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ABSTRACT

‘Critics of nuclear weapons abolition have long argued that, in an ostensibly disarmed world, ‘rogue’ states could renege on their treaty commitments, secretly build nuclear arsenals, and then ‘breakout’ of the abolition treaty. The law-abiding majority would then be at the mercy of unscrupulous nuclear cheats.

This paper critically analyses some of the most-discussed risks of nuclear ‘breakout’ from a denuclearised world. It argues that while these risks are real, they must be measured against the risks inherent in a turbulent international system where states retain large arsenals of nuclear weapons indefinitely. It is the balance of risks which should be the critical factor in determining whether or not a nuclear-free world will enhance global security. The paper suggests that the advantages of nuclear possession and risks of nuclear ‘breakout’ have both been exaggerated, while the risks of nuclear possession and the benefits of nuclear disarmament have been insufficiently stressed.

The paper considers a range of technical, strategic and political arguments and concludes that the so-called ‘breakout’ risk does not provide the basis for a compelling case against nuclear disarmament.’
NUCLEAR ‘BREAKOUT’: RISKS AND POSSIBLE RESPONSES*

Andrew Mack

Introduction

A central concern of opponents of complete nuclear disarmament has long been that, in an ostensibly disarmed world, a ‘rogue’ state would renege on its treaty commitments, secretly build a nuclear arsenal, and then ‘breakout’ of the abolition treaty. Such concern is not surprising—in the 1990s both Iraq and North Korea reneged on their Nuclear Non-Proliferation Treaty commitments by pursuing clandestine nuclear weapons programs.

There are in fact many ways in which ‘breakout’ risks might manifest themselves in practice. Some states might seek a nuclear capability as a ‘strategic equaliser’ against a growing perceived threat from a conventionally more powerful adversary. Others, already locked into a losing war, might pursue a crash nuclear weapons program in order to secure victory, or avoid defeat. Still others, neither immediately threatened nor fighting a war, might start a clandestine program simply because they suspected the nuclear intentions of other states and had lost confidence in the ability of the international community to detect cheating.

This paper critically analyses some of the most discussed risks of nuclear ‘breakout’ from a denuclearised world. It argues that while these risks are real, they must be measured against the risks inherent in a turbulent international system where states retain large arsenals of nuclear weapons indefinitely. It is the balance of risks which should the critical factor in determining whether or not a nuclear-free world will enhance global security.

The paper does not examine the risks of continued reliance on nuclear weapons; these are familiar enough and have been dealt with more than

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* (This is a revised version of a paper prepared for the Canberra Commission on the Elimination of Nuclear Weapons and published in the Commission’s Background Papers, August 1996).

1 Thanks to J.L. Richardson, Brad Roberts and Stephanie Copus-Campbell for helpful comment on earlier drafts of this paper.
It does argue, however, that the risks of abolition have been considerably overstated by opponents of nuclear disarmament, and that the security arguments for retaining nuclear weapons have become less compelling as the prohibitionary norm against nuclear use has grown, and as the risks of war between industrialised states have declined.

How might ‘breakout’ be achieved in practice? There are at least four possibilities. First, an existing nuclear weapon state may cheat on the global disarmament regime by retaining a secret cache of nuclear weapons and/or fissile material during the disarmament process. Second, a state may create a clandestine program to produce fissile material and, ultimately, nuclear weapons. Third, a state may use separated ‘reactor-grade’ plutonium from civilian power reactors to make nuclear weapons. Fourth, stolen fissile material may be smuggled to, or otherwise acquired by, a ‘rogue’ state or a terrorist group and used to produce a bomb.

States which feel sufficiently threatened may, of course, withdraw from the global disarmament regime and create a nuclear weapons program perfectly legally and with no attempt at concealment.

A much-cited reason for concern about ‘breakout’ derives from the fact that the ‘nuclear genie is out of the bottle’ and that ‘nuclear weapons cannot be disinvented’. Nuclear arsenals may be destroyed, but the knowledge needed to rebuild them will persist. Opponents of global nuclear disarmament believe that, since there is no foolproof means to prevent cheating, honest disarmers would, sooner or later, find themselves at the mercy of unscrupulous nuclear cheats.

Security planners in nuclear weapons states (NWS) also fear that if they destroyed all of their nuclear weapons they would give up the only credible deterrent against nuclear threats from ‘rogue’ states which cheated on their treaty commitments. Nuclear weapons are also seen by some states as the best deterrent against the threatened use of chemical and biological weapons. Thus for the critics the risks of nuclear disarmament are simply too great to be entertained seriously. Only when relations between nations are so benign that

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3 As argued below a withdrawal clause would almost certainly have to be included in any elimination treaty.
states will no longer require any military forces, will getting rid of all nuclear weapons become a realistic option.

However, while the pro-nuclear arguments should be carefully weighed, they are eminently contestable. For example, the argument that creating a nuclear abolition convention is impossible or undesirable because ‘nuclear weapons cannot be disinvented’ is, in itself, unpersuasive. Chemical weapons cannot be disinnvented either, but that did not prevent the creation of the Chemical Weapons Convention. Indeed, as Nobel Peace Prize winner Joseph Rotblat has noted:

The ‘disinvention’ argument is an argument against disarmament in general; if accepted it would mean that there should be no disarmament of any kind of weapon.\(^4\)

The claim that it is impossible to have complete confidence that states would not cheat on their treaty obligations is true, but it is not a compelling argument against seeking a nuclear-free world. States which are signatory to the Nuclear Nonproliferation Treaty (NPT) and the Chemical Weapons Convention may also cheat on their treaty obligations, but this fact did not preclude these agreements from being successfully negotiated, nor did it mean that they were of no security value. The point of a creating a nuclear abolition treaty is not that it would create a world free of risk, but one in which the balance of security risks is decreased.

**Nuclear ‘breakout’**

Creating confidence that the parties to a Nuclear Weapons Convention would not be able to cheat on their obligations and that cheating would be of less concern than is generally believed, would be critical its successful negotiation and implementation.\(^5\) Yet the verification task associated with such a Convention will be highly demanding. The international community will need to be adequately assured that the nuclear weapons states (NWS) have not only dismantled all their nuclear weapons, but also that all the fissile material these

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5 Since no such convention is currently being negotiated it may seem inappropriate to capitalise ‘nuclear weapons convention’. The term is, however, increasingly commonly used in this form in the arms control and non-governmental agency disarmament communities and is capitalised here for this reason.
weapons contain (and any other stocks of fissile material) is identified and dealt with in such a manner that it is no longer a source of proliferation concern. In addition, intrusive verification regimes that can detect the clandestine production of fissile material and weapons must be established. Detection must be timely enough for effective preventive action to be taken by the international community.

The following sections examine the four major sources of ‘breakout’ risk in a disarmed world. The conclusion argues that much of the concern about the risks and consequences of ‘breakout’ has been overdrawn. Again the point is not that there are no risks, but that, with adequate safeguards, a nuclear-free world is less dangerous than a nuclear-armed world.

‘Breakout’ risks I: retention of undeclared nuclear weapons and/or fissile material by nuclear weapons states

When states have very large numbers of nuclear weapons, cheating at the margin is of little strategic import. If a country claims that it has 20,000 nuclear weapons, but has hidden a hundred more, the extra weapons do not confer any significant strategic advantage. Deterrence based on mutual assured destruction will remain robust. However, if all nuclear weapons states are supposed to have disarmed and one state retains a secret one-hundred bomb nuclear stockpile—enough to destroy every major city in Europe, Russia and the United States—cheating could matter very much indeed.

