X[th] Anniversary
of the International Luxembourg Forum
on Preventing Nuclear Catastrophe

TOPICAL ISSUES OF NUCLEAR NON-PROLIFERATION

Edited by Dr. **Viatcheslav Kantor**
President of the International Luxembourg Forum
on Preventing Nuclear Catastrophe

2018

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This book marks the 10th anniversary of the establishment of the International Luxembourg Forum on Preventing Nuclear Catastrophe. It builds on the discussions and final declaration of the two-day conference in Paris in October 2017 which brought together more than 50 of the world's leading experts on international security from 15 countries and 11 of the most prominent international organizations dealing with nuclear issues. Prefaced by the President of the Forum, in their chapters the authors deliberate on acute problems of the nuclear weapons non-proliferation regime, issues of nuclear arms limitation and reduction, and regional and global security challenges.

The official website of the International Luxembourg Forum: www.luxembourgforum.org

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INTRODUCTION

The end of the Cold War, despite hopes and expectations, has not provided for fundamental restructuring of international relations to ensure lasting peace and disarmament. Significant achievements in arms control and non-proliferation during the first two decades of post-Cold War era have been replaced in recent years by revived political tensions, arms race and disintegration of arms control regimes.

The disappearance of the ideological rivalry between Moscow and Washington did not remove the rivalry for international political and economic influence among powers which had led to conflicts and arms race. The most dangerous manifestation of this trend is the present political and military stand-off between Russia and the West around the Ukrainian crisis which is once again threatening European security that seemed assured only a few years ago.

Deterioration of political relations has badly affected the arms control system and process. Only few agreements are still functioning, but their future is not bright. The INF Treaty is in greatest danger due to mutual accusations by the US and Russia of violation of its provisions and their unwillingness to find a compromise through additional verification methods. The Prague START Treaty has been fully implemented this year and is complied with, but there have been no negotiations on the follow-on treaty for seven years and the prospects

of its prolongation till 2026, to say nothing of a new agreement, are extremely uncertain.

In the last several years due to the sharp growth of tensions in relations between Moscow and Washington, there has been an unprecedented escalation of "nuclear rhetoric" on both sides which included transparent nuclear threats and flamboyant discussion of the possibility of a nuclear attack against the other side and of various limited nuclear strike options.

Universally respected public figures with impressive record of technical expertise and state service consider such behavior unacceptable and irresponsible. The former US Secretary of Defense William Perry speaking at the 10th Anniversary Conference of the International Luxembourg Forum on Preventing Nuclear Catastrophe in Paris emphasized that if nuclear weapons were ever used "no one can control further escalation in the nuclear field. In spite of all the theories on escalation, no one really knows how it works or whether it would work."

In the Declaration of this Conference "From Alarm to Action: Growing Nuclear Dangers Demand Constructive Policies" its participants "strongly urge Moscow and Washington to engage in a new nuclear dialogue to re-establish as a core principle the goal of reducing the role and risks of nuclear weapons in global security policies." Such dialogue, in their opinion, could start from "promoting a new Joint Presidential Declaration confirming that a nuclear war cannot be won and must never be fought."

In the atmosphere of growing confrontation, with the weakening mechanisms of restraint and fading memory of the past crisis of the Cold War times, the present situation is increasingly dangerous. Dr. William Perry warned about "the danger that we will blunder into a nuclear war — as we blundered into World War I." To prevent such a possibility a constructive military and political dialogue between the principal nuclear states — Russia and the US should be resumed as soon as possible.

But this will not be enough. One proven remedy against the eruption of the worst case scenarios of the nuclear age is the arms control

system and process — the network of the arms control negotiations and agreements which were following one after another — sometimes going in different fields in parallel. The well known Soviet-American Joint Statement on Future Negotiations on Nuclear and Space Arms and Further Enhancing Strategic Stability of June 1, 1990 emphasized that "reductions in strategic offensive arms" may have and must have a "stabilizing" character.

The nuclear arms control has for decades served as the indispensable tool of strategic stability. In the present unstable situation it is becoming clear that the continuation of the nuclear arms control process is essential for stabilizing US-Russian strategic and political relations and for the preservation of global security.

After the prolonged pause the leaders of the two most powerful nations have at last given a sign that they are ready for negotiations. In the telephone conversation on March 20, 2018 after the presidential elections in Russia, Vladimir Putin and Donald Trump for the first time expressed their readiness to resume dialogue on arms control.

Inability of the nuclear states to fulfill their obligation under the Article VI of the NPT (to "pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control") acquires critical character. The existence of the club of "nuclear celebrities" does not suite most of the non-nuclear states any more. This division of the world in the zones of "different quality" of security is aggravated by the inability of the major powers to organize reliable regional security systems or to provide security guarantees to weaker states who feel insecure.

This unsatisfactory situation led to the adoption of the Treaty on the Prohibition of Nuclear Weapons in the UN in July 2017 with the support of more than 120 states. This has introduced a new dividing line in the world security space and a new front of juxtaposition between the nuclear states and non-nuclear ones. This contradiction may

eventually prompt "have-nots" to take care of their security individually, including by obtaining nuclear arms of their own. It plants yet another mine under the non-proliferation regime and international security in general.

Speaking at the 10th Anniversary Conference of the Luxembourg Forum, Executive Chairman of the Institute for Global Change, former UK Prime Minister Tony Blair noticed that "proliferation of nuclear weapons capability remains the most serious threat to the future of humankind."

The nuclear and missile programs of North Korea is a typical example of this threat. While participating in the NPT, DPRK acquired technologies and materials for the military nuclear program and then withdrew from the Treaty rudely violated its provisions for withdrawal. It was a demonstration of a limited capability of the world community to prevent this venue of proliferation. Neither was it able to stop Pyongyang's consecutive nuclear and missile tests. The attempts of the great powers and the UN to stop this provocative behavior through economic sanctions were not successful either.

The impulse for political dialogue became feasible during the Olympic Games in South Korea in February 2018. After an acute crisis with mutual nuclear threats Washington agreed to a direct dialogue with Pyongyang. It remains unclear whether the North Korean regime has decided to curtail its nuclear and missile programs to get lifting of sanctions and security guarantees from Washington — or this is yet another round of DPRK's maneuvering and deception to gain time and then resume its threatening course.

The "Iranian Deal" (Joint Comprehensive Plan of Action) which was reached by July 2015 after prolonged negotiations is essential for the enhancement of the NPT. However it is threatened from another direction: by President Trump, who is ready to withdraw from the deal, which may lead to the restoration of the Iranian nuclear program, and possibly to a new war in the region. Mr. Tony Blair in his speech pointed out that "non-proliferation can only be dealt with effectively

by close cooperation between the main powers." The US is presently on the verge of breaking such cooperation, since it was the foundation of the JCPOA.

All these and other important issues are constantly in the center of attention of the International Luxembourg Forum on Preventing Nuclear Catastrophe. They were the subject of comprehensive professional analyses of the prominent experts from many countries — contributors of this book, based on the presentations and discussion at the 10th Anniversary Conference of the Forum in Paris in October 2017.

ADDRESS BY VIATCHESLAV KANTOR, PRESIDENT OF INTERNATIONAL LUXEMBOURG FORUM

Paris, October 9, 2017

Ladies and Gentlemen, Colleagues, Friends!

Allow me to thank you all for taking part in this conference, held to mark the anniversary of the Luxembourg Forum. Let me remind you that this Forum was established in May 2007 following a conference held in Luxembourg that brought together more than 50 leading international experts from 14 different states, many of whom are now members of the Forum's Supervisory Board.

The world's 11 most eminent international organizations dealing with nuclear issues are with us here today, and we will be introducing their leaders and representatives to you over the course of the conference.

Since the very outset, the Forum's main objectives have been to analyze the most pressing problems relating to the regime of nuclear non-proliferation, to the nuclear arms limitation and reduction processes, to regional nuclear and missile crises, especially in Iran and North Korea, to security of nuclear materials and to the prevention of nuclear terrorism.

In order to do so, over the last ten years we have organized more than 25 conferences and roundtables involving the world's most renowned international institutions.

The results of our work have always been presented to the leaders of key states, the UN, the IAEA and other international organizations through

declarations and statements containing concrete proposals and recommendations for managing critical situations. We usually receive a response.

Since the Forum's inception, 24 books and brochures have been published and disseminated.

Along this path we have met with both successes and setbacks. For instance, in December 2015, following a joint conference in Washington of the Luxembourg Forum and the Nuclear Threat Initiative, a well-reasoned Joint Statement was sent to the Presidents of the USA and Russia urging them to resume negotiations on the further reduction of strategic nuclear weapons. This drew prompt, but diverging responses. As early as in January of the following year, Washington reiterated its proposal to reduce the number of these weapons by about a third, whereas Moscow set out the reasons standing in the way of a new treaty.

Our proposals have at times been met with only vague responses from a number of addressees. This may be because our arguments were not convincing enough.

We will do better. The members of the Forum's Supervisory Board will see to that. The Board is made up of distinguished political figures and scientists of international renown. They are all well known to you. Unfortunately, the Board has also lost some of its members. The academician Nikolay Laverov, an outstanding scientist and administrator has passed away. Ever since his time as Deputy Prime-Minister of the Soviet Union and Vice-President of the Russian Academy of Sciences, Nikolay had a perfect grasp of all the ins-and-outs of nuclear matters. Also, due to an excessive workload, one of the founders of the Forum, Mohammed ElBaradei, the former head of the IAEA and one-time presidential candidate in Egypt, is unable to continue his activities as a member of the Supervisory Board.

But its ranks are also being replenished. This year, Henry Kissinger joined the Board, and we are certain that he will make a significant contribution to enhancing the Forum's work.

Every year, the members of the Supervisory Board provide a rather critical assessment of the Forum's work and recommend relevant issues for further analysis. That is why we can always hope to work more effectively.

That is the current state of the Luxembourg Forum.

I believe I must point out that 2017 has been marked by a previously unimaginable level of uncertainty in almost all areas that fall within the remit of the Luxembourg Forum and its fellow international organizations. Just take this example: next year, the US and Russia are supposed to complete the reduction of their strategic weapons, in accordance with the New START Treaty signed in Prague; however, for the first time in the history of the two nuclear super-powers' mutual relations, negotiations on further reducing nuclear arsenals are bogged down in stagnation.

Tensions have been mounting due to mutual grievances concerning the implementation of the Intermediate-Range Nuclear Forces Treaty. The joint program on surplus plutonium has been frozen, and the joint work of nuclear scientists has been suspended.

Washington is highly critical of the nuclear agreement with Iran, whereas Teheran is threatening to withdraw from the agreement and to resume its weapons program. The situation on the Korean peninsula is ever tenser and has hit a critical peak due to Kim Jong-Il's nuclear and missile provocations.

Past experience clearly shows that without negotiations on the limitation of strategic weapons based on the balance of nuclear forces, an uncontrollable arms race towards this most destructive weapon becomes inevitable.

However, it is often said that the relations between Russia and the US in this field are non-existent, but that is an exaggeration. So far, the New START Treaty, which is due to expire in 2021, has been being fully implemented. Every year, the parties carry out dozens of on-site inspections of the other's land-based launch pads, submarine missile-carriers, heavy bombers, and exchange hundreds of verifiable notifications about the state of their nuclear forces. And there have been no mutual recriminations whatsoever!

