons in a reciprocal, cooperative and transparent manner. First, there is the disdain of the George W. Bush Administration for legally binding arms control treaties, which are seen as constraining US flexibility.⁶⁸ Second, there is an apparent lack of incentive for Russia to engage in tactical nuclear weapons transparency. Fur-

⁶³ See, e.g., Moscow Interfax, 'Russian President denies deployment of nuclear arms in Kaliningrad', FBIS-SOV-2001-0106, 6 Jan. 2001; Moscow Interfax, 'No nuclear weapons in Baltic enclave—foreign minister', FBIS-SOV-2001-0309, 9 Mar. 2001; and Agence France-Presse (North European Service), 'Russian official says Moscow entitled to deploy nuclear weapons in Kaliningrad', Foreign Broadcast Information Service, *Daily Report—Europe (FBIS-EUR)*, FBIS-EUR-2001-0325, 25 Mar. 2001.

⁶⁴ See, e.g., 'Annan rejects n-powers' stand on proliferation', *The Hindu*, 3 Apr. 2000, available at URL <<http://www.the-hindu.com/holnus/01032003.htm>>; and *Report of the Canberra Commission on the Elimination of Nuclear Weapons* (National Capital Printers: Canberra, Aug. 1996), p. 54.

⁶⁵ Johnson, R., 'Implications of the outcome of the NPT review conference', International Security Information Service, Special Briefing Series on UK Nuclear Weapons Policy, no. 5 (Jan. 2001), p. 6.

⁶⁶ The text states the need for 'Steps by all the nuclear-weapon States leading to nuclear disarmament . . . [including] . . . the further reduction of non-strategic nuclear weapons, based on unilateral initiatives and as an integral part of the nuclear arms reduction and disarmament process', '2000 NPT Review Conference Final Document', Article VI.9, *Arms Control Today*, vol. 30, no. 5 (June 2000), p. 31.

⁶⁷ The most recent analyses are Lewis and Gabbitas (note 10); Potter, W. C., 'Unsafe at any size', *Bulletin of the Atomic Scientists*, vol. 53, no. 3 (May/June 1997), pp. 25–27; Potter and Sokov, eds Potter *et al.* (note 2); Arbatov (note 16); and Millar, A. and Alexander, B., 'Uncovered nukes: arms control and the challenge of tactical nuclear weapons', Fourth Freedom Forum, 16 Nov. 2001, available at URL <<http://www.fourthfreedom.org>>.

⁶⁸ Gottemoeller, R., 'Offense, defense, and unilateralism in strategic arms control', *Arms Control Today*, vol. 31, no. 7 (Sep. 2001), p. 11; and chapters 9 and 10 in this volume. As far as the issue of reductions of tactical nuclear weapons is concerned, the unclassified version of the congressionally mandated US Nuclear Posture Review was silent. It is noteworthy that the USA is planning to keep in storage non-operational warheads resulting from reductions in its strategic forces. US Department of Defense, 'Findings of the Nuclear Posture Review', News briefing slides, 9 Jan. 2002, URL <<http://www.defenselink.mil/news/Jan2002/g020109-D-6570C.html>>.

thermore, the US domestic political agenda in the aftermath of the 11 September 2001 terrorist attacks is dominated by counter-terrorism efforts. As far as Russia is concerned, the unrivalled military superiority of the USA⁶⁹ and the other NATO member states, the emerging potential of China, and the rapid deterioration of its conventional weaponry may be seen as political motivations for retaining, if not a large number, perhaps a non-transparent stockpile of tactical nuclear weapons.⁷⁰ Their possession could also form an asymmetric response to the development of US missile defences. For these reasons, the possibility of any short-term breakthrough appears remote.

Nevertheless, the 11 September terrorist attacks have brought Russia and the USA closer together and have galvanized interest in moving forward on a variety of fronts, including nuclear reductions. To make sustained progress, more trust needs to be restored, and this will probably take time. Overcoming differences over missile defences will be a critical factor in this regard. The two countries seem committed to making large cuts in their deployed strategic nuclear arsenals over the next several years, although the parameters they will adopt to this end have not yet been decided. As deployed strategic weapons are further reduced and bilateral security cooperation broadens, they could also explore a variety of confidence-building measures to address tactical nuclear weapons. First and foremost, it will be necessary, without lengthy consultations, to declare how many tactical nuclear weapons remain in their inventories. Information could be periodically updated and supported by historical data. In addition, the two countries may be willing to confirm that all battlefield nuclear weapons have been fully dismantled. Decisions to diminish the role of tactical nuclear weapons in their military strategies and to forgo any further modernization could complement such undertakings.

