

Nuclear Risk Reduction: Looking Back, Moving Forward, and the Role of NATO

by Wilfred Wan

ABSTRACT

In a difficult geopolitical environment marked by increased tensions among nuclear-armed and nuclear-allied states, there has emerged an urgent and widespread call for the implementation of practical measures to reduce the risk of nuclear-weapon use – whether intentional or inadvertent. A concerted effort to take risk reduction forward must address the spectrum of use scenarios by drawing on past activities, building on existing agreements, and considering innovative approaches. NATO will have a key role to play, given the nuclear nature of the Alliance and the involvement of its members in strategic and regional competition. Alliance activities past and present can provide insight relevant to the development of multilateral risk-reduction measures. At the same time, in highlighting the dynamism and multi-faceted nature of risk, they underline the scale of the challenge ahead.

Arms control | WMD | Nuclear | NPT | NATO | Russia | Transatlantic relations

keywords

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Introduction

Recent years have seen the emergence of the topic of nuclear-weapon risk reduction on the agenda of several multilateral forums and state-led initiatives. This renewed sense of urgency on the part of the international community to enact measures that would reduce to a minimum the possibility of any use of nuclear weapons, intentional or inadvertent, appears linked to overriding concerns about the global state of affairs, which is marked by tense relations and the heightened possibility of conflict between some nuclear-armed and nuclear-allied states. Exacerbating such concerns is the continued centrality of nuclear weapons in the security strategies of these states. In addition, the nuclear arms control and disarmament architecture stands in a precarious state, with treaties falling by the wayside and the pace of post-Cold War reductions in global stockpiles stalled. Partly in response to these trends, a call is becoming widespread for practical risk-reduction action that can have immediate impact and can also facilitate the type of cooperation among states necessary to reinvigorate dialogue on nuclear arms control and disarmament.¹

The overall pool of potential measures that could contribute to risk reduction is large, including steps to improve the safety and security of nuclear weapons, lessen the risk of accidents, lower the possibility for miscalculation in a crisis and prevent terrorists from obtaining nuclear materials. Yet while there exists widespread support for the notion of reducing the risk of nuclear-weapon use in principle, complexities in and around the topic show no clear path forward.

¹ As expressed by the UN Secretary-General, *Securing our Common Future. An Agenda for Disarmament*, New York, Office for Disarmament Affairs, 2018, <https://www.un.org/disarmament/sg-agenda>.

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Any such risk reduction must now move forward in an environment marked by a general decline in cooperation and trust among some of the nuclear-armed states. Common understandings on risk reduction and related concepts remain absent. What constitutes an appropriate measure for some may for others increase risk by upending the credibility of nuclear deterrence, threatening strategic stability, or creating new forms of unhelpful nuclear ambiguity. Indeed, there is no objective notion of “risk” or “risk reduction”, with differing perspectives reflecting varied constituencies, priorities and strategic cultures. Moreover, risk itself is persistent and dynamic – and especially relevant here are developments across technologies and domains whose impacts are yet to be fully understood. Overall, limits to our knowledge with nuclear-weapon and related complex systems persist and are likely to grow, rendering risk assessment a “moving target”.

The factors outlined complicate the task of risk reduction, but must not prevent efforts in the arena. The nuclear nature of the North Atlantic Treaty Organisation (NATO), its centrality in the tense Euro-Atlantic region and its relations with the Russian Federation (intertwined with US–Russia strategic competition), make it a critical actor for future risk-reduction efforts. An examination of NATO’s activities past and present underlines the multi-faceted and complex nature of nuclear risk and, correspondingly, the promise and challenge of risk reduction.

1. The evolution of the debate

The following analyses centres on the risk of nuclear-weapon use. It employs a broad, qualitative approach focusing on the likelihood of a nuclear detonation event – as there exist significant barriers to precise quantitative calculations and assessments of such low-probability, high-consequence global catastrophic events (with risk being a function of probability and consequence).² Policy discussion on risk reduction is often shaped from national perspectives of risk. Accordingly, the scope of risk-reduction measures considered is wide, including steps taken to improve the safety and security of nuclear weapons, lessen the risk of accidents, lower the possibility for miscalculation in a crisis and prevent terrorists from obtaining nuclear materials.

1.1 Cold War origins

Recent attention on risk reduction can belie the fact that the topic has been a “central preoccupation” of leaders since the Cold War.³ The 1962 Cuban missile crisis provided a clear incentive for the United States and the Soviet Union to avoid the sort of brinkmanship that precipitated escalation and could result in

² See John Borrie, Tim Caughley and Wilfred Wan (eds), *Understanding Nuclear Weapon Risks*, Geneva, UNIDIR, 2017, <http://www.unidir.org/node/4252>.

³ Michael Krepon, “Is Cold War Experience Applicable to Southern Asia?”, in Michael Krepon (ed.), *Nuclear Risk Reduction in South Asia*, New York, Palgrave Macmillan, 2004, p. 8.

nuclear confrontation. Such concerns contributed to the deal to withdraw missiles from Cuba and Turkey in its immediate aftermath, as well as the establishment of a Moscow–Washington direct line. Later agreements – including on Measures to Reduce the Risk of Outbreak of Nuclear War (1971), Prevention of Incidents on and over the High Seas (1972), Nuclear Risk Reduction Centres (1987), Ballistic Missile Launch Notification (1988) and Prevention of Dangerous Military Activities (1989) – focused on closing pathways to accidental nuclear war, complementing the growing bilateral arms-control architecture.⁴

The experience in Cuba, alongside others in the 1960s (the Berlin wall crisis in 1961 and the invasion of Czechoslovakia in 1968), sparked action in NATO as well. In its 1967 Harmel Report, the Alliance invoked the possibility of crisis in elaborating a dual-track approach that for the first time added to its strong defence and deterrence posture a policy of détente that sought “a more stable relationship” with the East and called for “realistic measures” to that end.⁵ The cooperative approach laid the groundwork for a series of East–West initiatives intended to reduce the risk of confrontation, including the Strategic Arms Limitation Talks (SALT I 1969-1972 and SALT II 1972-1979); the Mutual Balanced Force Reduction Talks (1973-1989); the Multilateral Preparatory Talks (1972, and precursor to the 1973 Conference on Security and Cooperation in Europe); and the consequent Helsinki Final Act (1975).⁶ As with the bilateral agreements, even though the use of nuclear weapons was not explicitly mentioned in many of the texts, the spirit of such measures, centred on restraint in conduct as well as information exchange, aimed at “reducing the dangers of armed conflict and of misunderstanding or miscalculation” among nuclear-armed and nuclear-allied states.⁷