Could the international community be wholly confident that a Nuclear Weapons Convention would prevent the NWS from cheating? Could even the most intrusive inspection regime guarantee that no nuclear weapons/fissile material had been hidden? There are good reasons for scepticism. According to one arms control specialist:

> Modern nuclear munitions, such as those in the stockpiles of the P5 [the five Permanent Members of the UN Security Council], are so small and easily concealed that no verification system, however intrusive, could provide confidence that all of the declared and

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6 Fissile material can either be ‘burned’ or disposed of as waste. High-enriched uranium (HEU) can be diluted and used as fuel in light-water reactors. Plutonium can be mixed with uranium and ‘burned’ as Mixed-Oxide Fuel (MOX).

7 It may, of course, be of considerable political import as the history of US/Soviet nuclear arms control disputes demonstrates.
undeclared nuclear states—the P5 and the ‘outer three’—had destroyed all of their stockpiles.8

As James Leonard has recently noted: ‘The simple fact is that verification of elimination is extraordinarily difficult. Some would even say that it is impossible’.9 The verification problem is complicated by the fact that the NWS have not been required to declare all of their nuclear weapons inventories or facilities, nor to submit them to International Atomic Energy Agency (IAEA) inspection.10 There is thus no internationally verified assessment of the size of either the nuclear weapons stockpiles of the NWS, or their stockpiles of fissile material. As German Foreign Minister Klaus Kinkel has pointed out: ‘Only if we know the size of existing arsenals can we check on the success of the disarmament process’.11

So-called National Technical Means (NTM) of verification, which were used extensively to verify strategic arms control agreements in the Cold War era, would be of little use in determining whether or not states have met their obligations to denuclearise by eliminating all their stocks of plutonium or high-enriched uranium (HEU). NTM use a variety of remote sensors to detect missile launches, monitor missile telemetry and count missile launch platforms. NTM sensors can also detect the existence and operation of clandestine nuclear reactors and spent fuel reprocessing plants, but not nuclear warheads or caches of fissile material.

Even with a highly intrusive in-country verification regime, detection of clandestine nuclear weapons/fissile material caches would be impossible at the present time. It is true that fissile material (plutonium or HEU) has radioactive ‘signatures’ which, unless well-shielded, can be detected by commercially

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8 Peter D. Zimmerman, ‘We Have to Live With the Bomb Forever, We Need the INESAP Bulletin, no. 5, April 1995, p. 7.
10 Although not required to do so under the NPT, the NWS have provided the IAEA with lists of civil nuclear facilities at which they will accept safeguards.
11 Klaus Kinkel, 10-Point Initiative on Non-Proliferation Policy, 15 December 1994. Germany’s November 1993 proposal for creating a Nuclear Weapons Register was sharply rebuffed by Britain, France and the US, however. The smaller NWS (Britain, France and China) have been less transparent than the US and Russia and have traditionally resisted demands for greater nuclear transparency in the name of national security.
available sensors even when hidden. But according to a recent report by the US Center for Naval Analyses, ‘nuclear detection ranges are still measured in meters rather than kilometers. No long-range, high-sensitivity remote-detection capability is envisioned in the near-term’.

Non-nuclear weapons states (NNWS) that were members in good standing of the NPT would not have a comparable opportunity to cheat on a Nuclear Weapons Convention, since all activities of potential proliferation concern which they had pursued would have been monitored by the IAEA from the outset. The weapons-relevant nuclear material inventories of the non-nuclear-weapon NPT states are declared, verified and under constant surveillance.

How real is the risk that the nuclear powers might successfully hide either some nuclear weapons, or sufficient fissile material to build them? It is certainly true that the retention of unaccounted for fissile material or nuclear weapons could go undetected by international inspections. But the possibility of being caught this way would not be the only disincentive to cheating. No state contemplating cheating could be certain that its transgression would not be revealed from within. Any attempt to hide nuclear weapons and/or fissile material would be known by a considerable number of citizens of the state in question. Successful cheating would mean—indeed it would require—that these citizens be party to a gross violation of international law. But while governments can legitimately require citizens to keep secrets relating to lawful national security concerns, they cannot legally require them to break international laws to which they are signatory. If just one individual refused to go along with the deception and ‘blew the whistle’, all would be revealed. This is in no sense a fanciful idea, indeed nuclear ‘whistle-blowing’ is already a fact:

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12 Thomas J. Hirschfield, *The Impact of Nuclear Proliferation: Final Report*, Center for Naval Analyses, Arlington VA, July 1995, pp. 69–70. Hirschfield’s information came from Lawrence Livermore National Laboratory personnel. Another report states that, ‘Helicopter-mounted neutron detectors can detect nuclear warheads at a distance of about 70 to 100 metres provided that the warheads have plutonium components (containing Pu-240) and provided that no extraordinary means have been taken to shield the warheads with thick neutron-absorbing materials.’ See Christopher E. Paine, Thomas B. Cochrane and Robert S. Norris, ‘Techniques and Procedures for Verifying Nuclear Weapons Elimination’ in *Background Papers*, p. 173.

13 Unless, of course, they had smuggled in secret stocks of fissile material from a clandestine overseas source. This possibility is discussed below.
Israel’s nuclear weapons program had its Mordechai Vanunu. Russia’s State Institute of Organic Chemistry and Technology had its Dr Mirzayanov, and Saddam Hussein had his defector son-in-law, Lt. General Hussein Kamel Hassan.\textsuperscript{14}

Governments contemplating cheating could not know in advance whether or not their violation would be revealed by a ‘whistle-blower’. Revelations of such a gross violation of a major international treaty could be deeply humiliating to the government concerned, more important it would also make it liable to severe sanctions by the international community. Thus the risk of being caught cheating is appreciable, even when remote detection of clandestine weapons/fissile material is very difficult if not impossible, and when there is no guarantee that on-site challenge inspections would reveal clandestine stocks of weapons/fissile material. These risks and the consequences which could flow from them, may in themselves, constitute a sufficient deterrent to this form of cheating.

Some analysts will be sceptical about such a claim. They can point to the fact that no North Korean ‘whistle blowers’ came forward to warn the international community of the North’s NPT transgressions, and that no insiders ‘blew the whistle’ on Iraq’s nuclear cheating before Saddam was defeated militarily in the Gulf War. This is a valid criticism. Clearly much stronger incentives are needed for individuals to ‘whistle-blow’ than exist at the moment. Recognising this, a number of abolition advocates have suggested that regimes of ‘societal verification’ be established.\textsuperscript{15} They argue that a global nuclear disarmament treaty should contain a clause requiring signatory states to pass laws mandating their citizens to report any suspected treaty violations.

To provide a material incentive for such ‘citizen reporting’, the international community could offer substantial rewards for information leading to proof of treaty violations.\textsuperscript{16} A one million dollar reward offer that led to the


\textsuperscript{16} Ibid. p. 106. The rewards could still be offered even if no national laws were legislated requiring citizens to report violations. Since such legislation could be seen as an affront to national sovereignty, many states might refuse to enact it. To
revelation of a clandestine bomb program would be an extraordinarily cheap form of detection. Some form of sanctuary might also have to be provided for ‘whistle-blowers’ since in some states such activity could be seen as treasonous and thus be highly dangerous for the individuals involved.