Reliable information has emerged about consultations having started on extending the New START Treaty by five years, a possibility foreseen by the Treaty's text. But it would be far better to sign a new Treaty on the further reduction of strategic nuclear forces.

The main priority now is to preserve the open-ended Treaty on the Elimination of Intermediate-Range and Shorter-Range Missiles, the parties having accumulated mutual grievances concerning compliance with its provisions. Already there are signs that the treaty might be repudiated. The USA appears ready to start preparing to produce weapons types that are prohibited under the INF Treaty.

Terminating this treaty could spell disastrous consequences for Europe, Russia and the United States, because the reasons that compelled the parties to sign it in 1987 carry even more weight in today's new conditions, threatening all of Europe with a massive nuclear strike. Every so often we hear about fresh consultations aimed at solving the parties' mutual complaints, but what is really needed is more responsible action from Moscow and Washington.

EU and IAEA leaders welcome the nuclear agreement with Iran and the progress in its implementation, which is reason for optimism concerning the sustainability of the agreement. But that does not mean it is not necessary to strictly monitor both its implementation and Iran's missile program.

I will not draw out my remarks now by expounding on the situation on the Korean peninsula, you are all aware of it. There will be ample opportunity throughout the conference for views and recommendations on this issue. I would just draw your attention once again to history, which has shown that attempts to placate aggressive, totalitarian regimes tend to lead to catastrophic consequences.

In sum, it must be underscored that, as things stand now, the global situation will in no way help strengthen the nuclear non-proliferation regime or encourage more joint and closely coordinated actions by leading states to prevent nuclear terrorism.

From what I understand, participants of our conference have concrete proposals to make for addressing the challenges in these fields, which is why I wish us every success.

Once again, I would like to thank all of you for coming to this conference.

Thank you for your attention.

I. CURRENT STATE AND PROSPECTS OF NUCLEAR ARMS CONTROL

1.1. AFTER THE END OF BILATERAL NUCLEAR ARMS CONTROL[1]

Linton Brooks[2]

In only slightly more time than it will take to read this essay, the United States and the Russian Federation can destroy each other as functioning societies no matter who attacks first. This condition, often called Mutual Assured Destruction, makes deliberate nuclear war irrational. Because neither side can be certain of controlling escalation (especially once the nuclear threshold is crossed), conventional war between nuclear states is also too risky to contemplate.[3]

For over four decades Mutual Assured Destruction played a major role in preventing war between the United States and the Soviet Union. Despite this, it remains a frightening and unsatisfactory concept. As

1 While this paper is based on my experience both within government and in unofficial dialogues, these are personal views and do not necessarily reflect the official position of the US government or any organization with which I am affiliated. The conceptual portions of this paper draw heavily on "US Perceptions of Sino-American Strategic Stability," a background paper prepared for a May 2017 workshop US-China Strategic Stability and Japan sponsored by the Carnegie Endowment for International Peace. See also Brooks L. Can the United States and Russia Reach a Joint Understanding of the Components, Prospects and Possibilities of Strategic Stability? In *Revitalizing Nuclear Arms Control and Non-Proliferation,* Moscow: National Institute of Corporate Reform, 2017. Pp. 80-95. I am grateful to Elbridge (Bridge) Colby, John Harvey, Micah Lowenthal, Mira Rapp-Hooper, James Schoff, Brad Roberts and Heather Williams for comments on those earlier papers and, in the case of Brad Roberts, for allowing me to participate in a series of workshops on stability which have helped shape my thinking. I alone am responsible for the use I have made of their insights.

2 Linton Brooks — Member of the International Advisory Committee of the International Luxembourg Forum on Preventing Nuclear Catastrophe; Non-resident Senior Adviser at the Center for Strategic and International Studies; Ambassador (USA). Ambassador Brooks has over 58 years of military and national security experience, including serving as the chief US negotiator of the first Strategic Arms Reduction Treaty and as the Administrator of the US National Nuclear Security Administration, responsible for the US nuclear weapons program. He is now an independent consultant and analyst.

3 This essay assumes this remains the view of both states. Many American analysts question whether this statement still describes the actual Russian view. See: Nuclear Posture Review 2018. US Department of Defense. February 2018. Available at: https://media.defense.gov/2018/Feb/02/2001872886/-1/-1/1/2018-NUCLEAR-POSTURE-REVIEW-FINAL-REPORT.PDF (accessed on 15 February 2018).

a result, especially since the Cold War ended, experts have sought a way to move beyond basing their security on the ability to destroy one another. They have not found one. That is because Mutual Assured Destruction is not a policy to be embraced or rejected but a fact to be accepted and managed. One important tool in managing the inherently dangerous nuclear relationship between Russia and the United States is nuclear arms control. That tool, unfortunately, will no longer be available in a few years. This essay describes the implications of its loss and how they might be mitigated.

Current status and prospects for bilateral strategic nuclear arms control

For decades, first the United States and the Soviet Union and now the United States and Russia have used formal treaties to regulate the nuclear balance between them. Currently they are parties to two such treaties. The most recent is the New START Treaty — which Russians often call START III[4] — limiting deployed strategic warheads to 1550 on each side. New START was signed in 2010, entered into force in February 2011 and will expire in February 2021. Both Russia and the United States completed the reductions mandated by the treaty on February 5, 2018. Despite the current tension in US-Russian relations (which is probably as bad as any time since the Cuban Missile Crisis) implementation has gone smoothly. Indeed, New START is often considered a bright spot in the relationship. Unfortunately, that is about to change. US-Russian bilateral nuclear arms control is about to collapse.

The probable collapse comes from US concerns over the second treaty, the 1987 Intermediate Range Nuclear Forces Treaty (INF Treaty), which bans ground-launched ballistic or cruise missiles with ranges between 500 and 5500 kilometers regardless of whether they carry nuclear or non-nuclear payloads. In 2014 the United States formally accused Russia of testing a ground-launched cruise missile that violated the INF

4 Formally the Treaty between the United States of America and the Russian Federation on Measures for the Further Reduction and Limitation of Strategic Offensive Arms, signed in Prague on April 8, 2010.

Treaty. To protect intelligence sources the United States released no details but asserts that it has provided Russia with sufficient information to identify the violation.[5] In March 2017, the Vice Chairman of the Joint Chiefs of Staff testified to Congress that the prohibited missile had been deployed.[6] This conclusion is widely accepted by American experts and by members of Congress. Russia has denied any violation, claimed the information provided by the United States is insufficient for evaluation and expressed concern over three potential American treaty violations.[7]

This essay will not discuss the details of the INF Treaty dispute or offer proposals for its solution, which currently appears unlikely. Instead the essay will analyze the impact of the dispute on the future of the far more important strategic nuclear arms treaty. When New START was signed, it was assumed that it would be followed by a replacement treaty that would further lower weapons levels and deal with issues omitted from New START. Without solving the INF issue, it will be politically impossible for the United States to negotiate such a replacement treaty, nor could any such treaty be ratified by the US Senate.

As a result, when New START expires in 2021 the two states will

5 See Adherence to and Compliance with Arms Control, Nonproliferation, and Disarmament Agreements and Commitments. US Department of State, April 2017. Available at: https://www.state.gov/t/avc/rls/rpt/2017/270330.htm (accessed on 10 January 2018). The report provides little technical detail on the alleged violation. It notes that the United States has provided the Russian Federation Russia's internal designator for the mobile launcher chassis and the names of the companies involved in developing and producing the missile and launcher, the coordinates of the tests, Russia's attempts to obfuscate the nature of the program and the fact that the missile of concern is distinct from the R-500/SSC-7 GLCM or the RS-26 ICBM.

6 Transcript of Hearing on Military Assessment of Nuclear Deterrence Requirements. US Department of Defense. March 8, 2017. P. 10. Available at: https://www.defense.gov/Portals/1/features/2017/0917_nuclear-deterrence/docs/Transcript-HASC-Hearing-on-Nuclear-Deterrence-8-March-2017.pdf (accessed on 10 January 2018).

7 The most significant Russian charge is that the Mark 41 launcher being deployed in Europe for ballistic missile defense purposes is also capable of firing offensive missiles because the comparable sea-based system fires such missiles. Other concerns are an 18-year old dispute on what ballistic missile stages may be used in test targets for anti-ballistic missile testing and whether armed drones are prohibited cruise missiles, rather than (as the United States asserts) essentially unmanned aircraft. The Department of State set forward the US response to these concerns. See: Refuting Russian Allegations of US Noncompliance with the INF Treaty. US Department of State, December 8, 2017. Available at: https://www.state.gov/t/avc/rls/2017/276360.htm (accessed on 10 January 2018). On the Aegis Ashore Missile Defense System, the statement notes the system "does not have an offensive ground-launched ballistic or cruise missile capability." Specifically, the system lacks the software, fire control hardware, support equipment, and other infrastructure needed to launch offensive ballistic or cruise missiles such as the Tomahawk.

face a situation where, for the first time in half a century, no treaty regulating the nuclear balance between Russia and the United States will be either in force or under negotiation. In theory, they could delay this outcome. New START allows for a single extension of up to five years without the need for ratification. Taking this option and extending the treaty to 2026 may be the only way to preserve strategic arms control after 2021. Such an extension would not be a panacea. While there are straightforward ways to resolve Russian concerns with American compliance with INF, resolving US concerns appears unlikely. Without a solution to the INF Treaty dispute, an extension only postpones the demise of bilateral arms control. But an extension would buy time to plan for a future with no formal bilateral arms control agreements.

It is unclear whether such an extension will be politically acceptable in either country. In the United States, such an extension faces significant political opposition in Congress. The new Nuclear Posture Review endorses continued participation and notes the possibility of an extension. It neither rejects nor endorses such an extension but lists a series of concerns with Russian behavior including concerns with treaty violations of additional treaties and agreements beyond the INF Treaty.[8] Still, there is a reasonable chance that, facing the actual prospect of no arms control, the two states could agree to an extension in 2019.

Arms control and strategic stability

Recognizing that Mutual Assured Destruction was inescapable, Cold War analysts evolved the concept of strategic stability. US experts concluded that preventing nuclear war required that neither adversary fear that the other had a viable pathway to nuclear victory and that strategic stability was therefore a mutual interest. To foster such stability, the two superpowers sought policies, forces, and postures that met three criteria:

- In time of great crisis, there is no incentive to be the first to use military force ("crisis stability").

8 Nuclear Posture Review 2018... P. 73.

- In crisis or conventional conflict, there is no incentive to be the first to use nuclear weapons ("first strike stability").
- Neither side believes they can improve their relative position by building more weapons ("arms race stability").

Because the goal of strategic stability is the prevention of war, especially nuclear war, these criteria are irrelevant unless there is at least some possibility of conflict between two states. Strategic stability exists when war is possible but can be made significantly less likely by the policies, forces, and postures the two sides adopt.