1.2 Different frameworks of discussion

Additional dialogue on nuclear risk and the means to address it has taken place in different contexts over the decades. For instance, UN Security Council Resolution 255 (1968) recognised the need for action by the Security Council in situations involving acts of aggression with nuclear weapons against non-nuclear-weapon states party to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT). There have been subsequent pushes for legally binding protections against use, or negative security assurances – including as protocols to nuclear-weapon-free zones. The dialogue on risk also includes on-and-off debates on policies of “no first use”, announced by China in 1964 and India in 1998, discarded by Russia in

⁴ Including the Strategic Arms Limitation Talks (1972), the Anti-Ballistic Missile Treaty (1972), the Intermediate-Range Nuclear Forces Treaty (1987) and the Strategic Arms Reduction Treaty (1991).

⁵ NATO, *The Future Tasks of the Alliance – ‘The Harmel Report’*, 13-14 December 1967, https://www.nato.int/cps/en/natohq/official_texts_26700.htm.

⁶ Jamie Shea, “How the Harmel Report Helped Build the Transatlantic Security Framework”, in *New Atlanticist*, 29 January 2019, <https://www.atlanticcouncil.org/?p=107764>.

⁷ OSCE, *Conference on Security and Co-operation in Europe Final Act*, Helsinki, 1975, p. 10, <http://www.osce.org/node/39501>. See also Zdzislaw Lachowski, “Confidence- and Security-Building Measures in the New Europe”, in *SIPRI Research Reports*, No. 18 (2004), <https://www.sipri.org/node/1525>.

1993, and which the Barack Obama administration (2009-17) reportedly considered in 2016.⁸ NATO in 1967 adopted a “flexible response” policy that included the possibility of first use.⁹ However, a 1990 declaration referred to its nuclear forces as “truly weapons of last resort”, with use seen in its 1991 Strategic Concept as “even more remote” given “the radical changes in the security situation”, but yet not excluded.¹⁰

In the 1990s, the risk of unsanctioned use became a point of emphasis, sparked partly by the August 1991 failed coup in the Soviet Union, which created uncertainty about control over Soviet nuclear forces as well as subsequent concerns about its broader stockpile’s safety and security post-breakup.¹¹ The United States and Russia worked on this aspect through the Cooperative Threat Reduction programme (1992) and a 1996 Moscow summit that later produced the Global Partnership (2002). The NATO–Russia Founding Act (1997) also cited nuclear proliferation and trafficking as key areas of consultation and cooperation.¹² While such activities were oriented towards non-proliferation, risk of use was never far from minds, with the ultimate aim to “prevent the misuse or diversion of Soviet nuclear weapons, their design information, and related materials or technology”.¹³ In the twenty-first century, concerns over the risk of unauthorised use have revolved around non-state armed groups.¹⁴ A series of multilateral initiatives – including the US-instigated and -led Proliferation Security Initiative (2003), UN Security Council Resolution 1540 (2004) and the Nuclear Security Summit Series (2010-2016) – have sought to address this pathway through a focus on control and the security of global stocks of fissile materials, of transfers of technology and equipment, and personnel screening and training.

⁸ Steve Fetter and Jon Wolfsthal, “No First Use and Credible Deterrence”, in *Journal for Peace and Nuclear Disarmament*, Vol. 1, No. 1 (2018), p. 102-114, <https://doi.org/10.1080/25751654.2018.1454257>.

⁹ Including a deliberate escalation strategy that allows for “demonstrative use of nuclear weapons” and “selective nuclear strikes”, as well the “controlled use of nuclear use” against aggressors. North Atlantic Military Committee, *Overall Strategic Concept for the Defense of the North Atlantic Treaty Organization Area* (MC 14/3 (Final)), 16 January 1968, p. 11-12, <https://www.nato.int/docu/stratdoc/eng/a680116a.pdf>.

¹⁰ NATO, *Declaration on a Transformed North Atlantic Alliance Issued by the Heads of State and Government participating in the meeting of the North Atlantic Council*, London, 5-6 July 1990, https://www.nato.int/cps/en/natohq/official_texts_23693.htm; NATO, *The Alliance’s New Strategic Concept Agreed by the Heads of State and Government Participating in the Meeting of the North Atlantic Council*, 7-8 November 1991, https://www.nato.int/cps/en/natohq/official_texts_23847.htm. See also John R. Harvey, “Assessing the Risks of a Nuclear ‘No First Use’ Policy”, in *War on the Rocks*, 5 July 2019, <https://warontherocks.com/?p=20502>.

¹¹ Mikhail Tsypkin, “Adventures of the ‘Nuclear Briefcase’: A Russian Document Analysis”, in *Strategic Insights*, Vol. 3, No. 9 (September 2004), <http://hdl.handle.net/10945/11449>.

¹² NATO and Russia, *Founding Act on Mutual Relations, Cooperation and Security between NATO and the Russian Federation signed in Paris, France*, 27 May 1997, https://www.nato.int/cps/en/natohq/official_texts_25468.htm.

¹³ Paul I. Bernstein and Jason D. Wood, “The Origins of Nunn-Lugar and Cooperative Threat Reduction”, in *Center for the Study of Weapons of Mass Destruction Case Study Series*, No. 3 (April 2010), p. 2, <https://wmdcenter.ndu.edu/Publications/Publication-View/Article/627147>.

¹⁴ As it emerged, after the attacks of 11 September 2001, that Al-Qaida had sought to acquire or develop nuclear weapons. Also, there were revelations about the nuclear black market in 2003–2004.