Clearly ‘citizen reporting’ is more likely to succeed in open societies where free speech is guaranteed and where citizens would not be prevented from, or penalised for, informing an international inspection body of attempted violations. But with very few exceptions (North Korea is an example, albeit one unlikely to survive for long) it is increasingly difficult even for authoritarian governments to control the flow of information across national borders. Given the likely future entrenchment of the information super-highway in all the states capable of making nuclear weapons, preventing determined citizens from communicating information on treaty violations to the international community would be extraordinarily difficult. Moreover, well before any global agreement to eliminate nuclear weapons is likely to be in place, ‘global hand-held cellular communications will be established, allowing instant communication of any observed questionable activity from almost anywhere, including remote sites’.  

There is some evidence to suggest that, even without financial rewards, ordinary citizens might be prepared to ‘betray’ their country by participating in a ‘societal verification’ regime. In 1958, a six-nation US poll by the American Institute of Public Opinion asked citizens of the United States, United Kingdom, France, Germany and Japan if they supported the idea of ‘citizen verification’, and whether they would report a treaty violation to an international inspection body. Remarkably—this was the middle of the Cold War years—clear majorities answered ‘yes’ to both questions.

‘Breakout’ risks II: clandestine nuclear weapons production facilities

A second source of ‘breakout’ concern arises from the fact that states might build clandestine nuclear facilities in order to make nuclear weapons—as did Iraq. The most time-consuming, expensive and technically difficult stage of

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18 Ibid. p. 110.
nuclear weapons manufacture is the production of the fissile material, in the form of either plutonium (Pu), or HEU.

Assuming that all civilian nuclear facilities would be under effective safeguards, producing nuclear weapons via the plutonium route would require a would-be ‘breakout’ state to operate a clandestine reactor to produce plutonium, and a reprocessing plant to separate the plutonium from the spent reactor fuel.

But building an underground reactor or reprocessing plant in a remote location will usually require the construction of roads, considerable excavation, the provision of electricity, water supplies and so forth. Some or all of these preparations would be detectable by surveillance satellites. And even if the construction of such a reactor went unnoticed, its operation might still be detected. The heat signature of an operational reactor, even one located underground, is, in principle, detectable by remote infra-red sensors. And this is only one of a range of techniques by which clandestine operations can be revealed.

Under its ‘Program 93 + 2’, the IAEA is seeking to enhance a wide range of safeguards activities, including the ability to detect undeclared nuclear activities in remote locations. The prospects for success in detecting reactors and reprocessing plants using so-called ‘environmental monitoring’ techniques are far greater than the chances of detecting clandestine bomb or fissile material caches. Detection is possible because minute traces of identifiable materials cannot be prevented from escaping during the production and separation of fissile material, and because sophisticated sensors can detect these traces remotely. According to one official:

There is good evidence that environmental monitoring techniques can be effective in detecting distant undeclared reactor and reprocessing operations for the recovery of plutonium.19

IAEA-sponsored remote-detection field trials, based partly on experience gained in Iraq, have already proved successful. According to one recent report, ‘effluent signatures can...detect reactors over...hundreds of kilometers’.20 The

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operation of reprocessing plants may also be detected at considerable distances. When spent fuel rods are cut up and irradiated fuel is dissolved during the separation process, radionuclides are released which can be collected remotely by 'large volume air sampling’, and subsequently analysed. Other chemicals released into the environment can also help indicate the presence of a reprocessing operation. Some of these may be airborne, others may be contained in liquid discharges which enter the ground water. Sampling of radioactive and other traces in ground water and river bed sediments is one of the most promising and cost-effective means for remotely detecting clandestine reactors or reprocessing plants. Fish and shellfish, which can act as bio-concentrators of radionuclides, may provide a further source of data on radioactive discharges.

Clandestine uranium enrichment facilities are more difficult to detect than plutonium production or reprocessing facilities. But in the enrichment process, 'some enriched uranium will inevitably be released into the environment’ and this can, in principle, be detected. Traces of the uranium intended for enrichment could also provide valuable intelligence—providing the uranium did not occur naturally in the enrichment facility location. Unusual chemicals associated with the enrichment process which are released into the environment may provide further useful verification data.

Proliferator states can, of course, take countermeasures to try to prevent detection of clandestine facilities. Underground reactors could be sited beneath other heat-generating industrial plants and/or in urban areas. This would obviate the need to create new electricity and water supplies and would help hide the reactor’s heat signature. Emissions from reprocessing plants and reactors could be reduced, though not eliminated, with high-efficiency filters, or the weapons plants could be co-located with legitimate civilian nuclear facilities to confuse environmental monitoring analysis. In addition, as a recent Office of Technology Assessment report on environmental monitoring explains:

21 Such sampling needs to be undertaken in conjunction with accurate meteorological observations which will indicate the strength and direction of winds taken at the time of collection. Unlike most aquatic sampling, airborne samples can be taken from outside the territory of a suspect state. One problem with such sampling is that the activity which is detected may not have come from the suspect state, but from a more distant one.

...it is relatively easy for a small, covert facility to minimise liquid run-off, and in dry areas there may not be sufficient rain to wash out and concentrate material that settles out from the atmosphere... Effective air monitoring requires a great many stations...Hence air monitoring can be quite expensive.\(^{23}\)

Nevertheless, as one official recently noted:

...it seems very unlikely that, even with such countermeasures, over a period of time, all indicative emissions from facilities can be prevented.\(^{24}\)

Other ‘cues’ that a state was building nuclear weapons might include:

- intelligence provided to the IAEA by nuclear supplier states\(^{25}\) that a potential proliferator state was seeking to acquire weapons-relevant materials or technologies;
- national intelligence assessments based on NTM or human intelligence provided to the IAEA by member states;
- citizen ‘whistle-blowing’ from within the proliferator states (see above).

Any suspicious data could provide the basis for ‘special’ or ‘challenge’ inspections of the locality in question by the IAEA, or what other inspection body may have been set up under the terms of the disarmament treaty.

There can be no guarantees that a 100 per cent detection rate of clandestine facilities could ever be achieved. But this is not the point. Deterring would-be proliferators requires first, that there is some reasonable probability that the cheating will be detected, and second, that its revelation will incur very considerable costs.\(^{26}\)

It is impossible to determine in the abstract how would-be proliferators would weigh the costs and benefits of nuclear acquisition. As a 1993 US Office

\(^{23}\) Office of Technology Assessment, *Environmental Monitoring for Nuclear Safeguards*, Congress of the United States, Washington DC, September 1995, p. 7. This is the most up to date and comprehensive overview of environmental monitoring for nuclear safeguards in the public domain.

\(^{24}\) Ibid. p. 420.

\(^{25}\) Supplier states have cooperated in the Zangger Committee and the Nuclear Suppliers Group to produce ‘trigger lists’ of sensitive items to be monitored.

\(^{26}\) In some cases desperation may impel political leaders to seek nuclear weapons almost without regard to the risks of getting caught. That of course is a risk that the international community already faces under the NPT regime.
of Technology Assessment report put it: ‘Inevitably, judgments on these matters will be complex, subjective and open to debate: no conclusive technical criteria will be possible’.27

‘Breakout’ risks III: civilian fissile material inventories

A third source of ‘breakout’ concern lies with the large and rapidly growing inventory of weapons-useable plutonium, mostly from civilian power reactors. According to one recent estimate, between 300 and 550 tons of separated plutonium will have been produced from nuclear waste from civilian reactors by 2010.28 This is approximately twice the amount of plutonium currently contained in the world’s nuclear arsenals.29 Only a small percentage of this plutonium will be disposed of by being blended with uranium to make mixed-oxide fuel (MOX) and ‘burned’ in light-water reactors.