Facing both a relationship characterized both by the reciprocal ability to inflict devastation and by growing tension between them, Russia and the United States have concluded that the concept of strategic stability remains valid, although their understanding of the details is not totally consistent. Both US and Russian analysts believe that the concept needs to be expanded to recognize new technological factors. At a minimum, ballistic missile defenses play a more significant role than they did throughout most of the Cold War and must be included in any broad analysis of stability. Most experts believe that developments in space and cyberspace must also be considered, although they are uncertain about how to do so. Russian experts tend to favor a broader concept of strategic stability than do US experts. For example, they routinely express concern about the effect on strategic stability of long-range conventional precision strike capabilities (especially sea-launched cruise missiles).[9]

Despite these differences, virtually all experts agree that, at a minimum, strategic stability requires creating a world where there is no structural incentive to be the first to use force or the first to use nuclear weapons and where building more or different weapons cannot change the situation. If this is the goal, bilateral arms control can enhance strategic stability in at least three ways. First, the existence of formal arms control agreements demonstrates that each side respects the other and recognizes that the strategic nuclear relationship between them is

9 For additional discussion, see Brooks L. Can the United States and Russia Reach a Joint Understanding of the Components, Prospects and Possibilities of Strategic Stability?.. (note 1) from which much of the discussion in this section is drawn.

important. Such agreements also explicitly codify the equality of the two sides, providing clear and public acknowledgement that neither side seeks superiority over the other. They thus help avoid arms races.

Second, arms control treaties can encourage stabilizing force structures. New START, for example, treats bombers (which are unsuitable for a first strike) more leniently than ballistic missiles. Earlier treaties have sought to shift forces away from fixed ICBMs carrying multiple warheads and toward sea-based, mobile or single-warhead missiles. Virtually all US analysts believe that in a crisis fixed ICBMs carrying multiple warheads are subject to pressures to "use or lose" and thus are particularly destabilizing.

Finally, formal treaties with their data exchanges and confirming inspections provide exceptional transparency. Transparency leads to predictability and predictability in turn enhances stability. For many American analysts, including the present writer, this enhanced predictability is the most important benefit of the New START Treaty.

Consequences of a post-arms control world

While Russia and the United States should work toward an extension of New START, preferably before 2020 and what is likely to be a contentious US presidential campaign, they also need to begin discussing how to limit the damage to their political and strategic relations if the treaty expires with no plans for replacement. Because arms control is not an end in and of itself, but rather a means to ensure national security and international stability, the two states should start by discussing the specific problems the end of the treaty will cause. For the United States, one problem is the loss of transparency and predictability, which enhance stability. For Russia, bilateral arms control symbolizes the respect and equality that the country expects and deserves. For both states, the New START Treaty is one way to assert compliance with Article VI of the Nuclear Non-Proliferation Treaty[10] and help to preserve the international

10 Article VI requires parties to "pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament..."

non-proliferation regime. Both sides have a policy of maintaining rough strategic parity with the other; strategic arms control allows doing this without reigniting an arms race. There are doubtless other benefits that further thinking and discussion will reveal.

Mitigation

After the two sides have determined the specific benefits of New START, they should jointly see how, if at all, it is possible to mitigate the consequences of its lapse. They might, for example, continue exchanging periodic data on our strategic forces as a confidence building measure. They might even agree to limited inspections to verify the number of warheads on ballistic missiles, the most important limit that cannot be verified by national technical means.[11] They might exchange plans annually with ten-year projections of their strategic forces and take a politically-binding commitment to promptly notify one another of any near-term changes.

To deal with concerns over seeking to maintain rough strategic parity by re-initiating an arms race, the United States and Russia might agree that neither would expand their forces above New START levels provided the other side showed comparable restraint. This could be done by reciprocal speeches or by a joint statement to either the 2020 or 2025 Review Conference of the Nuclear Non-Proliferation Treaty or to the United Nations Security Council.

To show that they can cooperate on a basis of respect and equality, the two states might intensify cooperation under the Global Initiative to Counter Nuclear Terrorism, which Russia and the United States co-chair. They might focus this effort on preventing onward proliferation from North Korea if, as seems probable, near term denuclearization of the Korean peninsula is not attainable in the next few years.

In 2017, 122 states (none of which possess nuclear weapons or are

11 This proposal is more ambitious than it may appear. While inspections under the Cooperative Threat Reduction program did not require a treaty, they did require a formal bilateral agreement which may not be politically feasible. Further, there may be issues under US domestic law with disclosing ballistic missile loadings in the absence of a treaty.

allied to states that do) signed the Treaty on the Prohibition of Nuclear Weapons, in large part to symbolize their frustration with the slow pace of nuclear disarmament. While the new treaty is not binding on either Russia or the United States, the number of signatories virtually guarantees that the 2020 Non-Proliferation Treaty Review Conference will be contentious. The risk is not that the Review Conference will "fail." Russia and the United States should be concerned with whether the risk of proliferation increases, not with whether a consensus document can be negotiated. Still, it will be politically useful for the two leading nuclear states to present a common view. In addition to a voluntary agreement to remain at or below New START levels, a joint initiative to help states comply with UN Security Council Resolution 1540 and a parallel initiative to revitalize discussions on controlling fissile material could provide modest signals of support for the non-proliferation regime and Article VI.

The way ahead

The solution to the problems raised by the end of formal strategic agreements, like the solutions to many international relations disputes, begins with candid communications. The ideas presented in this paper are obviously rudimentary. More thinking, discussion and analysis is needed. Russia and the United States should begin both official and unofficial discussions of how to proceed following the expiration of New START. These discussions should take place even if New START is extended, since such an extension only postpones the issue. The strategic stability talks held in Helsinki in September 2017 could serve as a venue if — as many hope but the two governments have not yet agreed — they become the beginning of a regular process.[12] Any such talks should be candid and confidential.

Only official discussions can reach agreement. But official discussions may not be appropriate for informal brainstorming about possible approaches. In official discussions it is very difficult for senior

12 The September 12, 2017 meeting was formally described as covering "issues of strategic stability" with no further amplification. The delegations were headed by Russian Deputy Foreign Minister Sergey Ryabkov and US Under Secretary of State for Political Affairs Thomas Shannon. This is the appropriate level for such discussions: senior enough to matter but able to devote more time than is typically available at ministerial-level meetings

participants to advance ideas that go beyond their government's formal position. Despite the inevitable claims that these are simply "personal opinions," the other side will assume they are formal proposals. Therefore, official discussions should be supplemented by discussions between experts who are deeply familiar with their government's thinking and have sufficient access to get promising new ideas to appropriate senior officials. The prerequisite for either form of discussion is sound and creative internal analysis.

Both formal and unofficial discussions should also deal with issues where formal arms control has been less than successful. In their seminal work in arms control theory, *Strategy and Arms Control*,[13] Thomas Schelling and Morton Halperin treated "arms control" as a concept much broader than restraint codified in formal, legal agreements. Their concept encompassed any form of cooperative measures, including, for example, military-to-military discussions. It is time to implement that broader concept.

The author has presented these ideas in five separate forums during the last few months of 2017.[14] No Russian expert has agreed that the discussions described above are necessary. Many Russian colleagues have seen the proposal as a distraction from "working on the next treaty." These experts appear to misunderstand the degree to which concern with the INF Treaty issue is dominating US thinking. Without an unlikely breakthrough, there will not be a "next treaty" for many years, if ever.

The United States and the Russian Federation have from now to 2021 (or perhaps to 2026) to devise and implement a transition from formal treaties to less formal ways to manage our strategic relationship and sustain mutual restraint. They should use that time to find ways to enhance stability. They may even find that a less formal approach allows us to address issues the two states have been unable to deal with to date. Three examples:

13 Schelling T.C., Halperin M.H. *Strategy and Arms Control*. Martino Fine Books, 2014.

14 The Aspen Forum, Luxembourg Forum, Moscow Non-Proliferation Conference, strategic stability discussions between the US and Russian Academies of Science and a track 2 discussion sponsored by two prestigious institutions.

- Both states worry about China's emergence as an economic and military power and the lack of clarity over China's nuclear forces. China will not join formal arms control talks until Russia and the United States reduce drastically below current levels. China might, however, participate in strategic stability discussions that would allow it to clarify its thinking and demonstrate restraint. Ideally other states with nuclear weapons might subsequently join those discussions.
- Currently Russia and the United States lack a process for exchanging information and concerns on non-strategic nuclear weapons, missile defenses, and other areas of mutual interest. Less formal approaches might help us develop such a process.
- Finally, existing treaties do an inadequate job of dealing with crisis stability. The two sides should consider resuming military-to-military discussions or, if that proves infeasible,[15] should examine how to mitigate the risks to crisis stability that have arisen from truncating the military dialogue.

This has been a gloomy essay to read — and to write. But the problem will not be improved by ignoring it. The era of formal Russian-American strategic arms control is coming to an end, at least for a while. It may not be possible to prevent such a result but thinking through the consequences can minimize the harm to US-Russian relations, to international stability and to the cause of peace. That thinking should begin now.

15 In response to the Ukraine crisis and the annexation of Crimea, the Obama Administration ended what it considered routine interactions while maintain cooperation in areas like counter-terrorism and New START that were crucial to joint security. Unfortunately, it erred in treating military-to-military discussions as routine. In fact, in times of tension like the present, such discussions are more important, not less. Unfortunately, the restriction has been codified in law and may be difficult to reverse.

1.2. NUCLEAR ARMS CONTROL: STATE OF PLAY AND PROSPECTS

Vladimir Dvorkin[1]

Nuclear arms control is understood to apply to strategic arms, intermediate and shorter range nuclear weapons, and tactical nuclear weapons.

It is forever being said that the negotiations on strategic arms have bogged down to an unparalleled degree. Reports suggest consultations could extend the 2010 Prague New START Treaty for another five years, but the prospects for such an agreement remain ambiguous.

US and Russian grievances over the INF Treaty are public knowledge. Periodically consultations are held, but the jury is still out.

There have been no consultations on tactical weapons at all since the unilateral reductions in the 1990s. The numbers at which experts put them have not been confirmed or denied officially.

One unquestionably positive factor is still the parties' virtually perfect compliance with the terms of the New START Treaty: the 18 annual inspections of ICBM launchers, subsurface launch platforms and

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heavy bombers; and the dozens of verified notifications on the status of weapons, replacements, flight tests, deployments, etc.

History is irrefutable in teaching us that where no such information is available, naturally and inevitably there will be a build-up of each side's forces and capabilities, leading to an increase in the quantity and sophistication of weapons at considerably greater cost. In management theory this translates into a self-reinforcing system which inexorably grows unstable: i.e. a nuclear arms race.

A negligible portion of intelligence may be gained by national space-based surveillance means, but that is wholly inadequate. For example, the actual number of warheads on the ICBM or SLBM for which they have been designed and tested cannot be determined. According to the most recent Treaty, four warheads may be installed on a Trident-II SLBM, but it is also possible to equip it, in the absence of verification, with 8 more powerful warheads, or even as many as 12 less powerful ones. All Minutemen-3 ICBMs can be fitted with three warheads each, which would mean nearly tripling the nuclear payload. Similar options are also available in Russia.

To repeat then: this is a direct path to a nuclear arms race.

The breakdown of the INF Treaty is no less of a threat, given the mutual claims of treaty violations.

The US accuses Russia of having developed and tested ground-launched cruise missiles in 2014 with a range exceeding 500 km.

Russia charges the US with using Hera target missiles — (on a par with intermediate-range ballistic missiles) — to test missile defense systems, as well as with developing Predator and Reaper attack drones with a range of over 500 km. The main point of contention is over deployment in Romania and later in Poland of missile defense systems with Mk-41-equivalent launchers on US Navy vessels capable of firing not just Standard Missile-3 (SM-3) type ABM interceptors but Tomahawk cruise missiles as well, capable of ranges up to 2500 km.

Since things have as yet to come to a full-scale confrontation, such recriminations might be resolved fairly straightforwardly within the

permanent special verification commission set up originally for that purpose.