1.3 The NPT and disarmament

Risk reduction has also acquired prominence in NPT review cycles since the treaty's indefinite extension in 1995. The thirteen "practical steps" outlined in the 2000 Review Conference outcome document mention such measures. These included a push to reduce the operational status of nuclear weapons – addressing a risk source by lengthening the decision-making "fuse" (since 2007 a group of states has tabled a resolution in the UN General Assembly calling for practical steps to address high-alert statuses).¹⁵ The final document of the 2000 Review Conference of the NPT also called on states to diminish the role of nuclear weapons in security policies "to minimize the risk that these weapons will ever be used".¹⁶ In 2009, the five NPT nuclear-weapon states – also the permanent five members of the UN Security Council – convened a conference to look at non-proliferation and disarmament confidence-building measures. This "P5" process fed into the 2010 NPT Review Conference outcome document, which expanded upon elements from 2000 in calling for nuclear-weapon states to engage with a view to, among other measures,

- Further diminish the role and significance of nuclear weapons in all military and security concepts, doctrines and policies;
- Discuss policies that could prevent the use of nuclear weapons and eventually lead to their elimination, lessen the danger of nuclear war and contribute to the non-proliferation and disarmament of nuclear weapons;
- Consider the legitimate interest of non-nuclear-weapon states in further reducing the operational status of nuclear weapons systems in ways that promote international stability and security;
- Reduce the risk of accidental use of nuclear weapons; and
- Further enhance transparency and increase mutual confidence.¹⁷

The aforementioned measures, collected in "Action 5" of the outcome document did not use the words "risk reduction", but paved the way for a multilateral, systematic and broad approach to the topic – one not tethered to individual proposals or aspects of risk. It is this holistic perspective that, as discussed in the introduction, has garnered attention in recent years. For instance, the chair of the 2019 Preparatory Committee recommended the "elaboration of measures that can contribute to building confidence and reduce the risk of the use of nuclear weapons".¹⁸ The P5 likewise affirmed the need to "strengthen exchanges on nuclear

¹⁵ The De-Alerting Group, comprising Chile, Malaysia, New Zealand, Nigeria, Sweden, and Switzerland.

¹⁶ United Nations, *2000 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons, Final Document, Vol. I* (NPT/CONF.2000/28 (Parts I and II)), New York, 2000, p. 15, [https://undocs.org/NPT/CONF.2000/28\(PartsIandII\)](https://undocs.org/NPT/CONF.2000/28(PartsIandII)).

¹⁷ United Nations, *2010 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons, Final Document, Volume I, Part I* (NPT/CONF.2010/50 (Vol. 1)), New York, 2010, p. 21, [https://undocs.org/NPT/CONF.2010/50\(VOL.I\)](https://undocs.org/NPT/CONF.2010/50(VOL.I)).

¹⁸ UN Preparatory Committee for the 2020 Review Conference of the Parties to the Treaty on the

policies and strategies, enhance strategic mutual trust and maintain common security, in a bid to spare no effort to prevent nuclear risks that may be caused by misunderstandings and misjudgments”.¹⁹ Risk reduction has been discussed in many other forums as well.²⁰

Certainly, nuclear risk reduction is not a substitute for nuclear disarmament. The ultimate risk-reduction step is to eliminate all nuclear weapons, as risk of their use exists so long as nuclear weapons do. Yet measures to build trust and confidence and promote practical cooperation and engagement in the nuclear sphere are especially relevant today, and can help to facilitate disarmament progress.

2. A pathways-based approach

Advancing the dialogue on nuclear risk reduction requires accounting for the dynamism of risk across situations. Pathways to use, including those discussed – escalation and non-sanctioned scenarios – not only vary but are context-specific. Relevant factors can include the doctrines and force postures of nuclear-armed states, the nature of their alliances and underlying sources of tension. Reducing the risk of use in Europe, for instance, requires at a minimum consideration of the security perceptions of NATO states and Russia, which can then facilitate understanding of how potential risk-reduction measures (for example, reciprocal reductions on heavy conventional equipment in the Baltics to prevent escalatory dynamics)²¹ would address – or exacerbate – their particular concerns. The same considerations would not apply elsewhere.

Yet in the interim, a conceptual framework for risk reduction can help establish parameters for that contextual analysis. In the following an approach is sketched out that could be applied to address four risk scenarios involving the use of nuclear weapons.²² Each of these pathways to use, including their risk sources is discussed, as are the tools to combat them, based on the examination of baskets of measures presented by scholars, analysts and policymakers, and drawing from NATO activities past and present.

Non-Proliferation of Nuclear Weapons, *Chair's Working Paper. Recommendations by the Chair to the 2020 Review Conference* (NPT/CONF.2020/PC.III/WP.49), New York, 10 May 2019, p. 3, <http://undocs.org/NPT/CONF.2020/PC.III/WP.49>.

¹⁹ China's Ministry of Foreign Affairs, "Five Nuclear-weapon States Hold a Formal Conference in Beijing", in *MFA News*, 30 January 2019, https://www.fmprc.gov.cn/mfa_eng/wjbxw/t1634793.shtml.

²⁰ The US-led Creating an Environment for Nuclear Disarmament and the Stockholm Initiatives, and in intergovernmental processes such as the 2019 Group of Seven Statement on Non-Proliferation and Disarmament, the 2018 session of the UN Disarmament Commission, and the 2016 Report of the Open-Ended Working Group taking forward multilateral nuclear-disarmament negotiations.

²¹ Ulrich Kühn, *Preventing Escalation in the Baltics. A NATO Playbook*, Washington, Carnegie Endowment for International Peace, 2018, <https://carnegieendowment.org/publications/75878>.

²² The categorization of those four scenarios is not "hard and fast", but instead serves as an organizing framework around which risk reduction can be discussed.

2.1 Doctrinal risk

To reduce risk stemming from nuclear doctrines (doctrinal risk), states should narrow the situations in which they would consider nuclear use and lessen ambiguity surrounding those situations.