Concern about civilian plutonium stocks arises because, contrary to some claims, so-called reactor-grade plutonium can be used to make nuclear weapons. In 1994, a US National Academy of Sciences report noted that, ‘virtually any combination of plutonium isotopes can be used to make a nuclear weapon’.30 Reactor-grade plutonium is more difficult and dangerous to work with than weapons-grade plutonium. It is also susceptible to premature initiation of fission and has a lower and less reliable yield than a comparable quantity of weapons-grade plutonium. For these reasons it has not been the preferred material for making nuclear weapon in the past. But this is not the point. A state which was seeking to ‘breakout’ of a Nuclear Weapons Convention would clearly prefer reactor-grade plutonium that could be used to make simple bombs to no plutonium at all.


28 See M. Kalinowski et al., ‘Cutoff of Nuclear-Weapons-Useable Materials’ in Beyond the NPT: a Nuclear-Free-World, a report prepared for the 1995 NPT Extension Review Conference, by the International Network of Engineers and Scientists Against Proliferation, April 1995, p. 81. These figures assumed that the construction of reprocessing facilities proceeded according to plans then current. The estimate of the stock of unseparated plutonium in 2010 was some 2200 tons.


30 References to the Academy of Sciences Report and to other authoritative sources are found in Kalinowski et al., ‘Cutoff of Nuclear-Weapons-Useable Materials’, p. 88.
Civilian stocks of HEU are of lesser proliferation concern than plutonium for a number of reasons. First, the quantities are much smaller. In 1994, there were only about 20 tons of HEU, which is used as fuel in civilian research reactors, compared with some 180 tons of separated Pu, and some 960 tons of unseparated Pu. Second, HEU stocks are shrinking rather than growing as a result of international efforts to convert HEU-fuelled research reactors to use low-enriched uranium. Third, not only are HEU stocks much smaller than separated Pu stocks, but in making nuclear weapons of the same yield, approximately three times as much HEU is needed as weapons-grade Pu.  

There is little doubt that the rising civilian stockpile of fissile material is a source of proliferation concern. William Dircks, Deputy Director General of the IAEA, argued in 1992 that, ‘the excess of isolated fissile material from civilian nuclear programs poses a major political and security problem worldwide’.  

President Clinton has also warned about the risks of civilian plutonium. In October 1993, he stated: ‘Its continued production is not justified on economic or national security grounds, and its accumulation creates serious proliferation and security dangers’.  

The central concern here is not that fissile material might be diverted during the production process, which has been the traditional focus of IAEA

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31 The IAEA claims that some 8 kgs of Pu is needed to form a ‘significant quantity’ (the minimum amount for a simple nuclear device) compared with 25 kgs of HEU. As the level of enrichment declines the amount of uranium needed for a critical mass increases. See IAEA Information Circular No. 153 (INFCIRC/153), International Atomic Energy Commission, Vienna, June 1972 and Carson Mark et al., ‘Can Terrorists Build Nuclear Weapons?’ in eds P. Leventhal and Y. Alexander, Preventing Nuclear Terrorism: The Report and Papers of the International Task Force on the Prevention of Nuclear Terrorism, Lexington Books, Lexington MA, 1987, p. 56. Other analysts point out that nuclear weapons can be made with smaller quantities of fissile material, although the engineering task becomes somewhat more demanding.


34 This is not to say that traditional verification issues are unimportant. Safeguarding new plutonium production and separation facilities and large Pu stockpiles will
safeguards activities, but that states which possess civilian plutonium might simply withdraw from the Nuclear Weapons Convention and use their fissile material quite openly to make nuclear weapons. There would unlikely to be any legal barrier to such a course of action since any treaty banning nuclear weapons would, like the Nuclear Non-Proliferation Treaty, almost certainly contain a clause permitting states to withdraw if they perceived their ‘supreme national interests’ to be jeopardised.  

States that have both the technical expertise to make nuclear weapons and large stockpiles of plutonium are sometimes called ‘virtual’ nuclear weapons states. They are able to ‘go nuclear’ far more quickly than states which would have to produce fissile material from scratch.

In a world in which nuclear weapons had been banned, but in which large quantities of civilian fissile material remained under national control, the current global division of nuclear weapons states and non-nuclear weapons

create growing difficulties for an already over stretched IAEA. As a US Office of Technology Assessment report on IAEA Safeguards noted:

To date, the IAEA has not considered the possibility that it may be unable to safeguard effectively large facilities such as the Rokkashomura reprocessing plant now under construction in Japan, but neither has it been able to demonstrate that it can.

See Report Brief: Nuclear Safeguards and the International Atomic Energy Agency, Office of Technology Assessment, Washington DC, 18 July 1995. The problem here is that there are inherent measurement uncertainties associated with IAEA safeguarding of nuclear fuel reprocessing plants. This means that very small percentages of plutonium could in principle be diverted during reprocessing without detection. In large reprocessing plants such diversion could over a period of some years provide enough fissile material for many nuclear weapons.

Some disarmament advocates will argue that such a ‘let out’ clause is undesirable. The problem is that it is likely to be impossible to gain agreement for a NWC without a withdrawal clause. If other treaties are any guide it will be left to the withdrawing state to define what it is that constitutes threats to ‘supreme national

On the concept of the ‘virtual’ nuclear weapons state, see Roger C. Molander and Peter A. Wilson, The Nuclear Asymptote: On Containing Nuclear Proliferation, MR-214-CC, RAND/UCLA Center for Soviet Studies, 1993. The term ‘virtual nuclear state’ is also used to describe the situation in which an existing nuclear weapon state has separated the warheads of its nuclear weapons from their launchers and possibly removed the fissile material from the warheads to secure storage as well. The point of such an exercise is to enable reconstitution relatively swiftly if the global abolition treaty should break down.
states would be replaced by a new division between ‘virtual’ nuclear ‘have’ and ‘have-not’ states.

The risk of ‘breakout’ using civilian fissile material would be eliminated if all fissile material production (including civilian Pu) were ceased and existing stockpiles destroyed. The simplest way to do this would be via the Comprehensive Cut-off Convention proposed by some arms control advocates. This is a far more radical policy than the limited cut-off proposal currently under discussion at the Conference on Disarmament.\footnote{Proponents of a comprehensive ban on fissile material argue that existing Pu stocks could be mixed with high-level radioactive wastes, vitrified and disposed of, or mixed with low-enriched uranium to form MOX fuel and ‘burned’ in power reactors. HEU stocks could simply be diluted to a safe level and used as reactor fuel. HEU and Pu production facilities would, of course, be closed.\footnote{A Comprehensive Cut-off Convention is currently unacceptable to states which have made major investments in the plutonium fuel cycle. Russia and Japan, for example, continue to view plutonium as a potentially valuable long-term energy resource, even though it is currently far more expensive than low-enriched uranium as a source of reactor fuel.\footnote{A Comprehensive Cut-off Convention is not, however, the only way to remove fissile material stocks from national control. One obvious alternative, which would continue to permit the use of fissile material for civilian purposes, would be the creation of an international fissile material storage and control regime. Such a regime could remove all civilian fissile material in excess of current fuel-cycle requirements from national control. There is provision for such a regime in Article XII.A.5 of the IAEA Statute which has a clause stating that the Agency has the right to approve a system requiring that fissionable materials in excess of the needs of member states be deposited with}}

37 Such a convention might also include a ban on tritium production. Although tritium is not a fissile material it is used in nuclear weapons to boost their yield. See Kalinowski et al., ‘Cutoff of Nuclear-Weapons-Useable Materials’, p. 83. One problem with a global ban HEU is that it would create a major problem for navies which deploy nuclear-powered submarines since these HEU as reactor fuel.