However, the points at issue are not about to find any practical solution in the current climate, and the future of the INF Treaty is in danger. For the Treaty to cease to have effect now, though, would propel relations between Russia and the West back into an intransigent Cold War style confrontation far worse than was the case during the mid-1980s of the last century.

New and ever more effective ballistic and cruise missiles would appear in Europe, coming to hug Russian borders considerably more. Costly missile systems would have to be developed and deployed, exposing large urban administrative and industrial centers and their tens of millions of residents, as well as the entire NATO infrastructure and European seaports to the risk of a nuclear strike. That is why withdrawal from the INF Treaty is seen as utterly unacceptable, and disastrous for Russia, the US, and Europe.

Some postulate that neither the leaders of nuclear states nor public opinion would countenance a nuclear arms race. Occasionally modernization and development of new strategic systems are seen to be part of such a race, though if such processes take place within the scope of arms limitation and reduction treaties, that would still fall short of the race.

What is perceived to confound new START talks are global and regional missile defense systems; non-nuclear high-precision means of wielding a disarming strike, including Prompt Global Strike capabilities; the lack of a ban on space-, land-, air- and sea-based weapons systems designed to hit targets in space or from outer space; third country nuclear weapons; and the use of cyber weapons.

Experts' findings at the Luxembourg Forum and in other organizations confirm that the case for such impediments is not so much about destabilizing military factors as about political hurdles. They could be overcome entirely, if we are to judge from the experience of previous decisions adopted under considerably more fraught political and military circumstances by the historic leaders of the two mightiest nuclear states.

1.3. THE FUTURE OF NUCLEAR ARMS CONTROL

Robert Legvold[1]

The question can and should be asked in three ways: what is the likely future of nuclear arms control? What could be the future of nuclear arms control? And what should be the future of nuclear arms control? The three questions involve not simply probabilities, but perspective. That is, not simply the chances that the effort to control nuclear weapons will go forward in some form or even whether it matters, but why it matters and in what context.

Start with the first question, what is the likely future of nuclear arms control? Nearly always this refers to the status and future of arms control arrangements between the United States and Russia. The answer these days, given the poisoned relationship between the two countries, is bleak. (With a moment's reflection, the fact that there never has been an agreement limiting nuclear arms between other nuclear powers and none in prospect simply adds to the bleakness.)[2] As Alexey Arbatov wrote in 2015, "It is obvious that the world is presently facing the most serious and comprehensive crisis in the fifty-year history of nuclear arms control."[3] Few experts on either side would bet that the United States and Russia will manage to salvage the tattered remains of what they, in fits and starts, laboriously negotiated over forty-years. The prospect of saving the INF treaty appears to dim with each passing month. Both the intractable nature of the two countries' negotiating positions and the politics of the issue in their deepening standoff militate against that. Even if they agree to extend New START in 2021 (far from a certainty, if the INF treaty collapses), many expect the end of the five-year extension to be the end of the road for strategic nuclear arms control.[4]

That leaves the other two questions. In thinking about what could or should be the future of nuclear arms control, were circumstances to change, the choice is between two fundamentally different analytical frameworks. The first — and the one most likely to frame the answer to the question of what could be the future of nuclear arms control — focuses on the nuclear regime as it is and strategic nuclear arms control as it has been. The first, the regime, was the product of the Cold War bipolar nuclear world, and the second, the arms control process, was designed for it. The chief objective ultimately came to be achieving and then preserving "strategic stability" in the US-Soviet nuclear relationship. Strategic stability had two parts: First, crisis stability, the crucial notion that, if each side had the wherewithal to ride out an initial nuclear attack and retaliate with devastating force, in a crisis neither side would care or dare to use nuclear weapons.

To that end, over time, they cut short a de-stabilizing offense-defense race by banning all but very limited ballistic missile defense systems, reduced each side's ability to destroy the other side's land-based ICBMs by banning in 1991 MIRVed ICBMs, eliminated an entire class of weapons (intermediate-range nuclear arms) that are particularly destabilizing in a European context, and, along the way, created a nuclear hotline and risk reduction centers. The enterprise was overwhelmingly

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2 This is not to diminish the importance of the 1988 India-Pakistan Agreement on the Prohibition of Attack against Nuclear Installations and Facilities or the annual exchange of lists of nuclear installations and facilities that occurs under it.

3 Arbatov A. *An Unnoticed Crisis: The End of History for Nuclear Arms Control?* Carnegie Endowment for International Peace, June 2015. P. 22.

4 Linton Brooks makes the case well in his chapter in this book (see the previous chapter).

of and by the two countries that in 1986 held more than 99 percent of the world's nuclear weapons, albeit it also was for a world spared a nuclear catastrophe.[5] Then and now crisis stability and strategic stability were and are often treated as one and the same. But over the course of the Cold War, placing limits on an open-ended nuclear arms race was also seen as contributing to strategic stability.

The two countries sought arms race stability not only by eschewing the competition that a full-scale effort to build an effective ballistic missile defense system would unleash, but they also placed a cap on US and Soviet nuclear launchers and then began reducing both launchers and nuclear warheads, eventually eliminating almost 80 percent of the two countries' nuclear arsenals. The agreements they reached, by setting quantitative limits on critical portions of each side's nuclear forces, eased the planning burden for both by making predictable the future scale of the other side's forces. And the inspection regime that eventually accompanied these agreements rendered the character of the other side's forces more transparent, thus, reducing the temptation to rely on worst-case analysis. All of this, however, has been in the service of a bimodal framework for thinking about and dealing with the world of nuclear powers. When turning to the question of what should be the future of nuclear arms control, no longer will this bimodal framework suffice. But first comes the second of the three questions.

What could be the future of nuclear arms control?

Nothing discussed in the paragraphs that follow will have any currency unless Moscow and Washington begin digging themselves out of the deep hole where they are stuck. Given the inability and increasingly the unwillingness of the Trump administration to challenge the anti-Russian consensus within the Congress and seriously engage the Russian side, and the reluctance of the Putin leadership to make any

5 Norris R.S., Kristensen H.M. Global Nuclear Weapons Inventories, 1945-2010 // Bulletin of the Atomic Scientists. July/August 2010. P. 81. By their estimate in 1986, the peak year, the United States and the Soviet Union combined had 68,317 nuclear weapons; the United Kingdom, France, China, Israel, India and Pakistan combined had 1,057 nuclear weapons.

concession that would make engagement productive, few expect the digging to begin soon.

Before capitulating to the hopelessness of the moment, however, it is worth remembering how grim things appeared in fall 1983. September 1, 1983, Soviet air defenses shot down the South Korean civilian airliner, KAL 007; the first two weeks in November of that year NATO ran the command post exercise code named "Able Archer," seen by the Soviet side as a prelude to a likely nuclear attack, bringing the two sides as close to nuclear war as they had been since the October 1962 missile crisis. In the harsh first two years of the first Reagan administration, the two countries were deep in the Cold War. Less than three years later, with Mikhail Gorbachev in power, the two governments had begun taking the first steps leading to the end of the Cold War.

History more often than not does not telegraph the twists and turns that it has in store, and, if the path by which the current impasse might be surmounted remains shrouded, the other side of uncertainty makes the effort to think through the future of nuclear arms control not only imperative, given the stakes in an increasingly complex and potentially dangerous multipolar nuclear world, but also less fanciful.

Were prospects in US-Russian relations to brighten, and the two governments to resume discussion of new nuclear arms control measures, it is likely to be within the bimodal framework of what already exists — provided what already exists has not ceased to exist. Familiarity and the limits of what seems feasible favor incremental improvements of a regime already in place. Hence, the natural tendency will be to focus on incremental steps beyond the 2010 New START agreement. The logical, but by no means easy next step, would be a further reduction in numbers of warheads and delivery systems. Indeed, in 2013 Obama proposed reducing the number of warheads from 1550 to 1000 and delivery vehicles from 700 to 500. These, however, are deployed weapons, and each side has a sizable number of non-deployed warheads that, in a crisis, could theoretically be reincorporated into the active force. The vexatious issue of sub-strategic nuclear weapons could also be

addressed by including them in an overall limit and leaving it to each to decide on the mix of weapons it wants. And the current rule that under counts nuclear weapons carried by bombers could be corrected to more accurately reflect reality. An agreement with any or all of these elements would be an immensely positive development — first, by saving the process of strategic nuclear arms control, second, by giving greater degree of stability to the US-Russian nuclear relationship, and, third, by adding momentum to what of necessity would have to be improving relations between Moscow and Washington.

But the unresolved issue surrounding the INF treaty stands in the way.[6] Unless it is resolved any hope of even gingerly re-starting strategic nuclear arms talks appears slim. A resolution, however, could be in one of three forms. First, the two sides could decide the treaty was worth preserving, and, in turn for accommodations addressing Russia's three concerns (drones, test missiles, and the potential capabilities of "Aegis Ashore"), Russia would limit or eliminate its two SSC-8 sites, thus, returning to compliance with the treaty. Or, second, the treaty could be abandoned in one of two ways. First, if the two countries continue on their current path they will together bury the treaty — Russia by developing and deploying a new generation of GLCMs and the United States by advancing beyond the "research and development" of a GLCM of its own as provided for in the 2018 defense budget. This would be the destructive version, with each side blaming the other for undermining the treaty and each side re-opening a de-stabilizing competition that will unnerve the United States' European allies. Alternatively one or both sides could formally abrogate the treaty, as the United States did with the 1972 ABM treaty, but reaffirm their commitment to nuclear arms control by immediately launching follow-on New START talks. This too would be a de-stabilizing outcome, but one that preserved a nuclear arms control process.

6 The common assumption is that as long as Russia remains in US eyes in violation of the INF treaty no new strategic arms control stands a chance of ratification within the US Senate. That, however, ignores the possibility that, were the two sides to begin follow on talks to New START, any progress made would facility a resolution of the INF issue.

As some have argued, a third possibility exists. Rather than attempt to save what they believe cannot and need not be saved, the two sides should negotiate a new agreement that focuses on nuclear warheads, not on the ballistic and ground-launched cruise missiles to deliver them.[7] The agreement would be to de-mate nuclear warheads from all delivery vehicles capable of striking within the 500-5500 kilometer range, and store them at a distance eliminating the risk that they could be used in a sudden nuclear attack. The systems would remain and so too the prospect that at some point in a conflict they would be used, but an acutely de-stabilizing aspect of the threat would be eliminated.

Within the bimodal framework there are other ideas that push at the edges, and offer ways of addressing some of the new challenges posed by a changing nuclear universe. While still principally concerned with the future of US-Russia nuclear arms control, Stephen Pifer has sketched a potential agenda that takes into account key Russian demands and transcends the parameters of prior agreements.[8] The Russians, when they have spoken of further nuclear arms talks, have said these must address three new factors: the development of ballistic missile defense systems; the emergence of conventional missiles capable of executing strategic missions, particularly, hypersonic glide vehicles; and the need to involve other nuclear powers in any new negotiation.

Although for the foreseeable future the chance of the United States developing an effective strategic ballistic missile defense system does not justify, on the US side, the Republican Party's stubborn commitment to such, and, on the Russian side, the concern that the United States could succeed, Pifer suggests modest steps to remove the issue as a roadblock to progress in other areas of nuclear arms control. Assuming the two sides cannot get back to negotiating a cooperative

7 Ryan K. After the INF Treaty: An Objective Look at US and Russian Compliance, Plus a New Arms Control Regime // Russia Matters. 2017. 7 December. Available at: https://www.russiamatters.org/analysis/after-inf-treaty-objective-look-us-and-russian-compliance-plus-new-arms-control-regime (accessed on 10 January 2018).