Most of the nine states that possess nuclear weapons – China, France, India, Israel, North Korea, Pakistan, Russia, the United Kingdom and the United States – have to some degree outlined the circumstances in which they would be prepared to use them. Existing doctrines and declaratory policies centre largely – but not exclusively – on notions of retaliation in response to both nuclear and non-nuclear attack. Yet expansive notions of deterrence can increase the range of situations that fulfil established conditions for use. For instance, the US Nuclear Posture Review of 2018 specifies the deterrent role of nuclear weapons against “significant non-nuclear strategic attacks”.²³ Russia’s 2014 Military Doctrine specifies the applicability of nuclear-deterrence capabilities for preventing the outbreak of regional war.²⁴ Such language contains a degree of purposeful ambiguity, maintaining flexibility or expanding the spectrum of circumstances for use. Further, individual decision-makers remain the arbiters of when national spatial, military, economic and political thresholds have been crossed. Consequently, how states (mis)perceive intentions, policies, plans and actions can also set-in motion a pathway to use.

There are several means of addressing doctrinal risk, beginning with stigmatising overall use. Many have suggested that the United States and Russia, as well as other nuclear states, should reaffirm the Reagan–Gorbachev joint statement that a “nuclear war cannot be won and must never be fought”.²⁵ Statements like this that strengthen normative barriers against use, including simply toning down rhetoric, essentially undermine the notion of doctrinal use as an option. Relatedly, a second component entails circumscribing conditions under which states contemplate nuclear retaliation. States could exclude consideration of nuclear response to cyberattacks, specify as instigating events only attacks with weapons of mass destruction (WMD), or more narrowly define what constitutes their extreme circumstances and vital interests – or consider “no first use” policies. A third component involves clarifying doctrine, or reducing ambiguity surrounding those conditions. Certainly, states will determine the level of transparency

²³ The document identifies non-nuclear strategic threats as “including chemical, biological, cyber, and large-scale conventional aggression”. See US Department of Defense, *Nuclear Posture Review 2018*, February 2018, p. 21 and 38, <https://dod.defense.gov/News/SpecialReports/2018NuclearPostureReview>.

²⁴ Russian Federation, *The Military Doctrine of the Russian Federation*, No. Pr.-2976, 25 December 2014, <https://rusemb.org.uk/press/2029>.

²⁵ *Joint Soviet–United States Statement on the Summit Meeting in Geneva*, 21 November 1985, <https://www.reaganlibrary.gov/research/speeches/112185a>; John Borrie, *Resuming Dialogue on Moving Nuclear Disarmament Forward. An Immediate Challenge*, Geneva, UNIDIR, 2018, <https://unidir.org/node/4278>.

they are willing to accept. But any such movements – for example, defence and military engagement – can serve to reduce risk by enhancing collective mutual understanding, preventing misperceptions regarding capabilities and posturing behaviours, and altering the incentive structures behind brinksmanship.²⁶

In 2010, NATO released its seventh Strategic Concept. While nuclear deterrence remained a core element, there were fundamental ways in which the document suggested “gradual but fundamental change” in its nuclear policy – including with a stated commitment to “creating the conditions for a world without nuclear weapons”.²⁷ Unlike its 1999 predecessor, the Concept no longer referred to the “essential role” of nuclear forces, the “essential political and military link” between European and North American members provided by non-strategic nuclear weapons based in Europe, or the “vital” nature of their presence.²⁸ It even highlighted “reduced [...] reliance on nuclear weapons in NATO Strategy”.²⁹ These textual changes were linked to debate as to the role of the Alliance’s nuclear capabilities in combating emerging threats.³⁰ Thus, even as nuclear forces nominally remained its “supreme guarantee” of security, the Concept suggested a lessened role for those weapons in 2010, just as Alliance members had in 1990 when they identified their nuclear forces as “weapons of last resort”.³¹ Such steps marginalised the role of nuclear weapons.

2.2 Escalatory risk

To reduce escalatory risk, states should work to raise the threshold for nuclear use – especially in volatile situations.

Evolving military strategies suggest that the possibility of nuclear-weapon use has not been definitively excluded. In the view of some experts, Russia’s Ministry of Defence in 2003 elaborated a concept of de-escalation through limited nuclear strikes that remains central to its strategy (though others disagree with this

²⁶ Lewis A. Dunn, *Reversing the Slide. Intensified Great Power Competition and the Breakdown of the Arms Control Endeavor*, Geneva, UNIDIR, 2019, <https://unidir.org/node/4312>.

²⁷ Trine Flockhart, “Nuclear Posture, Missile Defence and Arms Control - Towards Gradual but Fundamental Change”, in Jens Ringsmose and Sten Rynning (eds), “NATO’S New Strategic Concept. A Comprehensive Assessment”, in *DIIS Reports*, No. 2011:02 (March 2011), p. 156, <https://www.diis.dk/node/16704>.

²⁸ NATO, *The Alliance’s Strategic Concept*, Approved by the Heads of State and Government participating in the meeting of the North Atlantic Council in Washington D.C., 24 April 1999, paras. 42, 62, 63, https://www.nato.int/cps/en/natolive/official_texts_27433.htm.

²⁹ NATO, *Active Engagement, Modern Defence*. Strategic Concept for the Defence and Security of the Members of the North Atlantic Treaty Organisation, Adopted by Heads of State and Government at the NATO Summit in Lisbon, 19-20 November 2010, para. 26, https://www.nato.int/cps/en/natohq/official_texts_68580.htm.

³⁰ Joseph F. Pilat, “NATO Nuclear Forces and the New Nuclear Threats”, in *International Journal*, Vol. 63, No. 4 (Autumn 2008), p. 875-892.