38 There is a range of other disposal techniques which can be used. See Kalinowski et al., ‘Cutoff of Nuclear-Weapons-Useable Materials’, p. 108.

39 Achieving a ban on uranium enrichment above the critical 20 per cent level would be less difficult.
the Agency. The stored material would be returned to member states for legitimate energy purposes as needed.

Concern about the risks of civilian fissile material was the major stimulus for the various International Plutonium Storage (IPS) proposals of the 1970s and early 1980s. But all such proposals were rejected by states which had embarked on plutonium cycle programs. A recent report by the Dutch government outlined various options for International Plutonium Management—a somewhat broader concept than international storage.

One of the more radical options suggested giving the IAEA veto power over particular uses of the plutonium; another went further and proposed that the IAEA take physical charge of the stockpiles. The Dutch government considered both options too radical to be acceptable in the current political climate. Its assessment was almost certainly correct.

From a proliferation perspective, the various management proposals suffer from a number of drawbacks compared to a comprehensive cut-off. First, under most of the proposed regimes, the plutonium would remain within the state which produces it—allowing physical access. Second, if plutonium were to be removed to international storage overseas there would be risks associated with transportation.

Third, there is no consensus as to what constitutes ‘surplus’ or ‘excess’ amounts of plutonium relevant to ‘current needs’. Current discussions on plutonium security within the IAEA and elsewhere tend to focus on relatively modest transparency measures. There are good reasons to support increased transparency measures, like the proposed International Plutonium Registry, which would include currently unsafeguarded material held by the NWS. But while such measures may be important

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41 See Rioux, ‘Options for the Management of Highly Fissionable Civilian

42 These could include hijacking of Pu shipments—a source of some concern with the shipment of plutonium from France to Japan.

building-blocks towards an effective control regime, they cannot in themselves provide any real protection against ‘breakout’.

It seems clear that major changes in the attitudes of states still committed to the plutonium economy will be needed before either a comprehensive cut-off ban or an effective international plutonium management regime can be put in place. Such a shift in opinion may be facilitated by the fact that there appears little likelihood that the economics of either fast-breeder reactors, or of using plutonium mixed with uranium as fuel for light-water reactors will improve in the foreseeable future. Enthusiasm for the plutonium economy has declined rapidly over the past two decades and what is currently politically impractical may not be so some years hence.

‘Breakout’ risks IV: nuclear terrorism

A denuclearised world would certainly make the acquisition of nuclear weapons by terrorists more difficult than is currently the case. The implementation of a Nuclear Weapons Convention and its associated verification/safeguards regime would considerably reduce the ‘loose nukes’ problem in the states of the former Soviet Union. These states are currently seen as the most likely source of fissile material for terrorist organisations and a possible source of supply for so-called ‘rogue’ states, like Iraq and Libya.

If an effective Comprehensive Fissile Material Cut-off Convention were in place in addition to a Nuclear Weapons Convention, there would be no known sources of unseparated plutonium or high-enriched uranium which could be illicitly diverted to terrorist groups. A Nuclear Weapons Convention would also greatly strengthen the global norm against the possession and use of nuclear weapons—even for terrorists.

Moreover, terrorist organisations do not have the scientific, technological, material or financial resources necessary to produce fissile material. Creating fissile material requires either a large uranium enrichment program, or the construction of both a nuclear reactor and a reprocessing plant to extract the Pu from the spent reactor fuel. The costs of such programs are measured in hundreds of millions of dollars, and their creation would almost certainly require the acquiescence, if not outright cooperation, of the government of the country in which they were to be built. Moreover, as argued earlier, the production of fissile material is vulnerable to remote detection. It is noteworthy that the long and exhaustive report of the 1985 International Task Force on the
Prevention of Nuclear Terrorism did not even consider the possibility that terrorists might seek to produce their own fissile material.\textsuperscript{44}

The 1985 Task Force did, however, state that if terrorists had the fissile material and the necessary expertise they would be able fabricate a crude bomb. The weapons designers on the Task Force concluded that a crude nuclear device ‘could be constructed by a group not previously engaged in designing or building nuclear weapons, providing a number of requirements were adequately met’.\textsuperscript{45} Such a weapon could be carried in a truck; a more sophisticated device could be carried in the trunk of a standard car. Neither terrorists nor renegade states would need sophisticated delivery systems (for example, long-range ballistic or cruise missiles, or strike aircraft) to explode nuclear weapons on an adversary’s territory. One possible delivery platform would be a commercial container in a merchant ship flying a flag of convenience.

The fact that it might \textit{in principle} be possible for a terrorist group to make nuclear weapons does not, however, mean that all such groups could in fact do so. There are a number of engineering problems and potential hazards involved in bomb-making which some terrorist organisations might well be unable to overcome.

The only way that terrorists could acquire fissile material would be either to steal it, or to buy material illicitly acquired by others. While this might, as argued above, be much more difficult once a Nuclear Weapons Convention and a Comprehensive Fissile Material Cut-off Convention were in place, the material could be acquired well before either treaty were signed and implemented. So the issue of illicit acquisition remains relevant to ‘breakout’, not only for terrorist organisations, but also for proliferator states which cannot create their own fissile material.

During the past several years there has been growing concern that fissile material could be illicitly acquired in either Russia or from one of the other Soviet successor states, smuggled out and sold to terrorist organisations or ‘rogue’ states. The reasons for this concern are obvious.

The ending of the Cold War led to the collapse of tight authoritarian control in the states of the former Soviet Union, the rapid decline of their economies and the immiseration of thousands of nuclear scientists, technologists and other workers with access to stocks of often poorly safeguarded

\textsuperscript{44} See Leventhal and Alexander, eds, \textit{Preventing Nuclear Terrorism}.

\textsuperscript{45} See J. Carson Mark et al., ‘Can Terrorists Build Nuclear Weapons?’ in eds Leventhal and Alexander, \textit{Preventing Nuclear Terrorism} p. 60.
fissile material. According to one report, some 600,000 Russian scientists left their employment between January 1991 and June 1992.\footnote{46} Many scientists and engineers ‘now work at menial jobs and barely eke out a living’.\footnote{47} Those who remain employed have seen both their salaries and savings cut by rampant inflation. Military research institutes have been particularly badly hit since defence spending has been cut dramatically, and institute researchers ‘are often not paid for months at a time and their skills are of little value’.\footnote{48}

In such a context, and given the deep disillusion with government, the rise of organised crime and the new freedom to travel both at home and abroad, it is not surprising that some unscrupulous and/or desperate individuals should have sought to improve their lot by selling nuclear weapons secrets or materials. The Russian Mafia, which plays an increasingly important role in the national economy, and which has close ties with corrupt elements in the government and the military, is an obvious conduit to potential foreign buyers.

Moreover, control over nuclear materials is complicated by the fact that different ministries are responsible for nuclear materials in Russia and some have more lax material accountancy and safeguards standards than others.\footnote{49} Indeed, in some Soviet successor states, materials accountancy has been so lax that ‘it is probably impossible at the present time to distinguish between “material unaccounted for” (MUF) and material that has been stolen’.\footnote{50}

Transporting stolen fissile material out of Russia and/or other Soviet successor states has been made easier by increasingly porous borders and by official corruption.