The USA, being more comfortable with the status quo, may lead the way. In the longer run it could well consider limiting or withdrawing its nuclear gravity bombs from Europe because these weapons no longer serve any meaningful military purpose.⁷¹ This would be a major step forward, albeit not an easy one.⁷² In return, Russia could further restrict its tactical nuclear weapons to fewer locations, provide assurances about their deployments and elimination, or even allow monitoring at its storage sites. Such exchanges could be either bilateral or take place in the framework of the NATO–Russia Permanent Joint Council.⁷³

The diversion of even a single tactical nuclear weapon by a terrorist group would be a proliferation catastrophe. Urgent measures are necessary to ensure that all tactical warheads, in particular those of older designs and those that are fully detached from their delivery systems, are securely stored and guarded. Indeed, despite the souring

⁶⁹ According to one estimate, if Russian nuclear forces continue to deteriorate as currently projected, by 2015 the US arsenal will be 5 times the size of the combined arsenals of all the other nations. Cirincione, J., 'The assault on arms control', *Bulletin of the Atomic Scientists*, vol. 56, no. 1 (Jan./Feb. 2000), pp. 32–33.

⁷⁰ Although Russia appears to have recently embraced the notions of transparency and irreversibility of deep strategic reductions, there are no signs that it is prepared to apply them to tactical nuclear weapons. See, e.g., Statement by Ambassador Leonid A. Skotnikov, Permanent Representative of the Russian Federation to the Conference on Disarmament at the Plenary Meeting of the Conference on Disarmament, Geneva, 22 Jan. 2002, URL <<http://www.in.mid.ru>>.

⁷¹ Cotta-Ramusino, P., 'The unasked question', *Bulletin of the Atomic Scientists*, vol. 55, no. 4 (July/Aug. 1999), pp. 42–45.

⁷² 'We emphasised again that nuclear forces based in Europe and committed to NATO continue to provide an essential political and military link between the European and North American members of the Alliance.' Final Communiqué of the NATO Ministerial Meeting of the Defence Planning Committee and the Nuclear Planning Group held in Brussels on 18 Dec. 2001, Press Communiqué PR/CP(2001)170.

⁷³ See note 26; and *NATO Handbook* (note 39).

Russian–US political relations since the mid-1990s, a distinct characteristic of that period has been their continued, unprecedented and broad nuclear security cooperation.⁷⁴ The two countries may fruitfully consider ways to further expand and strengthen these programmes and, given that the dangers are global, invite other countries to contribute.

Nuclear warhead transparency and control

Tactical nuclear weapons are essentially delivered by dual-capable means, that is, by delivery vehicles that have both nuclear and conventional capabilities. Traditional strategic nuclear arms control measures cannot therefore be applied to tactical nuclear weapons. The only meaningful way to provide assurances about the implementation of the PNIs and any additional future agreement or treaty limiting tactical nuclear weapons would be to directly apply controls on the warheads. In this respect, from a technical viewpoint, dealing with tactical warheads will not be different from dealing with strategic warheads. The implementation of warhead transparency, however, will pose formidable challenges, as evidenced by the difficulties in making progress with the agenda proposed in the mid-1990s to address this issue.

It is important for Russian–US relations to move forward in order to bring about conditions conducive to innovative technical approaches to arms control and, specifically, to deal with tactical nuclear weapons. These would require, apart from comprehensive data exchanges, a rigorous inspection and verification scheme.⁷⁵ Directly imposing controls on warheads would be an immense and ambitious technical task that would require unprecedented intrusiveness into what hitherto have been some of the most sensitive segments of the national defence establishments.

A comprehensive regime could, at least conceptually, include a full account of warheads, verification of their dismantlement and monitoring of their production facilities, broadly comprising the following main elements: (a) establishing declarations of warhead inventories and verifying their accuracy and, more importantly, their completeness; (b) providing assurances that warheads earmarked for dismantlement or elimination are not diverted or replaced by decoys; (c) guaranteeing that no new warheads are manufactured; and (d) disposing of fissile material from dismantled warheads in an irreversible way.