8 Pifer S. Nuclear Arms Control Choices for the Next Administration. Brookings Institute. October 2016. Available at: https://www.brookings.edu/research/nuclear-arms-control-choices-for-the-next-administration/ (accessed on 10 January 2018).

approach to missile defense against third parties,[9] the United States might agree to cap or reduce the relatively small number (48) of SM-3 interceptors to be deployed in Romania and Poland or even to scrap plans for the Polish deployment. Short of that, the two sides might, as the United States proposed in 2013, consent to an annual data exchange, sharing planned numbers of interceptors and radars over, say, the next decade.

To deal with advanced conventional strike weapons, Pifer offers modest relief predicated on the assumption that these systems, other than conventionally armed cruise missiles, will remain a confined threat. As the Obama administration decided, it does not make sense to use treaty-limited SLBMs and ICBMs to deliver conventional ordinance, and hypersonic cruise missiles, except in the case of China, remain in a testing and development stage. When ready, they are not likely to be deployed in significant numbers — not, at least, as intercontinental weapons. Hence, Pifer proposes relatively easy fixes: either a specific agreement to keep them at a low number or to include them within the New START limitations on warheads and delivery vehicles (since in small numbers the impact on Russia's and United States' strategic nuclear forces would be negligible).

In one respect, Pifer's approach does evoke the challenge posed by a world of multiple nuclear powers. The Russian side has insisted that the next round of nuclear arms limitations must include other countries with nuclear arms, although no Russian official has sketched a process or agenda by which multilateral nuclear arms control negotiations might be conducted. Pifer fills the gap by suggesting that the nuclear P5 (the five permanent members of the UN Security Council, all nuclear-armed states) test the possibility of agreeing to a data exchange

9 For example, see Hadley S., Rühe V., Trubnikov V. Missile Defense: Toward a New Paradigm. Carnegie Endowment for International Peace. February 2012. Available at: http://carnegieendowment.org/2012/02/03/missile-defense-toward-new-paradigm-pub-46961 (accessed on 10 January 2018). They proposed the creation of Cooperation Centers for pooling and sharing information and data from US, NATO, and Russian satellites and radars operating in real time to notify each side of a third party missile attack as well as joint command-staff exercises on ballistic missile defense, including against medium- and intermediate-range missiles.

obliging them to share basic information on the total number and types of nuclear weapons in their arsenal, and perhaps, more ambitiously, the location of deployed strategic delivery systems. Or conceivably Great Britain, France and China would consider a pledge not to increase the number of their nuclear weapons, if the United States and Russia continued reducing theirs.[10] Pifer also raises the possibility of the other three being invited to observe US and Russian inspections under New START or the five providing notifications of major strategic exercises. Or they could make a formal commitment to de-mate non-strategic nuclear weapons — weapons that, for the most part, are already de-mated in the forces of the five countries. Finally, Pifer urges an ongoing strategic dialogue among the P-335 on "strategic stability, missile defense and the offense-defense relationship, the effect of potential new weapons technologies, and the doctrines governing their nuclear forces."[11]

What should be the future of nuclear arms control?

While Russia and the United States still retain 92 percent of the 15,700 nuclear weapons in the world, the contours of and the dynamics within an evolving nuclear order are shifting in dramatic ways. Not only is it a world of nine nuclear-armed states, but five of the nine (the United States, Russia, China, India, and Pakistan) now shape the future — no long only two of them. And the future they are shaping raises unprecedented challenges with dangers as great as or greater than in the earlier nuclear era. Not only are these challenges unfolding largely unattended — indeed, it seems, unrecognized by national leaderships — but at a time, when, as noted earlier, the existing nuclear arms control regime is crumbling.

10 Alexey Arbatov has assessed what the P5 has accomplished over its eight year existence, and laid out the reasons why transferring the model of US-Soviet/Russian nuclear arms will not work among these five nuclear states. See Arbatov A. Five-party talks on nuclear weapons. In Arbatov A., Dvorkin V. (eds.). *Polycentric nuclear world: challenges and new opportunities.* Carnegie Endowment for International Peace, 2017. Pp. 75-84.

11 Pifer S. Nuclear Arms Control Choices for the Next Administration... P. 38.

In this new world familiar challenges are twisted into unfamiliar forms. Earlier notions of strategic stability and its foundations lose precision, when mutual assured destruction does not exist between all adversaries or in different quarters the disincentive to use nuclear weapons is dismissed. Mutual deterrence grows cloudy and uncertain, when assessed in a triangular relationship. The impact of national nuclear doctrine fosters greater ambiguity, when the number of nuclear states with discordant and potentially clashing doctrines expands. Extended deterrence commitments swell in complexity, when the environments within which they apply become both more intricate and more dissimilar.

At a more specific level, developments from the past take on a different character when reproduced in the present. Thus, a renewed competition between offense and defense, particularly the development of ballistic missile defense, has different implications when not merely the United States and Russia have re-engaged, but when India, Pakistan, and China are also doing the same. Similarly, the earlier attraction of limited nuclear options (in a "flexible response strategy") promises different consequences as several countries race to develop smaller, lower-yield, more accurate nuclear weapons, valuing not only their usability as enhancing deterrence, but their usability as such. Defending against a counterforce attack on land-based nuclear systems becomes much more complex, were advanced conventional strike weapons currently under development capable of executing it. The proliferation of weapons systems that can be either conventionally or nuclear-armed, when indistinguishable, raises a problem once of marginal concern to a qualitatively different level.[12] And the inevitable advance of technology has a far more fundamental significance when it opens whole new realms, such as the cyber frontier in the world of nuclear competition, or breaks through critical thresholds, such as the potential threat posed by directed energy weapons to an opponent's C3I, or the future impact of advances

12 Indeed, the phrase "entanglement" to denote the risk of misperception or inadvertent action from an inability to distinguish one kind of system from the other had not even been coined during the Cold War nuclear era.

in artificial intelligence and machine learning on a country's ability to locate and track another's mobile and sea-based nuclear missiles.

Finally, not only does the geometry look different when five major nuclear powers shape the nuclear order, but the new and contrasting configurations among them create yet another complication peculiar to a multipolar nuclear world. In the Cold War nuclear era, the principals were locked in a two-way contest. Threats, dangers, doctrines, postures, and plans were all framed within this narrow, albeit formidable, context. Among the five major nuclear powers, today's reality is fundamentally different. Three of the five — China, India, and the United States — view themselves in three-way contests, and see themselves compelled to design their forces for dual nuclear adversaries, while the other two — Pakistan and Russia — remain focused on one nuclear adversary (although for Russia an adversary with nuclear allies).

This discrepancy, this asymmetry produces further distorting and potentially de-stabilizing effects. Measures taken to deal with one adversary are inevitably treated by the second adversary as directed against it, ratcheting up the competition all around. Defensive efforts against third parties — say US ballistic missile defense designed against an Iranian or North Korean threat — are viewed by major adversaries — in these cases, Russia and China — as ultimately intended to degrade their nuclear deterrent. Even arms control cooperation, constructive in the relationship between two nuclear adversaries, risks being judged a threat by a third adversary (say, China, were Russia and the United States to have achieved the cooperation on ballistic missile defense they pledged to seek at the NATO-Russia Council summit in 2010).

It should not take more than a moment's reflection to recognize that, if the challenges and potential dangers of this new, vastly more complicated nuclear environment are to be mitigated and managed, it will require new thinking and new approaches. In place of the bimodal framework of the past, the approach will need to be multidimensional and multilayered, open to a variety of mechanisms, both formal and informal, and conducted among different combinations of states.

This begins with rethinking the forum within which managing the new nuclear era takes place — indeed, with the need to think plural. Key strategic dialogues and agreements would almost certainly remain bilateral (United States-Russia; United States-China; India-Pakistan; India-China). But trilateral strategic dialogues among India, Pakistan, and China and among China, Russia, and the United States could play a critical role, and in the latter case it may be the necessary framework for dealing with issues such as the weaponization of space, limitations on the incorporation of cyber into the nuclear domain, and the emergence of hypersonic glide vehicles.

At the next level up, to give an overarching coherence to the process, the five nuclear powers — China, India, Pakistan, Russia, and the United States — should come together. Call it the N-5. There will be a need for governments at some level to agree on the dangers in this increasingly complex global nuclear environment and to think in ways transcending narrow national concerns on how to achieve common ground in addressing them. That cannot be done by any two (or three) countries. Finally, for some purposes, all of the nuclear powers should regularly convene. Those purposes include deliberating over nuclear norms, facilitating and complementing what is agreed to between and among the five, finding ways of strengthening the synergy between progress in managing relations among the nuclear powers and avoiding the further proliferation of nuclear weapons, and, depending on the outcome in the North Korean case, possibly managing a nuclear-armed DPRK. If in the end the objective of denying North Korea nuclear weapons and achieving the de-nuclearization of the Korean peninsula fails, the other nuclear powers, along with the DPRK's neighbors, will have a heavy stake in limiting the size and nature of the North Korean program, reducing the North's temptation to rely on nuclear intimidation, and avoiding a de-stabilizing action-reaction cycle between the DPRK and its adversaries.

The architecture of dialogue and negotiation, however, is not the only way in which thinking about the new nuclear order needs to

change. The objectives guiding efforts to manage a new multipolar nuclear order also need amending. The core objectives — enhancing crisis stability and avoiding arms race instability — remain the same. But they grow immensely more fraught in multiple competitive and potentially conflictual relationships, giving increased importance to critical secondary objectives. As the range of crises that risk the use of a nuclear weapon or weapons expands (witness the fears surrounding the DPRK case), and more useable nuclear weapons are developed along with plans to use them in what will remain a far-from-perfect information environment, the imperative to lengthen the decision-making time that leaders have before firing them intensifies. Second, when the means of disrupting or destroying command-control networks are becoming more diverse and lethal, it is important to find ways of making C3I more secure in all countries.

Third, given the uneven quality of fail-safe measures among a wider cast of nuclear-armed states, there is also a more pressing need to strengthen mechanisms and methods for preventing the unauthorized or accidental use of a nuclear weapon. And, fourth, albeit more controversially, among the five major nuclear powers, a more stable global nuclear order requires that each state has confidence in its nuclear deterrent. Presumably that means each of the five should have a secure second-strike retaliatory capability. If that is achieved through the transformation of offensive capabilities or a combination of missile defense and enhanced strategic forces, the goal of arms control then becomes to ensure that these efforts do not lead to arms race instability.

What is to be done?

If the risks associated with the hair-trigger nuclear postures of the United States and Russia, grave during the Cold War, are growing, because of the deterioration in US-Russian relations, the possibility of a US/NATO-Russian military conflict in Europe, and the swelling number of global hot spots, a priority should be moving Russia and the United States away from their prompt launch nuclear postures and

ensuring that others do not abandon their low-alert postures.