\footnote{46} The report was entitled \textit{The Russian Brain Drain in Perspective}. It was written by Sarah Helmstadter and published by the Radio Free Europe and Radio Liberty Research Institute. It is cited in Dorothy S. Zinberg, \textit{The Missing Link? Nuclear Proliferation and the International Mobility of Russian Nuclear Experts}, United Nations Institute for Disarmament Research, Geneva, August 1995, p. 44.

\footnote{47} Ibid. p. 3.

\footnote{48} Ibid. p. 3.


\footnote{50} Potter, ‘Nuclear Proliferation Challenge’, p. 164.
But despite alarmist media coverage,\textsuperscript{51} there have thus far been no seizures of smuggled weapons-grade fissile material in quantities large enough to make a nuclear weapon. In fact, much of the smuggled nuclear material has no relevance to the manufacture of nuclear weapons at all. But there remain several reasons for concern. First, a greater percentage of recently captured materials contains plutonium or highly enriched uranium than was previously the case. Second, the rate of intercepting smuggled nuclear material increased in the early to mid-1990s and may still be increasing. According to West European intelligence, there were 53 incidents in 1992, 53 in 1993 and 124 in 1994.\textsuperscript{52} Third, the intercepted material may only be the ‘tip of the iceberg’. If nuclear smuggling is anything like drug smuggling, only a percentage of the smuggled material will be intercepted. As William Potter has pointed out, ‘one cannot dismiss the possibility that large quantities of weapons-grade fissile material have been diverted’.\textsuperscript{53}

The emigration of nuclear scientists and engineers is one obvious way for nuclear secrets to get to countries and/or organisations of proliferation concern. In Russia there are still controls on overseas travel for individuals with access to state secrets, but according to Sergei Karaganov, Director of the Moscow Institute for International Relations, Russian scientists and engineers are already working for North Korea and other states.\textsuperscript{54} However, this claim, like so many others in this somewhat murky area, remains unsubstantiated. Travel overseas is not, of course, necessary to pass on nuclear weapons secrets. Media reports have claimed that Russian scientists are selling nuclear weapons expertise to countries like Iran and North Korea via the Internet.\textsuperscript{55}

\textsuperscript{51} See, for example, ‘Nuclear Terror for Sale’, \textit{Time}, 29 August 1994.

\textsuperscript{52} See Zinberg, ‘The Missing Link’, p. 6. It is never clear in such cases whether the increase in arrests is a function of increased smuggling or better intelligence and detection. Russia’s Interior Minister has claimed that the incidence of nuclear theft has decreased in Russia. See \textit{Nuclear Proliferation News}, no. 135, 26 October 1995, p. 15.

\textsuperscript{53} Potter, ‘The Nuclear Proliferation Challenge’, p. 164.


The US Nunn-Lugar Cooperative Threat Reduction (CTR) program was created in part to address the ‘loose nukes’ problem. Hundreds of millions of dollars are being provided by the United States to improve nuclear materials accountancy and storage, and make nuclear weapons and their components more secure. The US is also providing funding for the International Science and Technology Center (ISTC) in Moscow which supports work on non-military projects for scientists previously engaged in work on weapons of mass destruction. Thus far, ISTC has approved 140 projects involving some 8200 scientists and engineers.\footnote{General Accounting Office, ‘Weapons of Mass Destruction: Reducing the Threat from the Former Soviet Union: an Update’, Letter Report, 06/09/95, GAO/NSIAD-95-165, p. 19. Some scientists receiving ISTC funding are continuing to work on weapons projects, however.}

The long-term effect of this far-sighted program will be to help reduce the risks of illegal diversion and smuggling. However, a large part CTR funding goes, or will go, towards assisting the Soviet successor states with dismantling missiles, bombers and submarines and dealing with chemical weapons stockpiles. These activities, while important, are of little or no relevance to the smuggling problem. Moreover, as a 1995 General Accounting Office report on the CTR noted, ‘the CTR program has made little progress in protecting material that presents a proliferation risk’.\footnote{Ibid. p. 29.}

Whatever its difficulties, the Cooperative Threat Reduction program represents an innovative and constructive, if under-funded, approach to the ‘loose nukes’ problem in the Soviet successor states. Unfortunately it is under attack both in the United States and Russia. Russian nationalists see the CTR as part of a US plan to disarm Russia; US critics ask why the US should ‘bribe’ the Soviet successor states to comply with arms control treaties which they are legally obliged to comply with anyway.

In considering the problem of terrorist acquisition of nuclear weapons it is important to consider motives as well as opportunities. Terrorist organisations may not in fact see the acquisition of nuclear weapons as being in their strategic interest. There have been a few reports of terrorist interest in acquiring nuclear weapons,\footnote{Italian Red Brigades terrorists reportedly interrogated a kidnapped Italian general about NATO nuclear weapons locations and maps of nuclear storage sites were found on apprehended German Red Army Faction terrorists. See Senator Jeremiah Denton, ‘International Terrorism—the Nuclear Dimension’ in eds Paul Leventhal} but in general, as Brian Jenkins has argued:...
...terrorists want a lot of people watching, not a lot of people dead. Terrorists operate on the principle of the minimum force necessary. They find it unnecessary to kill many, as long as killing a few suffices for their purposes.\textsuperscript{59}

Moreover, if terrorist organisations did wish to kill on a mass scale, biological, and even chemical, weapons would be a more rational choice than nuclear weapons, since they are both simpler and less expensive to make. Yet, with the recent exception of the use of sarin gas by the Aum cult in Japan, resort to weapons of mass destruction by terrorists is virtually unknown.\textsuperscript{60} Not least of the reasons for this may be that terrorists, like other members of the international community, are influenced by the very strong global norms against weapons of mass destruction:

...the actions of even those we call terrorists are limited by self-imposed constraints that derive from moral considerations...Many terrorists consider indiscriminate violence to be immoral. They regard the government as their opponent, not the people.\textsuperscript{61}

Even terrorists who felt no moral qualms about resorting to weapons of mass destruction might be restrained by the political revulsion and odium

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\textsuperscript{59} Brian M. Jenkins, ‘Is Nuclear Terrorism Possible?’ in eds Leventhal and Alexander, \textit{Nuclear Terrorism}, p. 28.

\textsuperscript{60} Other examples of non-state terrorists using weapons of mass destruction are difficult to find. According to one source there have been ‘several’ instances of chemical and biological terrorism which led to fatalities. This is negligible compared to the violence caused with conventional weapons. See Rapporteur’s Summary, in eds Leventhal and Alexander, \textit{Nuclear Terrorism}, p. 13.

\textsuperscript{61} Ibid. p. 29.
which would result from their use, since this could undermine support for their cause.\textsuperscript{62}

The global norm against nuclear use is powerful, but currently nuclear weapons gain some legitimacy from the fact that the major powers not only possess them, but also claim that they are a force for world peace. The creation of a denuclearised world would negate this argument and further delegitimise nuclear weapons. This would, in turn, further decrease their political utility for terrorist organisations and thus reduce the incentive to acquire them.

Finally, and most importantly, however much the international community is concerned about nuclear terrorism, it should be evident that maintaining nuclear arsenals cannot help to resolve the problem. Terrorists operate from hiding; unlike states, they do not normally present a target for military action. If their presence were to be revealed, they might indeed become military targets, but not for nuclear weapons.