The uncertainties surrounding warhead inventories must be reduced to a minimum in order to establish an essential basis for deep reductions. Indeed, exchanges of stockpile information constitute a logical next step in arms control.⁷⁶ The Russian and

⁷⁴ The US Government, and principally the DOD and the DOE, have since the passage of the 1991 Nunn–Lugar Soviet Nuclear Threat Reduction Act, established an array of programmes to assist in the dismantlement of Russian nuclear weapons, improve their security and prevent their diversion. See Baker, H. and Cutler, L., *Russian Task Force, A Report Card on the Department of Energy's Nonproliferation Programs with Russia* (US Department of Energy: Washington, DC, 10 Jan. 2001).

⁷⁵ For a presentation and analysis of procedures and technologies for nuclear warhead transparency and verifiable dismantlement see Zarimpas, N. (ed.), SIPRI, *Transparency in Nuclear Warheads and Materials: The Political and Technical Dimensions* (Oxford University Press: Oxford, forthcoming 2002); Bukharin, O. and Luongo, K., *US–Russian Warhead Dismantlement Transparency: The Status, Problems and Proposals*, CEES Report no. 314 (Princeton University Center for Energy and Environmental Studies (CEES): Princeton, N.J., Apr. 1999), available at URL <<http://www.ransac.org/new-web-site/pub/reports/transparency.html>>; and UK Atomic Weapons Establishment, 'Confidence, security and verification—the challenge of global nuclear weapons arms control', Aldermaston, AWE/TR/2000/001, available at URL <<http://www.awe.co.uk>>.

⁷⁶ Müller, H., *The Nuclear Weapons Register: A Good Idea Whose Time Has Come*, PRIF Reports no. 51 (Peace Research Institute Frankfurt (PRIF): Frankfurt, 1998).

US presidents agreed in 1994 to develop a process for sharing classified stockpile data at regular intervals, but formal implementation was never successfully negotiated. The USA nevertheless declassified certain characteristics of its warhead stockpile (the total yield and numbers retired) from 1945 to 1994, as well as the total numbers produced from 1945 to 1961.⁷⁷

After confidence is gained from exchanging aggregate data, more detailed accounts could be provided in a phased manner. These might include inventories by types, as well as itemized lists of warheads, including their locations. Such detailed declarations might also involve formal verification arrangements to provide assurances about their accuracy and completeness. Verification will become imperative either when current stockpiles are substantially reduced or when an agreement is reached to impose quantitative limits on them. In this regard, two tasks are of concern: (a) demonstrating the authenticity of a declared warhead without disclosing classified design information; and (b) providing guarantees about the completeness of the declarations. The first task could be accomplished either by measuring some of the 'attributes' of the warhead (at least the presence of a minimum mass of fissile material) or by making use of its detailed spontaneous and/or stimulated radiation spectrum, the so-called 'template' approach. Information-barrier systems involving both technology and procedural elements could be applied to reliably protect sensitive information. Challenge inspections and examination of facility operating records could be used to fulfil the second task.

The use of appropriate tags to show a warhead's claimed identity and seals to guarantee its presence, portal-perimeter monitoring, as well as more intrusive chain-of-custody techniques would ensure confidence in the verification of warhead dismantlement. The Russian-US Laboratory-to-Laboratory Warhead Dismantlement Transparency Programme, an unclassified technical exchange which was initiated in 1995, made major advances in many areas, such as radiation measurement, information protection, remote monitoring, disposition of non-nuclear components and chain-of-custody monitoring, including the monitoring of tags and seals. However, much remains to be done since the technology base for warhead dismantlement transparency is far from complete.

Detection of the undeclared manufacture of new warheads would of course be a much more difficult problem. Satellite imagery, remote sensing and environmental monitoring, complemented by societal verification, would all be valuable tools towards this end.⁷⁸

Verifiable warhead elimination would have a major impact on warhead production and maintenance complexes, because such facilities were not designed to receive foreign inspectors or accommodate any other transparency measures, for example, monitoring. Consequently, warhead stewardship and re-manufacturing operations, which are probably carried out in adjoining or the same buildings where dismantlement is performed, could be seriously disrupted. Moreover, the demands on technical, support and security personnel, services and equipment would probably be significant. Physical segregation of verifiable warhead dismantlement processes or the use for this purpose of dedicated facilities or closed-down plants are options that could be

⁷⁷ US Department of Energy, 'Declassification of certain characteristics of the United States nuclear weapon stockpile', 1994, URL <<http://www.osti.gov/html/osti/opennet/document/press/pc26.html>>.