³¹ NATO, *Declaration on a Transformed North Atlantic Alliance*, cit.

interpretation).³² Meanwhile, the 2018 US Nuclear Posture Review emphasises the value of a flexible deterrent with low-yield options – including against situations of “regional aggression” (though, it specified, this would not amount to “nuclear war-fighting”).³³ The US has since deployed at least one such system (the W-76-2 Trident) to bolster its “regional deterrence capabilities”. In a similar vein, some observe that Russia and China are developing nuclear-capable forces that could be used in regional conflicts with the United States involving the Baltics or Taiwan respectively.³⁴ The notion of conventional conflict rising to the level of nuclear use has taken on new dimensions as the line between conventional and nuclear weapons – and their delivery systems – has further blurred.³⁵ Modernisation programmes that are enhancing nuclear capabilities and effectiveness have exacerbated the issue. An additional complicating factor is linked to attacks that could undermine the deterrent capability of nuclear-armed states, for instance with space-based nuclear assets (such as reconnaissance and communication satellites and early-warning sensors) often serving dual purposes while operating in an ever more tense and complex environment, contributing to the possibility of entanglement.³⁶ Advances in dual-use capabilities such as hypersonic glide vehicles can have similarly destabilising effects.³⁷

There are several means to reduce the risk of escalation to nuclear-weapon use. One is increasing predictability around conditions of use. This builds on the notion of clarifying doctrine and could include regularised bilateral or multilateral dialogues as well as military-to-military engagement. Enhancing information exchange about nuclear-weapons systems would similarly strengthen strategic analysis – lessening the likelihood of misperception, including during a crisis. States should also focus on strengthening nuclear restraint, raising the threshold for use (or at least not lowering the threshold in response to crisis-related pressure). Reductions in, storage of, and the disassembly of particular types of weapons and

³² For instance, see Katarzyna Zysk, “Nonstrategic Nuclear Weapons in Russia’s Evolving Military Doctrine”, in *Bulletin of the Atomic Scientists*, Vol. 73, No. 5 (2017), p. 322-327; Olga Oliker and Andrey Bakliskiy, “The Nuclear Posture Review and Russian ‘De-Escalation.’ A Dangerous Solution to a Nonexistent Problem”, in *War on the Rocks*, 20 February 2018, <https://warontherocks.com/?p=16905>.

³³ US Department of Defense, *Nuclear Posture Review 2018*, cit., p. xii, 54-55.

³⁴ William M. Arkin and Hans M. Kristensen, “US Deploys New Low-Yield Nuclear Submarine Warhead”, in *FAS Blogs*, 29 January 2020, <https://fas.org/?p=39180>; Elbridge Colby, “If You Want Peace, Prepare for Nuclear War”, in *Foreign Affairs*, Vol. 97, No. 6 (November/December 2018), p. 25-32.

³⁵ Pavel Podvig, “Blurring the Line between Nuclear and Nonnuclear Weapons: Increasing the Risk of Accidental Nuclear War?”, in *Bulletin of the Atomic Scientists*, vol. 72, No. 3 (2016), p. 145-149.

³⁶ James M. Acton, “Escalation through Entanglement: How the Vulnerability of Command-and-Control Systems Raises the Risks of an Inadvertent Nuclear War”, in *International Security*, Vol. 43, No. 1 (Summer 2018), p. 56-99, https://doi.org/10.1162/isec_a_00320. Space-based assets such as satellites also play a central role as national technical means in the verification of arms-control agreements; attacks thus contain another “risk” dimension; see Michael G. Gleason and Luc H. Riesbeck, *Noninterference with National Technical Means: The Status Quo Will Not Survive*, Center for Space Policy and Strategy, January 2020, <https://aerospace.org/node/31681>.

³⁷ John Borrie, Amy Dowler and Pavel Podvig, *Hypersonic Weapons. A Challenge and Opportunity for Strategic Arms Control*, New York, United Nations, 2019, p. 20, <https://unidir.org/node/4306>.

delivery systems – associated with battlefield use or contributing to ambiguity – can limit their destabilising effects and help to reinforce the barrier between nuclear-force-related systems and others.³⁸ Meanwhile, the decision-making fuse for the launch of nuclear weapons can be lengthened through de-alerting, de-mating and de-targeting measures, as well as crisis communication.³⁹ There is an interrelated need for preventing crisis, thus minimising situations in which use may be considered. Mutual signalling concerning actions such as military mobilisation, troop exercises, or weapon dispersion – limiting or ending what might be construed as provocative behaviours (with the Vienna Document of the Organisation for Security and Cooperation in Europe as a comprehensive example) – and guidelines on activities in space and other domains (as in the Hague Code of Conduct) can help to manage crises successfully.⁴⁰ Broader measures to assuage security and geopolitical tensions fall in this category as well.

The reduced doctrinal role of NATO's nuclear forces post-Cold War as "weapons of last resort" has been noted above. This was accompanied by a series of decisions (taken in conjunction with its nuclear-armed members) to assuage escalatory risks in the altered landscape. NATO undertook significant reductions in non-strategic nuclear weapons, eliminating all ground-launched systems and removing weapons from all surface ships. It also terminated standing peacetime nuclear contingency plans and associated targeting and relaxed readiness requirements for dual-capable aircraft.⁴¹ All of these measures helped to improve strategic predictability and signalled increased restraint. In 1996, when discussions of membership enlargement sparked the ire of Russia, NATO foreign and defence ministers announced "no intention, no plan, and no reason to deploy nuclear weapons on the territory of new members".⁴² The later establishment of the NATO-Russia Council in 2002 provided a formal institutional mechanism for consultations among nuclear experts and also quelled potential crises. And as recently as July 2019, amidst the recent downturn in relations, the Council exchanged briefings

³⁸ Pavel Podvig and Javier Serrat, *Lock Them Up: Zero Deployed Non-Strategic Nuclear Weapons in Europe*, Geneva, UNIDIR, 2017, <https://unidir.org/node/4251>; Andrew Weber, "Nuclear-Armed Cruise Missiles Should be Banned", in *APLN/Toda Peace Institute Policy Briefs*, No. 12 (May 2018), <https://toda.org/policy-briefs-and-resources/policy-briefs/nuclear-armed-cruise-missiles-should-be-banned.html>; Sico van der Meer, "Reducing Nuclear Weapons Risks. A Menu of 11 Policy Options", in *Clingendael Policy Briefs*, June 2018, <https://www.clingendael.org/node/9332>.

³⁹ Hans M. Kristensen and Matthew McKenzie, *Reducing Alert Rates of Nuclear Weapons*, New York/Geneva, UN/UNIDIR, 2012, <https://www.unidir.org/node/4179>.