State retention of nuclear weapons is more likely to increase rather than decrease the risks of non-state nuclear terrorism, and nuclear weapons have no utility should prevention strategies fail. Thus concern about the dangers of nuclear terrorism cannot, in itself, possibly be an argument against global nuclear disarmament.

\textit{Dealing with ‘breakout’}

What options would the international community have in dealing with cases of nuclear ‘breakout’? One possibility, which has been canvassed by a number of analysts, would be to create a UN-controlled nuclear force which could only be used in response to nuclear use (not revelation of possession) by a ‘breakout’ state.\textsuperscript{63} Nuclear retaliation by the United Nations would require authorisation

\textsuperscript{62} There is considerable evidence for the thesis that terrorists generally do not want large numbers of people dead. Writing in 1985, Jenkins pointed out that less than 1 per cent of the thousands of terrorist incidents which had taken place in the previous two decades involved ten or more fatalities, while only a handful of terrorist acts since the turn of the century had caused the deaths of more than a hundred people. Ibid. p. 29.

by all of the Permanent Members of the UN Security Council (UNSC), and the support of the majority of the Council as a whole.\textsuperscript{64}

The point here would be to have multi-nation control over firing authorisation of nuclear missiles. The platforms that carried the nuclear weapons could remain under national control. American submarines might carry the missiles, for example, without the US being able to fire them independently. Unauthorised launchings could be prevented by emplacing Permissive Action Links\textsuperscript{65} on the missiles. Launch authorisation would be ‘multi-key’ and would require receipt of authorisation codes from all the permanent members of the UNSC.

Such an International Nuclear Deterrent Force (INDF), as it has recently been labelled\textsuperscript{66} would have obvious limitations. Gaining consensus to use nuclear weapons among a diverse body of states would not be easy; if a Permanent Member of the UNSC were the violator it would be impossible. This, however, may be less of a problem than critics believe since, as will be argued below, there will be few strategic incentives for major powers to seek to re-acquire nuclear weapons in a non-nuclear world.

The fact that it could be very difficult to gain multi-nation consent to authorise nuclear use is wholly appropriate. It should be difficult to authorise such use. It is true that a ‘breakout’ state contemplating the use of nuclear weapons would be aware of the political constraints on INDF retaliation, but unless such a state is a permanent member of the UNSC it could not be certain that there would not be nuclear retaliation. In such uncertainty lies deterrence.

An INDF should not be seen as a permanent fixture of the global security system, but rather as a final stage in the move towards a completely nuclear-free world. This is not least because other means of deterring and dealing with nuclear ‘breakout’ may be more efficacious in the long-term than countervailing nuclear deterrence.

\textsuperscript{64} I assume that by the time a Nuclear Weapons Convention were to be in place, the permanent membership of UNSC would be more representative of the international community than it is today.

\textsuperscript{65} PALs are currently not fitted on US submarines, although they are on other strategic weapons.

The issue of motives is critical. As the Office of Technology Assessment report, *Proliferation of Weapons of Mass Destruction: Assessing the Risks*, points out:

Ultimately nonproliferation policies will have to find ways of showing leaders still desiring weapons of mass destruction either that their goals can be met in other ways or that the price of the weapons route is too high.67

What incentives would states have to ‘breakout’ of a Nuclear Weapons Convention? Clearly some of the current motives for nuclear acquisition would no longer apply.

- In a denuclearised world, states would no longer need nuclear weapons to deter the nuclear arsenals of other states—which is their most important function today.
- Global and regional influence would no longer be a motive for acquiring nuclear weapons. If nuclear weapons were legally and normatively proscribed for all states, ‘breakout’ would attract international odium, not prestige or influence.

But other current motives to acquire nuclear weapons would remain. Perhaps the most important of these would be the incentive for small and medium powers to acquire or maintain nuclear weapons as ‘strategic equalisers’ in confrontations with conventionally more powerful adversaries.68 Historically this has been an important acquisition motive for a number of states. Israel, for example, originally sought nuclear weapons because of the quantitative military imbalance between itself and its Arab enemies. North Korea wanted nuclear weapons in part because it was rapidly being overtaken militarily by South Korea. Taiwan’s repeated attempts to acquire nuclear weapons

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68 The more militarily powerful states are, *ceteris paribus*, the better they are able to defend themselves with conventional weapons. Indeed the US, the world’s most powerful state, has greater geostrategic interest in genuine nuclear disarmament than any other state. Currently the US can be effectively destroyed as a functioning society by the four other declared nuclear powers. In a nuclear-free world these threats would no longer exist while the US would retain unchallenged conventional military hegemony.
technologies\textsuperscript{69} were prompted not only by the desire to have a countervailing deterrent against China’s nuclear arsenal, but also to create an ‘equaliser’ to the potential threat from China’s huge conventional forces.

The issue of states which perceive themselves to be so threatened by powerful adversaries that they might feel impelled to ‘breakout’ from a Nuclear Weapons Convention is important and needs to be addressed.\textsuperscript{70} But while the problem is real, it should not be exaggerated, since it currently affects only a tiny handful of states.

It is also important to remember that the problem of small would-be proliferator states seeking nuclear ‘equalisers’ exists whether or not there is a Nuclear Weapons Convention in place. North Korea and Iraq are obvious recent cases in point. Yet no serious analysts believed that the use or threatened use of nuclear weapons would have been an appropriate response to the North Korean nuclear crisis. The case of Iraq is more ambiguous, many analysts claim that implied US nuclear threats dissuaded Saddam from using chemical weapons. A comprehensive recent analysis of these claims has raised serious doubts about their veracity,\textsuperscript{71} but even if one accepts that nuclear weapons may be effective in certain contexts, the particular benefit has to be set against the overall costs and risks of nuclear retention.

If there were no other strategies for seeking to prevent the small state ‘breakout’ problem, the case for retaining nuclear weapons would be strengthened. In fact there are many such strategies. Preventive strategies include various arms control options\textsuperscript{72} and positive and negative security assurances.\textsuperscript{73}

\textsuperscript{69} President Lee admitted in 1995 that Taiwan had sought to acquire nuclear weapons in the past.

\textsuperscript{70} It should also be noted that the withdrawal of the US ‘nuclear umbrella’ from states like South Korea and Japan will almost certainly increase their sense of vulnerability. This problem should not be exaggerated however. Washington has promised North Korea that, once it comes into full compliance with IAEA safeguards, the US will undertake not to use or threaten to use nuclear weapons against it. This means in effect that the US ‘nuclear umbrella’ will no longer protect South Korea from conventional threats from the North. Yet South Korea has not sought to compensate itself for this anticipated removal of US nuclear protection by acquiring its own nuclear weapons.


\textsuperscript{72} Arms control solutions would include reducing the threatening force imbalance to the point where the threatened state no longer felt the need to acquire a nuclear weapons.
Where prevention fails sanctions, including military sanctions, can be employed.74

One of the most important tasks for proponents of abolition is to demolish the illusion that the possession of nuclear weapons is a guarantee against conventional attack. The historical evidence demonstrates that it is not. US nuclear weapons did not prevent Vietnamese revolutionaries from attacking US forces in the Vietnam war, nor did they deter China from attacking the US during the Korean war. Israeli nuclear weapons did not deter Egypt from attacking Israel during the Yom Kippur War, Russian nuclear weapons did not deter the Afghan resistance, nor did they prevent a Russian defeat., and British nuclear weapons did not dissuade Argentina from invading the Falkland Islands.