Because at the moment only Russia and the United States maintain nuclear forces on high-alert allowing national leadership only a two- to three-minute window to react during the half hour between a detected nuclear attack and the moment missiles strike, this remains a problem that fits within the bimodal framework. They alone can stand down the 1800 US and Russian nuclear weapons ready to launch within 12 to 15 minutes. Given the risk of false alarms (of which there are thousands of varying seriousness annually), or of a malfunction in C3I, or of unauthorized or accidental release of a nuclear missile, removing the chance of catastrophe posed by forces poised to "launch on warning" and the excruciatingly short decision time it leaves to a US or Russian president is long overdue. But its importance assumes a different scale in a multipolar nuclear world, and different as well must be the framework within which it is addressed.

As the most thorough and carefully argued report on de-alerting forces on prompt launch notes, "All the countries possessing nuclear weapons today . . . besides fielding new types of weapons, and dispersing them more widely . . . are shortening the time needed to employ them."[13] Hence, the larger goal now becomes to slow this trend and ensure that other states, as they modernize their nuclear forces, do not emulate the prompt launch postures of the United States and Russia or embrace a policy of "launch-on-warning."

The authors, experienced policymakers and senior analysts from the major nuclear powers, propose a two-pronged process. On one side, Russia and the United States would together take a number of steps that would eliminate the possibility of a surprise disarming nuclear strike and lower the risk that either would react to a false alarm or inadvertent launch.[14] These include, among other measures, substantial advance

13 Cartwright J., et. al. De-Alerting and Stabilizing the World's Nuclear Force Postures. Global Zero Commission on Nuclear Risk Reduction Report. April 2015. P. 21. Available at: https://www.globalzero.org/files/global_zero_commission_on_nuclear_risk_reduction_report_0.pdf (accessed on 10 January 2018).

14 Ibid. Pp. 85-87.

notice of intended missile launches and exchange of real-time information on detected missile launches and the identity of the country launching; agreement not to deploy SSBNs within 30 minute missile range of the other country's borders; eliminate launch on warning from the repertoire of nuclear command operations, exercises, and training; scrub launch-on-warning procedures from Emergency War Orders; and stand down high-alert strategic forces over a phased ten-year period. For the last piece the objective would be to increase the time that it takes to launch missiles from currently under 15 minutes to, at a minimum, 24 hours.[15] The last piece will also require effective verification that has different levels of difficulty depending on the method of de-alerting selected.

On the other side, India, Pakistan, and China would need to lead consultations among the other nuclear powers pointing toward the negotiation of a multilateral agreement limiting the operational readiness of their forces and pledging not to adopt a launch-on-warning policy. In order to make the agreement effective, the Global Zero Commission, also recommends including these states in a joint early warning center to be created by Russia and the United States to monitor missile launches from any quarter and to share the information in real time; that India and Pakistan "establish in each country a strategic risk management unit, and further strengthen the safety and security of their nuclear weapons during storage, transportation, and handling;" and that NATO reaffirm the "three NOs" (that is, no intention, no plan, and no reason to deploy nuclear weapons on the territory of new NATO members) provided that Russia pledges not to move nuclear weapons to European borders.[16]

In order that moving from or avoiding a prompt launch posture enhance rather than weaken crisis stability, it must extend to all five or all seven major nuclear powers. Any or all players that remain outside the agreement would allow the risk of a potential surprise disarming

15 There are various ways of doing this: by removing warheads, gas generators, and/or flight batteries, and, in the case of the US Minuteman III, by removing the safety control switch and lock pin assembly from the distribution box (which is called "safing"). Depending on the method selected, the estimated time for re-alerting an initial tranche of missiles is between three and thirty hours.

16 Cartwright J., et. al. De-Alerting and Stabilizing the World's Nuclear Force Postures... Pp. 88-89.

nuclear attack to linger, and, thus, both increase crisis instability and impel adversaries to refuse to lower the operational readiness of their forces. Notably, getting to a de-alert/low alert regime that is inclusive can only be achieved through mutual agreement — that is, through an arms control process.

That process in a multipolar context, as noted earlier, will inevitably need to be disaggregated, but with key elements intricately linked; separate in its negotiating parts, but interdependent in its negotiated results; and varied in its forms, but cumulative in its effect. The intricacy is already implicit in the hope of creating a world where nuclear decisions are not hair-trigger. For example, a prime reason why the United States did not accept "sole purpose" as a principle guiding its nuclear deterrent in the 2010 Nuclear Posture Review was the belief that only nuclear weapons could strike quickly enough to thwart a terrorist bio attack concocted on some faraway island and about to be set in motion. When called upon, those nuclear weapons presumably needed to be on prompt launch. To remove that requirement, some other weapon system would have to be available to perform that mission. Might that be an advanced conventional strike weapon, including a hypersonic glide vehicle?

If so, developing advanced conventional strike weapons for a diverse set of missions, many of them non-nuclear, immediately generates tension and potential instability in key nuclear relationships (e.g., US-Russia; US-China; and, at some point in the future, India-Pakistan; and India-China), were they perfected and deployed in numbers large enough to menace national leadership (so-called "de-capitation"), command and control networks, and/or land-based missile systems. Regulating the push-pull tension around weapons that both offer a solution and pose a threat creates another task for arms control. A way forward may be to begin exploring possible constraints bilaterally between the United States and Russia, but it will obviously very soon have to include China, and eventually India and Pakistan as well.

The complex configurations that will need to replace the bimodal framework of the past will be a decisive factor determining whether

the nuclear world of the future is blessed with increased crisis stability and less arms race instability or cursed with the opposite. Thus, for example, in managing the impact that advances in technology will have on the outcome, different combinations of states will need to take the lead. Few developments would be more de-stabilizing than anti-satellite weapons genuinely capable of incapacitating another country's early warning infrared surveillance satellites in geosynchronous orbit. ASAT technology appears to be one area where China is ahead of the United States, and, if the perils that may lie ahead are to be averted, China and the United States, together with Russia, need to design mutual restraints.

Alternatively, the advances in MIRV technology that matter most to crisis stability and arms race instability are occurring between India and Pakistan and India and China. When nuclear forces are lethal but small and land-based, particularly at fixed sites, and ballistic missile defense is rudimentary, MIRVed ballistic missiles as high-value targets are, in a crisis, particularly de-stabilizing. Because a negotiated agreement among the three countries to abandon their MIRV programs would seem a reach too far, some argue in favor of a "MIRV restraint regime."[17] That is, through bilateral and trilateral informal agreements, the three would agree to limit the number of warheads tested on different missiles and then, with adequate verification, treat each deployed weapon as carrying that number of warheads.

In reality this would amount more to a confidence-building measure than an arms control arrangement for dealing with the underlying problem. As long as China and India are embarked on developing BMD systems, shrinking MIRVed forces will be seen as weakening deterrence. Addressing the link between MIRVs and BMD, however, underscores how ramified the connections are in this new multipolar context, and how imaginative and focused governments will have to

17 Mishra S. A Triangular MIRV Restraint Regime in Southern Asia. Stimson Center. June 7, 2017. Pp. 1-6. Available at: https://www.stimson.org/sites/default/files/file-attachments/A%20Triangular%20MIRV%20Restraint%20Regime%20in%20Southern%20Asia.pdf (accessed on 10 January 2018).

be, if the dangers that lie ahead are to be avoided. In theory a second proposal — that Pakistan terminate research and development of its MIRV program in return for an Indian decision to halt its BMD effort — might avert a de-stabilizing competition in this bilateral relationship, but it ignores the problem's tangled reach beyond.[18]

Both India's nascent BMD system and MIRV program have as much to do with China's nuclear advances as with Pakistan's progress. The more rapidly China moves forward with its two MIRV programs and BMD, the more India will press on with both of its own. At this level, a solution might be a three-way dialogue that leads to an agreement to call off the competition and set limits on both the scale of BMD and the number and size of MIRVed weapons. However, China's BMD and MIRV efforts, while likely of increasingly relevance in the South Asian context, exist primarily to strengthen nuclear deterrence in a China-US context. Hence, if the arms race instability and eroding crisis stability that await are to be contained, as five countries move ahead with their MIRV and BMD programs, not two or three but all five will have to decide on what limits they can agree on and, as difficult, what inevitable asymmetries in the results they can live with. First, however, they need to acknowledge the problem, and begin a dialogue engaging it. Addressing it in its global, rather than bilateral or trilateral context, argues for employing what I earlier called the N-5.

These complexities and still others in this new nuclear era make all the more important that the guidelines shaping choices be simple, even stark. None of the nine nuclear-armed states can be expected to place the goal of mutual security above maximum national security. Nor will any of them pause when enhancing their nuclear deterrent to contemplate an abstract blueprint for a safer nuclear world. Indeed, when tensions are rising in some cases and undiminished in others, the inclination of governments, whether in Washington or Moscow,

18 Tasleem S. No Indian BMD for No Pakistani MIRVs. Stimson Center. October 2, 2017. Available at: https://www.stimson.org/content/no-indian-bmd-no-pakistani-mirvs (accessed on 10 January 2018).

New Delhi or Beijing, to focus on ways of improving national security through mutual restraint largely disappears.

But if progress is to be achieved and disaster avoided, as governments do their nuclear posture reviews, plan steps to modernize their forces, choose among technologies, and respond to the strides they believe are being made by potential adversaries, they need to build into their decision-making process two other criteria: first, how does any one choice they make elevate the risk of crisis instability or release the brakes on arms race instability, and do the assumed gains to national security or an improved nuclear deterrent outweigh that price. Second, in the complicated mosaic of emerging challenges and dangers in this new nuclear age, the most severe at this point are still incipient. Therefore, governments can and should seize the opportunity to weigh the implications of paths not yet taken and decide whether or under what conditions they want to go down them.

Again, the process by which this might be done is variable, inviting different combinations of states for different purposes. For example, were states, as the result of technological advances, able to locate and track land-based mobile missiles and even ballistic missile submarines, a cornerstone of nuclear deterrence that depends on the invulnerability of a portion of their nuclear force will have crumbled. The technologies likely to perfect sensors to this level of capability will surely entail data analytics, robotics, artificial intelligence, and machine learning. In the United States, Russia, and China, advances in all these areas are well under way. On the horizon is not only the faster and vastly more efficient automation of satellite imagery analysis, but "technologies that can learn on the job — not simply follow prepared plans or detailed algorithms for detecting targets, but develop their own information and their guidelines for action."[19] Moreover the same technologies — e.g.,

19 O'Hanlon M., Karlen R. America Can't Afford to Lose the Artificial Intelligence War // The National Interest. 2017. 19 August. Available at: http://nationalinterest.org/feature/america-cant-afford-lose-the-artificial-intelligence-war-21960 (accessed on 10 January 2018). For a more extensive assessment of what advances in AI and machine learning portend, see Allen G., Chan T. *Artificial Intelligence and National Security*. Belfer Center Study, July 2017.

machine vision, sensor fusion, and planning and control — key to the self-driving automobile, when combined with high-performance computing, makes this threat all the more real.[20]

Left unimpeded, nothing will curb the natural momentum of this technological behemoth, unless governments signal to one another their readiness to face what will be the most de-stabilizing effects from an unstoppable transformative technology, and that their only chance to manage these effects requires that they act together.[21] Here China, Russia, and the United States should lead, because the problem will mature first in their nuclear relationship(s) and, only if they lead, will others follow.