⁴⁰ See Vipin Narang, *Nuclear Strategy in the Modern Era. Regional Powers and International Conflict*, Princeton, Princeton University Press, 2014; Kristin Ven Bruusgaard, "Russian Strategic Deterrence", in *Survival*, Vol. 58, No. 4 (2016), p. 7-26, <https://doi.org/10.1080/00396338.2016.1207945>; Robert Einhorn and W.P.S. Sidhu, "The Strategic Chain: Linking Pakistan, India, China, and the United States", in *Arms Control and Non-Proliferation Series Papers*, No. 14 (March 2017), <http://brook.gs/2lD4M6k>; Daniel Porras, *Towards ASAT Test Guidelines*, Geneva, UNIDIR, 2018, <https://www.unidir.org/node/4277>.

⁴¹ Jack Mendelsohn, "NATO's Nuclear Weapons: The Rationale for 'No First Use'", in *Arms Control Today*, Vol. 29, No. 5 (July/August 1999), p. 3-8, <https://www.armscontrol.org/node/520>.

⁴² NATO, *Final Communiqué, Meeting of the North Atlantic Council in Defence Ministers Session*, 18 December 1996, para. 29, https://www.nato.int/cps/en/natohq/news_63927.htm.

on maritime exercises as means to reduce misunderstanding and miscalculation.⁴³

2.3 Unauthorized risk

To reduce unauthorised risk, states should bolster security to deny access – direct and indirect – to nuclear weapons and related materials.

The risk of nuclear use not sanctioned by a state appears as a distinct possibility in times of crisis, when lines of authority “could blur and an aggressive junior commander could act precipitously”.⁴⁴ The cited example of the August 1991 coup in the Soviet Union illustrates that even in the most carefully controlled decision-making environments, there are chains of events that could lead to the loss of access to and control over nuclear weapons. Issues of personnel reliability – especially in the context of pre-delegated launch authority – continue to raise the spectre of unauthorised use today.⁴⁵ And while nuclear terrorism most likely entails a complex process of acquisition or development of weapons or weapons-usable materials, that scenario cannot be discounted either. The Nuclear Threat Initiative continues to sound the alarm on the opacity of materials safety and security in Iran, Israel, Pakistan and especially the Democratic People’s Republic of Korea, while “political instability, ineffective governance, pervasiveness of corruption, and the presence and capabilities of terrorist groups” adds to the risk of theft or sabotage.⁴⁶ Such conditions even suggest the possibility of poorly guarded, or loose nuclear weapons – once discussed in the context of former Soviet satellites, now a “serious and growing risk [...] in India and Pakistan”.⁴⁷

Narrowing the unauthorised-use pathway requires a supply-side approach that centres on denying access – direct and indirect – to nuclear weapons and materials.⁴⁸ This entails enhancing safeguarding procedures, including in storage, maintenance, transfer and control. These are often matters of national responsibility, involving efficient resource mobilisation; for instance, further risk analysis could strengthen defence and resilience of command, control and

⁴³ NATO, *Press point by NATO Secretary General Jens Stoltenberg following the meeting of the NATO-Russia Council*, 5 July 2019, https://www.nato.int/cps/en/natohq/opinions_167680.htm.

⁴⁴ Peter D. Feaver, “Command and Control in Emerging Nuclear Nations”, in *International Security*, Vol. 17, No. 3 (Winter 1992/93), p. 167.

⁴⁵ The United Kingdom and Russia have known pre-delegation procedures, though under strict conditions; see Jeffrey G. Lewis and Bruno Tertrais, “The Finger on the Button: The Authority to Use Nuclear Weapons in Nuclear-Armed States”, in *CNS Occasional Papers*, No. 45 (February 2019), <https://nonproliferation.org/?p=20600>.

⁴⁶ Ernest J. Moniz, “Foreword”, in *Nuclear Threat Initiative, NTI Nuclear Security Index. Building a Framework for Assurance, Accountability, and Action*, 4th ed., September 2018, p. 4, https://media.nti.org/documents/NTI_2018_Index_FINAL.pdf.

⁴⁷ Graham Allison, “Nuclear Terrorism: Did We Beat the Odds or Change Them?”, in *Prism*, Vol. 7, No. 3 (2018), p. 19, <https://cco.ndu.edu/News/Article/1507316>.

⁴⁸ A demand-side strategy (e.g. reinforcing nuclear stigmatization) should not be discounted in the longer term, but is less pertinent to the risk-of-use scenarios described.

communications ("C3").⁴⁹ The possibility of bi-, pluri- or multilateral collaboration also remains, with the Cooperative Threat Reduction programme as a model.⁵⁰ In addition, opacity concerning weapons programmes suggests a specific need for stronger assessment of the nature of unauthorised risk with a view to enhancing oversight. Focused exchange, including intelligence sharing, among several or all nuclear-armed states can help improve efforts against the possibility of improper acquisition and unauthorised use; this could take shape in a systematised peer-review process of measures in place. Certainly, there are legitimate security concerns that prevent nuclear-armed states from sharing information on specific breaches and vulnerabilities; transparency is not a panacea.⁵¹ Yet regularised exchange on such topics can refocus states on an objective that has enjoyed less political attention in the aftermath of the 2016 Nuclear Security Summit.

The risk of WMD – or chemical biological, radiological and nuclear (CBRN) – terrorism was a central focus of NATO–Russia cooperation beginning in 1997, as mentioned earlier. In the twenty-first century, the Alliance has regularly considered scenarios involving unauthorised use and intensified activities in order to prevent them – among member states and with external partners alike. This included the presentation of a nuclear-terrorism scenario-based exercise to the NATO Parliamentary Assembly and state observers.⁵² There have been seminars and workshops on nuclear terrorism, including those held under the auspices of the NATO-Russia Council; and since 2004 there has been an annual NATO Conference on Arms Control, Disarmament and Non-Proliferation in which the topic has featured. Such engagement can provide guidance for member states to develop national capacities further; the Combined Joint CBRN Defence Task Force and the Joint CBRN Defence Centre of Excellence also provide support in this area. The Alliance has additionally developed guidelines and training to cope with the aftermath of a large-scale CBRN terrorist attack.⁵³

2.4 Accidental risk

To reduce accidental risk, states should enact safeguards to limit human and technical errors while restricting their impact.