⁷⁸ Bukharin, O. and Doyle, J., *Verification of the Shutdown or Converted Status of Excess Warhead Production Capacity: Technology Options and Policy Issues*, LA-UR-01-5001 (Los Alamos National Laboratory: Los Alamos, N. Mex., Oct. 2001).

investigated for satisfying the rigorous operational and security conditions required.⁷⁹ More serious challenges will be posed by existing asymmetries in the number, capacities, structure, functions and technical organization of warhead production and dismantlement facilities in Russia and the USA.⁸⁰ These asymmetries must be clearly identified and well understood before warhead dismantlement inspection and monitoring arrangements are formally negotiated.

Last, in order to ensure the irreversibility of the process, transparency and verification should be fully extended to fissile material made available as a result of the dismantlement process, covering both its intermediate storage (in the form of pits, components or other forms) and its final disposition. Noteworthy in this respect is the Trilateral Initiative, launched in 1996 by the IAEA, Russia and the USA to voluntarily place both classified and unclassified forms of fissile material under international verification, as well as bilateral efforts to monitor such material at the Mayak storage site in Russia.⁸¹

V. Conclusions

The large number of tactical nuclear weapons remaining in the Russian and US nuclear arsenals is a legacy of the cold war. Their existence is detrimental to global security and the security of Russia and the USA. These weapons pose unique challenges and dangers and therefore deserve urgent attention. Russia and the USA should take steps to address these dangers. First, they should ensure that tactical nuclear weapons are safely and securely stored. Second, they should jointly reaffirm their commitments to the 1991–92 Presidential Nuclear Initiatives, provide updates on progress made in the elimination of tactical nuclear weapons and pursue increased transparency. Third, they should reassess the perceived utility of such weapons in their military and deterrence doctrines and halt further weapon modernization. Fourth, they should unilaterally proceed with additional reductions. Fifth, they should consider ways of constructing a cooperative framework that drastically limits the numbers and locations of tactical nuclear weapons.

In the long term, effectively addressing limitations on tactical nuclear weapons can only be achieved by directly imposing controls on their warheads. To this end, it is imperative to strengthen technical arms control research, cooperation and funding.

⁷⁹ Dubinin, V. and Doyle, J., *Item Certification for Arms Reduction Agreements: Technological and Procedural Approaches*, LA-UR-00-2740 (Los Alamos National Laboratory: Los Alamos, N. Mex., 2000).

⁸⁰ See appendix 10C.

⁸¹ See Shea, T., 'Potential roles for the IAEA in warhead dismantlement and fissile materials transparency', and Schaper, A., 'Monitoring and verifying the storage and disposition of fissile materials and the closure of nuclear facilities', ed. Zarimpas (note 75).

A tactical nuclear weapon (TNW) or non-strategic nuclear weapon is a nuclear weapon which is designed to be used on a battlefield in military situations mostly with friendly forces in proximity and perhaps even on contested friendly territory. Generally smaller in explosive power, they are defined in contrast to strategic nuclear weapons: which are designed to be mostly targeted in the enemy interior away from the war front against military bases, cities, towns, arms industries, and other hardened or Tactical nuclear weapons were meant to be used in specific combat operations alongside conventional weapons. The best example is the W82, a low-yield tactical nuclear warhead designed to be used in a 155 mm artillery weapon system. The W82 was a dual-purpose weapon with a blast yield that reached two kilotons. It came with interchangeable components that would enable the shell to function as either an "enhanced radiation" or a "standard" fission device. Like many nuclear weapons developed by the United States, the W82 was meant to provide a "cohesive forward defense" of NATO territory if the S Tactical nuclear weapons, which are much larger at the disposal of the Russian army than in the US, are the trump card with which this superiority can be reduced to zero. Official information on Russian TNW has never been published and is classified information. According to most expert assessments, the current Russian tactical nuclear capability is estimated at about the 2000 warheads. But the delivery and preparation of Russian tactical nuclear weapons for combat use is worked out by the troops annually. The United States has repeatedly raised the issue of reducing Russian tactical nuclear weapons to an "acceptable level of international security", seeking to deprive the Russian army of this trump card.