Technology, however, threatens to complicate nuclear rivalries in other critical respects, and, again, China, Russia, and the United States are in the forefront. What the United States calls "left of line defense" — that is, developing cheaper non-kinetic means of missile defense — is already in the test phase. The Navy is employing prototyping programs to explore the possibility of integrating a laser weapon into the Aegis Combat System and a high-power laser for boost-phase kill in missile defense. The US Missile Defense Agency aspires to put a directed-energy boost-phase kill capability on "an unmanned aerial vehicle that could provide persistent missile defense capability from high altitudes."[22] Russia and China have comparable programs underway.[23] While the prospect that any of or all three countries will succeed in

20 And a Chinese company, Uisee Technologies, has already completed that task. See: Markoff J., Rosenberg M. China Gains on the US in the Artificial Intelligence Arms Race // The New York Times. 2017. 3 February.

21 Other than something like the unilateral decision by the US Department of Defense in 2012 that no action to use lethal force will be taken without human input.

22 Ekstein M. Navy, MDA Experimenting with Laser Prototypes For Surface Warfare, Ballistic Missile Defense // USNI News. 2017. March 29. Available at: https://news.usni.org/2017/03/29/navy-mda-experimenting-laser-prototypes-surface-warfare-ballistic-missile-defense?utm_source=Sailthru&utm_medium=email&utm_campaign=EBB%203.30.17&utm_term=Editorial%20-%20Early%20Bird%20Brief (accessed on 10 January 2018).

23 In Russia, for example, the Almaz-Antey Corporation is reported to be working on an air-launched laser complex for use against US reconnaissance satellites and early-warning satellites. See: Arbatov A., Dvorkin V., Topychkanov P. Entanglement as a New Security Threat: A Russian Perspective. In *Entanglement: Russian and Chinese Perspectives on Non-Nuclear Weapons and Nuclear Risks*, ed. by J. Acton. Washington: Carnegie Endowment for International Peace, November 2017. P. 35.

building effective non-kinetic or mixed BMD systems may remain close to science fiction, the possibility of developing this technology to the point where it could be used to spoof or disable more vulnerable command and control networks seems less far-fetched. Is this a prospect that China, Russia, and the United States wish to leave unhindered?

Other de-stabilizing developments in a crisis context that might have been eliminated unilaterally, are now more likely a threat to arms race instability and require joint attention from the United States and Russia. For example, the United States could have, as critics urged, called off development of the new Long-Range Standoff weapon (LRSO), a long-distance, stealth, nuclear-armed air-launched cruise missile of increased accuracy, because it has conventionally armed standoff cruise missiles and the dual-capable JASSM-ER ALCM that can perform nearly all the missions that will be assigned the LRSO, except one: to penetrate advanced integrated air defenses (IADS) and deliver a "decapitating" strike against national command.[24]

That prospective mission, along with the early-use, warfighting rationales offered as justification for the weapon, and the concern over their potentially dangerous consequences in a political-military crisis might have tilted the balance against this weapon.[25] But it did not. And, since Russia has a parallel weapon in the Kh-102, the dynamic will now shift to an offense-defense competition. The United States will have still greater incentive to develop the Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System (JLENS) and Russia its next generation A-235 missile defense system. As in the larger and more portentous offense-defense competition that will unfold around BMD, US and Russian leaders need to weigh how freely they want that competition to run. Constraining what cannot or will not be eliminated — if it is to be stabilizing — presumably assumes a situation of effective

24 This, of course, is not a simple matter, and for Russia's super-hardened command facilities, it would depend on the yield, accuracy and lethality of the nuclear warhead carried by the LRSO weapon.

25 Kristensen H.M. The LRSO: The Nuclear Cruise Missile Mission. The Federation of American Scientists. January 26, 2016. Available at: https://fas.org/blogs/security/2015/10/lrso-mission/ (accessed on 10 January 2018).

defense in equilibrium; that is, each side able to defend against the other side's cruise missiles without fear that further advances in cruise missile technology will undo the balance.

Two other frontiers loom large as this new multipolar nuclear era assumes its unwieldy shape. One keeps the focus on the United States and Russia. The other shifts attention once more to Russia, China, and the United States. In the first case, Russia and the United States are speeding forward with the development of smaller and more precise nuclear weapons designed for so-called limited use. The proposed new low-yield warhead for a refitted Trident II sea-based missile, the new more accurate, variable-yield B61-12 gravity bomb, the LRSO weapon, and other small, low-yield nuclear weapons designed for tactical use, while rationalized as enhancing the credibility of the US nuclear deterrent and increasing a president's options in a crisis, also transform nuclear weapons into far more tempting tools when a military conflict erupts or is about to erupt. The same is true for Russia, as it loads the Iskander-M short-range ballistic missile with a nuclear warhead or when its new naval doctrine asserts that "during the escalation of military conflict," the Navy must be capable of demonstrating a "readiness and determination to employ non-strategic nuclear weapons capabilities" as "an effective deterrent," and has in its arsenal the nuclear-capable sea-based Kalibr cruise missile.[26] If advanced strategic conventional strike weapons are becoming a substitute for nuclear weapons, this new class of nuclear weapons, in this role, vastly enhances the capabilities of conventional weapons. In the process they and notions for their use lower the firebreak by blurring the line between conventional and nuclear war. Rather than allow this trend to roll on with no attention paid to the consequences, policymakers in Moscow and Washington, particularly at senior military levels, might well sit down together, and take a long look at where this interaction may lead.

26 Fundamentals of the State Policy of the Russian Federation in the Field of Naval Operations for the Period until 2030. US Naval War College. 2017. P. 12. Available at: http://dnnlgwick.blob.core.windows.net/portals/0/RMSI_RusNavyFundamentalsENG_FINAL%20(1).pdf?sr=b&si=DNNFileManagerPolicy&sig=i110Z1rxZVzKbB%2BdHJ1CZuTxvwL3N7W34%2FLpksgT1Bs%3D (accessed on 10 January 2018).

There is also a need to take a long look at the untoward direction another major trend could take — only in this case China is as key as Russia and the United States. In all three countries the stress on reducing reliance on nuclear deterrence by strengthening its non-nuclear component is growing. In doing so, the three countries are not merely struggling to improve conventional defense in general, but developing conventional weapons that impinge on and complicate each country's nuclear posture. This is true of conventionally armed hypersonic cruise missiles and hypersonic glide vehicles, directed energy kill capabilities, and other dual-capable aircraft and missiles. The risk is that weapons systems whose conventional or nuclear capabilities are indistinguishable, or command and control nodes that are used for both, or conventional and nuclear systems that are located together will be mistaken one for the other in a conflict, leading to unintended or inadvertent nuclear war.

One can imagine unilateral and mutual constraints that would reduce this risk, but none will be possible, until the three governments engage the issue. They could do this individually by, when making weapons choices, factoring in the risk of unintended nuclear escalation through the "entanglement" of conventional and nuclear systems and the misreading they invite. Or they could in separate conversations — the United States with China and the United States with Russia — probe one another's sense (or not) of the problem and the steps each is likely to take to address it. Conceivably they could make this an element in a three-way strategic dialogue, where a growing range of developments complicating the nuclear choices of all three nuclear powers would be confronted.

This brings me to a final point: when contemplating the challenges of managing this new nuclear age, much depends on sequencing. Few if any of the answers to the third question — what should be the future of nuclear arms control? — stand a chance as long as the process itself remains frozen or, worse, is abandoned. But the process will only be saved, if the two most advanced nuclear powers save it — only if they resume where they left off in 2010. And only if the United States and

Russia again demonstrate their will to manage the single most important bilateral nuclear relationship can the larger cast of nuclear powers be induced to confront the challenge of managing the many dimensions of a multipolar nuclear world.

In the end, the three questions that I have posed are not separate, but integrated. If there is a future for strategic nuclear arms control, it depends on the fate of US-Russian nuclear arms control.[27] US-Russian nuclear arms control negotiations, if resumed, almost surely will seek incremental improvements to prior agreements. Thus, in all likelihood, in the foreseeable future the answer to the question, what could be the future of nuclear arms control?, will be further quantitative limitations on warheads and delivery vehicles. That, in any event, is a prerequisite for drawing China into any kind of an arms control process. Moreover, if during this next phase, Russia and United States begin wrestling with the new challenges, such as the impact of advanced conventional strike weapons, the implications of an offense-defense competition, and the effect of cyber and other exotic technologies in the nuclear sphere, they will set the table for a broader discussion among a wider set of nuclear-armed states. It will not be a matter of abandoning a bimodal framework for one that is multilateral, multi-dimensional, and multi-level, but of merging one with the other.

Thus, for example, if a multipolar nuclear world is to be rendered safer and more stable, the previous rudimentary and now weakening set of nuclear norms (e.g., the nuclear "taboo," no first use, negative assurances for NPT-compliant states, non-proliferation, etc.) will only be effective, if these and other norms are reinvigorated and embraced by all. Logically the forum for exploring this possibility would be all seven major nuclear powers. But their dialogue, to have any chance, will depend on what is achieved at other levels among different combinations of states. The United States is not likely to adopt a "sole purpose"

27 The fate of US-Russian nuclear arms control, of course, depends on the general state of US-Russian relations. Analyzing how this relationship might be put on a more constructive path allowing the arms control process to be reinstated, however, is a large and critical, but separate task.

norm, unless the threats that lead to its rejection are eliminated or can be addressed by other means. Russia is not likely to move away from a prompt-launch posture and back toward a no-first use policy, unless the United States does too. The tendency of a growing number of states to develop "useable" nuclear weapons and think of using them will not be halted, unless a critical nucleus of states agree that they do not want to continue down this path.

At a time when saving even the shrunken nuclear strategic arms control regime between the United States and Russia and its imperiled remnants seems bleak, calling for a compendious, intricate, multidimensional approach to nuclear arms control admittedly has an air of fantasy about it. Anything less, however, will almost surely fall short as this exceedingly complex and potentially dangerous new multipolar nuclear world gradually threatens to spin out of control.

Three considerations, therefore, drive the analysis here: first, many of the trends and developments generating the dangers ahead are still inchoate, and, therefore, with foresight and will, can be contained or eliminated. Second, while the specific suggestions for implementing the general approach urged here may be off the mark, and certainly can be improved, the need to move beyond familiar modes of thinking designed for an earlier nuclear era, and craft an alternative model more attuned to the nuclear era we have entered is imperative. And, third, because governments — in their current myopic and paralytic state — will not do this, the expert community, including the Luxembourg Forum, must.

II. REGIONAL ISSUES OF THE NUCLEAR NON-PROLIFERATION

2.1. STRENGTHENING NON-PROLIFERATION REGIME IN CONFLICT REGIONS

Hans Blix[1]

In this paper written at the end of September 2017 I propose to focus on three regions:

- the Korean;
- the India-Pakistani; and
- the Middle East.

Before embarking on these complexes I feel a need, however, to make some comments of a broader bearing.

Looking at the international debate about nuclear proliferation one might get the impression that there is not much to worry about beyond these three regional cases — that they constitute the major part of the world's proliferation problem. This, I think, is a narrative that comes from the great powers that have nuclear weapons: they are not themselves a problem, others are.

When some 120 non-nuclear weapon states (NNWS) show their frustration by concluding a treaty through which they double their own commitment to remain without nuclear weapons and do not — as the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) does — welcome in their midst states that retain and continue to develop these weapons, they are met with sarcasms — even by ambassadors of some P5 states demonstrating at the doors of their talks.

In my view, the necessary and topical examination of three regional proliferation headaches should not make us forget the seemingly incurable headache of the huge quantities of nuclear arms and means of delivery elsewhere in the world. We must remember from scary past experiences and from more recent flaunting of these weapons that they pose constant lethal dangers to the whole world.