⁴⁹ Beyza Unal and Patricia Lewis, "Cybersecurity of Nuclear Weapons Systems. Threats, Vulnerabilities and Consequences", in *Chatham House Research Papers*, January 2018, <https://www.chathamhouse.org/node/22637>; Rolf Mowatt-Larssen, "The Armageddon Test: Preventing Nuclear Terrorism", in *Bulletin of the Atomic Scientists*, Vol. 65, No. 5 (2009), p. 60-70.

⁵⁰ The Cooperative Threat Reduction programme provided financial assistance and technical expertise in the area of warheads, delivery vehicles, and materials in the states of the former Soviet Union.

⁵¹ Elena K. Sokova, "Non-state Actors and Nuclear Weapons", in John Borrie, Tim Caughley and Wilfred Wan (eds), *Understanding Nuclear Weapon Risks*, Geneva, UNIDIR, 2017, p. 83-90, <http://www.unidir.org/node/4252>.

⁵² Nuclear Threat Initiative, *Black Dawn Exercise at NATO Parliamentary Assembly Shows Europe Vulnerable to Nuclear Terrorism*, 31 May 2005, <http://nti.org/6403N>.

⁵³ NATO, *Non-Binding Guidelines for Enhanced Civil-Military Cooperation to Deal with the Consequences of Large-Scale CBRN Events Associated with Terrorist Attacks*, 2019, https://www.nato.int/nato_static_fl2014/assets/pdf/2020/4/pdf/200414-guidelines-civmilcoop-cbrn.pdf.

The known history of nuclear-weapons programmes contains incidents of false alarms, accidents and near misses attributed to technical malfunctions, human fallibility and even natural events.⁵⁴ None have yet resulted in a detonation event, although in a few documented instances the possibility of such was prevented only by individual judgement under high pressure and uncertainty. The need for such “human safeguards” – while comforting on some level – illustrates use scenarios linked to technical error. Moreover, declassified “broken arrow” incidents have included missile explosions, aircraft collisions and even the release of nuclear weapons – without detonation. Most known accidents of this type are linked to the United States’ stockpile, “among the safest, most advanced, most secure against unauthorized use that have ever been built”, and about which there exists the greatest amount of declassified information – thus strongly indicating that they have also happened in other nuclear-armed states.⁵⁵ In the contemporary era, the potential for detonation events linked to technical or human error may exist even without physical access to nuclear weapons. Cyberattack and manipulation of the data provided by early-warning systems and C3, including space assets, can drive doctrinal and escalatory use scenarios based on false premises.⁵⁶

Reducing accidental risk requires a focus on minimising errors, human and technical, by first strengthening safety features in nuclear weapons and related systems. Cost concerns, design modifications and even bureaucratic resistance have hindered the timely installation of safety components in the past; their further development and incorporation (including in the cyber realm) constitutes a necessary step, especially with more advanced capabilities.⁵⁷ A second component involves enhancing operator control. Multiplicity in systems can help reduce the possibility of decision-making fallibility.⁵⁸ Further incorporation of machine learning and autonomous systems can lessen the data-searching, processing and analysis burden, offering human command better situational awareness – though increased system complexity can create its own source of errors, a product of the nature of complex interactions.⁵⁹ Finally, there is value in containing the consequences of errors when they occur. Data exchange and early-warning centres – as with the US–Russia Joint Data Exchange Centre concept agreed upon

⁵⁴ Scott D. Sagan, *The Limits of Safety. Organizations, Accidents, and Nuclear Weapons*, Princeton, Princeton University Press, 1993.

⁵⁵ Eric Schlosser, *Command and Control*, London, Penguin Books, 2013, p. 481.

⁵⁶ Peter Hayes, “Non-State Terrorism and Inadvertent Nuclear War”, in *NAPSNet Special Reports*, 18 January 2018, <https://nautilus.org/?p=47794>.

⁵⁷ Eric Schlosser, *Command and Control*, cit.

⁵⁸ Richard Halloran, “Nuclear Missiles: Warning System and the Question of When to Fire”, in *The New York Times*, 29 May 1983, <https://nyti.ms/29JLGHw>.

⁵⁹ John Borrie, “Cold War Lessons for Automation in Nuclear Weapon Systems” and Vincent Boulanin, “The Future of Machine Learning and Autonomy in Nuclear Weapon Systems”, in Vincent Boulanin (ed.), *The Impact of Artificial Intelligence on Strategic Stability and Nuclear Risk. Vol. I: Euro-Atlantic Perspectives*, Solna, SIPRI, May 2019, p. 41-52 and 53-62, <https://www.sipri.org/node/4808>; Charles Perrow, *Normal Accidents. Living with High-Risk Technologies*, Princeton, Princeton University Press, 1999.

in 1998 – could prevent accidents from increasing in magnitude to the level of nuclear use; for instance, the NATO–Russia Founding Act refers to consultation on “nuclear safety issues, across their full spectrum”.⁶⁰ Commitments to retain a human element in decision-making linked to early warning and C3 could likewise limit the severity of technical error.⁶¹ And even following an accidental launch, fail-safes built into delivery systems may be able to destroy missiles prior to catastrophe.⁶² Still, no range or combination of measures can altogether eliminate the possibility of operator error.

3. Advancing risk reduction

In a difficult geopolitical and security environment, the prominence of risk reduction on the international agenda and widespread support for the pursuit and implementation of such measures provides a critical opening. The framework identifying approaches to address risks associated with four use scenarios (doctrinal, escalatory, unauthorized and accidental) is based on the sources and underlying conditions that contribute to each scenario. As set forth earlier, however, the manner in which these scenarios manifest themselves will differ across particular contexts. By examining them in depth, the international community can move to identify practical and feasible risk-reduction baskets pertinent to the situation.