Finally, there is the question of aggression. What are the risks that states would pursue a ‘breakout’ strategy, motivated not by the sort of defensive concerns as discussed above, but because they harboured aggressive designs against other states? This pervasive concern has frequently been invoked as a reason to reject nuclear disarmament. But it focuses on a problem which is of rapidly declining importance.

Cross-border aggression is now the exception rather than the rule. In 1995, for example, out of some 30 ‘major armed conflicts’ (defined as those in which there have been 1000 or more combat-related deaths), none were interstate wars. The wars of the end of the twentieth century are overwhelmingly civil wars in which nuclear weapons can have no conceivable role.

‘equaliser’. This could be achieved either by force reductions, or by a shift in force posture so that both sides deployed non-threatening defensively oriented forces.

Positive security assurances are essentially promises to aid states which are attacked or threatened with attack. Negative security assurances are essentially promises not to attack, or threaten to attack, other states. They include various non-aggression pacts and the sort of qualified assurance provided by the US in 1978 to the effect that it would not use nuclear weapons against any non-nuclear state party to the NPT unless such a state was (a) allied to another nuclear weapons state, and (b) had attacked the US or one of its allies.

The crises in Bosnia and Rwanda have indicated that when the vital interests of the major powers are not perceived to be threatened, as they were by Iraq’s invasion of Kuwait, it is extremely difficult for the UN to gain member state support for peace-enforcement operations. This is likely to remain a major problem. But collective security does not necessarily require military action, sanctions are an alternative response and one which the UN finds politically much easier to apply.
The declining incidence of major interstate war is not accidental, it arises partly from changes in the structure of nation states and the international system, and partly from a change in international norms regarding the appropriateness of war as a means of dealing with conflict. The salient factors include:

- The increasing interdependence and enmeshment of today’s industrial economies makes even conventional war hugely costly for the aggressor, as well as the victim.\(^{75}\)

- War has, in general, ceased to be an efficacious way for states to increase their wealth. When land and raw materials were keys to wealth creation, conquest made economic sense. Today states get rich by increasing domestic productivity and foreign trade, not by seizing land and/or raw materials.\(^{76}\) Thus, much of the traditional economic rationale for aggression has disappeared.

- One of the strongest findings in international relations research is that democracies do not go to war against each other. Though the thesis is not uncontroversial,\(^ {77}\) it suggests that as the number of democracies continues to spread, the risk of interstate war may decline still further. In 1992, for the first time, a majority of states in the international system had democratic forms of governance.

- The phenomena of hyper-nationalism and of state ideologies which glorify war and martial virtues have, at least in the industrialised economies, disappeared almost completely.

- In the international community the resort to war is no longer seen as an appropriate form of state behaviour except in the most extraordinary circumstances. War *per se* is proscribed; only when resort to arms is in self-defence is it perceived to be legitimate. The contrast with previous eras is marked.

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\(^{75}\) Note it is not being argued here that interdependence is a necessary or sufficient condition for peace. There have been numerous examples of interdependent states being involved in war. What is being argued is that *on balance* interdependence generates more powerful incentives to avoid war than to wage it.

\(^{76}\) Iraq’s invasion of Kuwait is a recent exception to this rule.

\(^{77}\) While few dispute the finding that democracies generally do not fight each other, there is much less consensus as to why this should be the case. For a balanced assessment of the various arguments see James Lee Ray, *Democracy and International Conflict*, University of South Carolina Press, Columbia, 1995.
Two further points need to be made. First, it may well be the case that the conditions noted above interact synergistically—that is, that the whole is greater than the sum of the parts. Second, none of the above observations means that interstate war is impossible, simply that its costs have increased and its benefits have decreased. As the incentives to wage war decline, lower levels of deterrence will suffice and the case for the ‘ultimate deterrent’ will become ever less compelling.

Is the worst case really so bad?

A central concern of opponents of nuclear abolition is that they would be defenceless in the face of a successful ‘breakout from global disarmament regime and at an extreme strategic disadvantage vis a vis their nuclear-armed adversary. Yet the idea that nuclear monopoly is of great military utility, while superficially plausible, needs careful critical scrutiny. The United States was the sole nuclear power from 1945 until the first Soviet nuclear test in 1949, but derived little if any strategic benefit from this fact. Indeed, sole US possession of the ‘ultimate deterrent’ in this period did nothing to prevent the greatest expansion of Soviet control over neighbouring states in the entire Cold War period. Moreover, since the global norm against nuclear use is stronger today than it was in the immediate pre-World War II period, and since it would be stronger still with a global ban on nuclear weapons in place, the constraints on the ‘breakout’ state actually using its weapons would be very considerable. The fact that a regime has the physical capability to commit nuclear mass murder does not mean that it has political and moral capability to do so.78

A second point to note is that the nuclear monopoly gained by ‘breakout’ would almost certainly be short-lived. Threatened states would likely either reconstitute previously dismantled nuclear weapons programs, or start new programs from scratch.79

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79 If the separation of civilian plutonium had not been banned under a Comprehensive Fissile Material Cut-off Convention it could be used to make nuclear weapons. If such a ban were in place the quickest route would probably be to set in motion a crash program to build a reprocessing plant and to use spent fuel from a light-water reactor operated at a fast burn-up rate to produce Pu which was optimised for weapons use.
Reversion to a partially re-armed nuclear world, though highly undesirable, would be no more dangerous than the current situation. Indeed, in some ways it would be less so, not least because the relatively small numbers of weapons would mean that the costs of a nuclear exchange would be far less than would be the case with today’s huge arsenals.  

**Conclusion**

Concern about ‘breakout’ has been a major reason why states have refused to countenance complete nuclear disarmament. Yet examination of a range of possible scenarios has demonstrated first, that the incentives for states to ‘breakout’ of a global abolition regime are less than is often assumed. Second, that attempting ‘breakout’ involves real risks of being caught. Third, that being caught would likely involve severe penalties. Fourth, that in the worst-case scenario where a ‘breakout’ state actually achieved a nuclear monopoly, it would have less strategic value than the conventional wisdom assumes. Fifth, that the dubious strategic advantage of monopoly would likely be short-lived since other states would institute crash programs to reconstitute their nuclear weapons arsenals. Sixth, that the retention of nuclear weapons is irrelevant to dealing with the problem of terrorist nuclear ‘breakout’. Seventh, that nuclear weapons are wholly irrelevant in intra-state wars, which constitute the overwhelming majority of ‘major armed conflicts’ in today’s world. Finally, and of perhaps greatest importance, is the fact that the changing nature of the international system has reduced the incentives for war between the industrialised states (the only ones capable of going nuclear) and has increased the prohibitionary norm against using nuclear weapons—the so-called ‘nuclear taboo’. The net consequence is that the need for an ‘ultimate’ deterrent and the risks of nuclear abolition have both declined.

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80 There would, however, be strategic stability risks with small numbers since disarming first strikes might be thought to be possible—and might therefore be attempted.

81 It is possible that the nuclear weapons states might only agree to a NWC which required them to dismantle, rather than destroy, their nuclear weapons, possibly placing the dismantled components and fissile material under international safeguards. In this case, reconstitution would be very rapid indeed. A variety of proposals have been made along these lines, See, for example, Michael J. Mazarr, ‘Virtual Nuclear Arsenals’, *Survival*, vol. 37, no. 3, Autumn 1995, pp. 7–26.
What all of this suggests is that, while the possibility of ‘breakout’ cannot and should not be ignored, neither its risks nor its potential costs constitute compelling reasons to reject global nuclear disarmament.
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