Still, a word of caution is warranted. The difficult strategic relations that characterise the current era provide a daunting challenge to any risk-reduction efforts. Competitive dynamics create incentives for states to secure strategic advantages by engaging in technology and arms racing, as reflected in recent development of nuclear and non-nuclear capabilities. And absent trust and confidence, common understandings of risk reduction and related concepts are unlikely to emerge, let alone common priorities. In these circumstances, misperception, miscalculation and misunderstanding have become more likely. The measures that NATO takes to maintain its deterrence credibility, in view of lowering the risk of nuclear-weapon use – for instance by developing and deploying low-yield systems to strengthen its regional capabilities, or by expanding military exercises and resource allocation near the Russian border – can have unintended effects that can become a source of risks of their own.⁶³ They could blur the conventional–nuclear threshold, create other sources of ambiguity, or more directly be taken as aggressive manoeuvring,

⁶⁰ NATO and Russia, *Founding Act on Mutual Relations, Cooperation and Security...*, cit.

⁶¹ Hugh Miall, “Exploring New Approaches to Arms Control in the 21st Century: Building Lessons from the INF Treaty and Presidential Nuclear Initiatives (PNIs)”, in *Toda Peace Institute Policy Briefs*, No. 30 (November 2018), <https://toda.org/policy-briefs-and-resources/policy-briefs/exploring-new-approaches-to-arms-control-in-the-21st-century-building-lessons-from-the-intermediate-range-nuclear-forces-inf-treaty-and-presidential-nuclear-initiatives-pnis.html>.

⁶² See Range Commanders Council–Range Safety Group, *Flight Termination Systems Commonality Standard* (Document 319-14), September 2014, <https://apps.dtic.mil/docs/citations/ADA620923>.

⁶³ Jacek Durkalec and Matthew Kroenig, “NATO’s Nuclear Deterrence: Closing Credibility Gaps”, in *The Polish Quarterly of International Affairs*, Vol. 25, No. 1 (2016), p. 37-50.

threatening the action–reaction dynamics that can drive nuclear escalation.

Similarly, NATO's declaration of space as an operational domain and ongoing preparations against hybrid warfare may inspire a more cohesive Alliance policy, but may also fuel competition in those areas, increasing the potential for entanglement. Certainly, this is not a one-way street, and one could cite the destabilising effects in recent years of Russia's "dangerous brinkmanship" in European airspace, its military operations along with those of some Western states in the context of the Syrian civil war and missile deployments in Kaliningrad.⁶⁴ Certainly there exist different interpretations, but the implications are widespread. For instance, decades of controversy over missile-defence systems in Europe, intensified following the US withdrawal from the Anti-Ballistic Missile Treaty in 2002 and again with the US's European Phased Adaptive Approach contribution to NATO under the Obama Administration in 2009, continue to reverberate across its security landscape.⁶⁵ Given the current strategic rivalries and fundamental mistrust, actions on all sides can contribute to friction that underwrites escalation pathways.

Taking forward risk reduction requires activities of different types and at various levels. Nuclear issues, however, do not exist in a vacuum, and a pragmatic approach is advisable given the wider geopolitical and security environment. For instance, crisis-avoidance and -management activities present a likely area of common interest – one could recall Cold War-era agreements on incidents at sea and dangerous military incidents – and help to address escalatory risks.⁶⁶ Meanwhile, NATO's Partnership for Peace programme provides a natural framework for further cooperation on unauthorised and accidental risk, including with best practices and exchange on nuclear safety and security. Longstanding efforts on CBRN counter-terrorism provide a natural bridge to more of these activities, internally and externally. The interrelated building on, revisiting or revitalising of existing institutions such as the NATO-Russia Council could help ensure more regularised exchange on nuclear-related and adjacent issues, providing space for joint assessments and allowing at least the airing, if not the resolution, of concerns. In the long term, these exchanges could help reduce risk across all pathways, including the doctrinal one.

There remains a larger question about whether NATO's standing as a nuclear alliance "as long as nuclear weapons exist" lends itself well to longer-term and larger-scale efforts to reduce the risk of nuclear-weapon use, including by reducing reliance

⁶⁴ Thomas Frear, Łukasz Kulesa and Ian Kearns, "Dangerous Brinkmanship: Close Military Encounters Between Russia and the West in 2014", in *ELN Policy Briefs*, November 2014, <https://www.europeanleadershipnetwork.org/?p=1521>.

⁶⁵ Julian E. Barnes, "NATO Considers Missile Defense Upgrade, Risking Further Tensions with Russia", in *The New York Times*, 5 July 2019, <https://nyti.ms/2Nz8Fvh>.

⁶⁶ For more on these and other ideas relating to great-power relations, see Lewis A. Dunn, *Reversing the Slide*, cit.

on these munitions.⁶⁷ This is an increasingly salient point of discussion in the light of the aforementioned commitment in its 2010 Strategic Concept to creating a world without nuclear weapons. Examining risk reduction outside the prism of nuclear deterrence may require revisiting a conversation about consolidating, reducing or withdrawing altogether tactical nuclear weapons in Europe. This could constitute a first practical step towards transforming the identity of the Alliance itself.⁶⁸ Fundamentally, the process might also entail considering whether the continuation of nuclear sharing practices has a negative impact on global non-proliferation and disarmament norms, or whether the strategic and organisational culture of the Alliance “has enabled pro-nuclear actors to justify costly nuclear modernisation programmes as acts of ‘alliance solidarity’”.⁶⁹

Ultimately, there remains much work to be done on nuclear risk reduction, in NATO and outside it. The identification of areas of common interest among states and the development of practical, feasible and contextually appropriate measures will not only have tremendous value in and of themselves, but can also be critical in creating a more propitious environment for constructive engagement on all nuclear issues, including disarmament.

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⁶⁷ NATO, “NATO’s Nuclear Deterrence Policy and Forces”, in *NATO Topics*, last updated 16 April 2020, https://www.nato.int/cps/en/natohq/topics_50068.htm.

⁶⁸ Mark Fitzpatrick, “How Europeans View Tactical Nuclear Weapons on Their Continent”, in *Bulletin of the Atomic Scientists*, Vol. 67, No. 2 (2011), p. 57-65, <https://doi.org/10.1177/0096340211399405>.

⁶⁹ Kjølvs Egeland, “Spreading the Burden: How NATO Became a ‘Nuclear’ Alliance”, in *Diplomacy & Statecraft*, Vol. 31, No. 1 (2020), p. 143.

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