The NNWS constitute the vast majority of the world's countries and their active interest in the reduction and management of existing nuclear capacities is, in my view, entirely legitimate. The NPT imposes both upon the five nuclear weapons states (NWS) parties and the many NNWS parties the obligation to pursue in good faith "negotiations for the cessation of the nuclear arms race at an early date." The commitment was made some 50 years ago and more than 20 years ago the International Court of Justice declared that it comprised a duty to bring to a conclusion negotiations leading to nuclear disarmament.

While NNWS recognize that the NPT has been and remains of great value, they also feel that they are parties to a treaty that even after 50 years has failed in one of its main purposes and that this is due mainly to the insufficient ambition of P5 parties to agree on nuclear disarmament. States that join the Nuclear Weapon Ban Treaty hardly expect quick global nuclear disarmament resulting from their convention, but they may feel that at least all parties to the convention are genuinely supportive of such disarmament and seek to establish a categorical ban on the use of nuclear weapons.

The Korean region

The DPRK's development of nuclear weapons and of the means of delivering them has now brought the world to acute dangers of war. The country has long ignored the binding injunctions of the Security Council. It is governed by a regime that violates human rights on large scale and that alone in the world continues to test nuclear weapons.

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It is understandable that political attention is now riveted on the political and strategic impact of an approaching possible capacity of the DPRK to hit the US with long range missiles carrying nuclear weapons. It is a dramatic danger extending the current regional threat and it calls acutely for a solution. However, before I address it, I would like to make some comments on another ominous impact that the maturing DPRK programs may have, namely the risk of regional nuclear proliferation.

In the last half year, we have heard voices in RoK proposing either the reintroduction of US nuclear weapons in RoK or the creation of an indigenous nuclear weapon capacity or both. We have also heard voices in Japan calling for indigenous Japanese nuclear weapons and means of delivery.

The chances of this actually happening in RoK or Japan might be slight, but it should be recognized that already if these conjectures appeared to become more plausible they would drastically increase tensions in the region, notably between China and Japan. It is conceivable that such result would not be unwelcome to the DPRK, but I would assume that the perspective should worry other governments already now. For China, in particular, it should be an additional strong reason to help make DPRK walk back on the nuclear weapons path.

When we look at the current difficult and explosive situation, we cannot but regret that an ominous evolution that we could register as early as in the 1990s was not met with greater skill and foresight. To compare: Iran was induced to accept restrictions on its nuclear energy program after it had mastered the enrichment of uranium. For the DPRK no agreement was in place to stop even the testing of nuclear weapons. Without going through the history of this sorry tale, let me point to some approaches that have appeared helpful in the past and some that have not.

In 1992, the DPRK signed an NPT safeguards agreement with the IAEA. Agency inspectors — and I myself — were enabled to visit nuclear installations at Yongbyon. In retrospect it seems curious that the IAEA reports about the DPRK reprocessing plant and its declaration of a small quantity of plutonium did not cause wide concern. It was only when the Agency upon analysis concluded that the quantity of declared plutonium

was incorrect that the alarm bells rang and that over 20 years of crises began, including the DPRK withdrawing from the IAEA and the NPT.

A few elements strike me as having been helpful to persuade the DPRK to cooperate with the world and show a readiness for restraint.

First, the government of the DPRK that has often been ostracized and condemned has been sensitive and somewhat open to concessions when being paid attention by figures at high level. I think of Kim Il Sung, who signaled agreement to move to denuclearization when visited by ex-president Jimmy Carter. Similarly, the visit at the end of 2000 by State Secretary Madeleine Albright to Kim Jong Il following a long period of diplomacy brought positive response. Regrettably, time was too short to enable then President Bill Clinton to follow up and the high level path to possible agreement collapsed when President George W. Bush placed the DPRK in the "axis of evil" and rebuffed State Secretary Colin Powell, who wished to continue the efforts of the Clinton administration to reach agreement with DPRK. President Donald Trump may be unlikely to recruit Former President Clinton to visit Kim Jong Un but perhaps he would be ready to engage what he terms the "unused potential" of the UN and its Secretary-General?

Second, economic sanctions have undoubtedly provided pressure on the DPRK, but — as we have seen in other cases — such pressure and the humiliation linked to it seem to raise — at least at the government level — an angry resistance and a readiness to "eat grass" rather than to give in. It seems likely that the government of the DPRK is far more sensitive to the military pressures exerted. It has memories of the defeat and devastation of the Korean war and of the many years of being treated as a pariah. It wants to stay in power and has watched the actions to bring about regime change in Iraq, Iran, Libya, and Syria. It may well believe that heavy military exercises near its territory, whether on land or at sea could be preludes to or training for real action. Verbal assurances about a readiness for transforming the armistice to a peace treaty and economic assistance may not be taken seriously. Only its own military readiness — including in particular nuclear weapons and their means of delivery — has been seen so far by the DPRK government as tangible and reliable protection.

Reducing the military pressure on an obstreperous party may go against the DNA of strong powers but it seems possible that a combination of diplomatic offers combined with a reduction or suspension of military exercises — as actually happened in 1994 — may have a stronger persuasive value than offers of a choice between paper commitments and increased military pressure.

Now to the acute problem. The DPRK appears to have the capacity to strike targets within its region — including RoK, Japan, and Guam — with nuclear weapons and to develop within not many years the ability to reach the US. The verbal threats are unprecedented and the nervousness high.

Many seem to be of the view that a long term solution will call for some regional arrangement that includes the denuclearization of the Korean peninsula, the transformation of the armistice into a treaty of peace (but not unification), economic assistance and cooperation and international guarantees for all. It seems clear that while such a vision may be necessary it is impossibly ambitious for now.

The US declares that all options are on the table. Which are they?

The option that is currently clearly pursued by the US administration is to increase non-military sanctions to gradually suffocate the DPRK into submission. Above all the US seeks to bring China to cut life lines that may be indispensable to DPRK. Whether China is ready to take the risk of bringing a collapse of the DPRK regime is not yet clear. It wants to avoid a situation leading the US allied RoK to control the Yalu river border and it may worry about a massive influx of refugees.

Another option of the US administration is a preventive military but non-nuclear strike. It is well understood that it would risk triggering a second strike by Pyongyang to Seoul that is within artillery range. It may also risk triggering Chinese reactions to prevent a collapse of the DPRK.

A third option is to simply await the DPRK capacity for ICBMs and rely on US deterrent capacity in the same way as is done against Russia. Such reliance is based on an assumption that the DPRK regime acts rationally. While this is probably true, it may be an assumption hard to sell in the US.

A fourth option is de-escalation through diplomatic steps taken after direct or indirect talks. The US seems to have rejected this option, but we should remember that the Cuban crisis in 1962 was solved and nuclear war was avoided through concessions that saved the face of both parties. I note that even in the currently heated atmosphere the US Secretary of State has said that "regime change" and "reunification" are not required by the US. This may not by itself have much credibility and persuasive value to the DPRK but combined with tangible measures it could be valuable. What measures?

For some time, a "freeze" has been suggested consisting in a suspension by the DPRK of tests of nuclear weapons and long range missiles and suspension by the US and RoK of large military movements and exercises. It is obviously not a recipe for a long term solution. Construction work on both nuclear weapons and ICBMs could — and presumably would — continue in the DPRK. And suspensions could be broken at any time. However, there are some valuable features:

- The DPRK would need a fairly substantial time of testing to attain useable ICBMs. Without such testing the threat to the US is moved further away in time.
- Suspensions require no confidence between the parties. The parties retain their respective military capacities. On the DPRK side these include the nuclear weapons that the country sees as main guarantee against an attack.
- Suspensions require no mechanism for verification. The testing of missiles and the explosion of bombs can be observed and the moment the first long-range missile test occurs or nuclear test is set off, the freeze is off. On the other hand, the longer that suspensions hold the more confidence may grow and the more time is made available for exploring longer term arrangements.
- Suspensions can be introduced without a formal bilateral agreement. The DPRK could unilaterally declare that after the many tests it has undertaken of nuclear weapons and missiles and the experience it has gained it will suspend further tests *sine die*. The US could declare

unilaterally that it has demonstrated its military ability sufficiently to make itself understood and noting the statement by DPRK it will watch and will suspend further military exercises and be ready, if confidence grows, to seek permanent arrangements.

Risk of further nuclear proliferation in the Middle East

With the deep rooted conflict between Israel and other states in the Middle East about the Palestinian issue there was always a risk of nuclear proliferation. Israel achieved it without acknowledging it. Israel has also taken practical measures to stop various activities that it suspected might lead other states in the region to acquire nuclear weapon capacity. The most visible action was the bombing of the Iraqi research reactor, OSIRAK, in 1981. While this action was condemned by the UN Security Council, the bombing and destruction in 2007 of a Syrian installation claimed to be a nuclear reactor of North Korean design did not meet a similar condemnation. Israeli-US cooperation has been claimed to be behind the use of the *Stuxnet* computer malware to damage centrifuges used for uranium enrichment in Iran.

While Israel has thus shown that it may intervene by force or subversive means to physically prevent what it claims or suspects to be steps to further nuclear proliferation in its region, other regional states who were persuaded to adhere to the NPT have urged year after year that Israel, too should accept to be without nuclear weapons and adhere to the NPT or "to accept comprehensive IAEA safeguards" or to be a party to a Middle East zone free of weapons of mass destruction. Israel has not rejected the idea of such a zone, but it has made clear that it must be preceded by peace settlement. Although called for by NPT review meetings and by the UN General Assembly the convening of such a conference has been blocked by the US.

There was a time when I thought — naïvely, perhaps — that Israel might feel sacrificing its nuclear weapon ability could be a bearable quid pro quo for attaining a zone in which all — not only Iran but also Saudi

Arabia and Egypt and others — committed to renounce not only weapons but also the enrichment of uranium and production of plutonium.

With the attainment of the Joint Comprehensive Plan of Action — the JCPOA — accepted by Iran and the P5+1 and made binding for them and all UN members through decision by the Security Council far reaching guarantees have been put in place against Iranian high level enrichment of uranium for a rather long time. The zone concept, I think, remains in cold storage.

Meanwhile, the executive governments in the US and Israel express extreme dissatisfaction with the Iran deal viewing it as one sided in favor of Iran and of insufficient duration. It does not seem excluded that despite compliance by Iran the US might break the Security Council confirmed deal by unilaterally reintroducing economic sanctions that were lifted.

In Saudi Arabia, too, the view has been expressed that that the deal was lenient to Iran. At one point an official commented that if these were to be the rules for Iran, others in the region should be entitled to the same.

In view of the many substantial commitments made and respected by Iran the critical comments may sound startling. However, much depends on what legal premise one starts from. If, the premise is chosen that an NPT party's right of enrichment is conditioned upon proof of *bona fide* peaceful intentions and can be forfeited, then the treaty's explicit allowance of enrichment becomes a license that other parties can refuse or grant as they deem fit. However, the concept of a forfeiture of the right to enrich is a juridical construction advanced by self-appointed interpreters of the NPT. I see no basis for the concept in the NPT. In my view, the legal premise is that any enrichment deemed to be for non-peaceful purposes would simply be an abuse of a legal right. It should prompt and justify demands that the exercise of the right should be brought within such limitations that it conforms with the treaty's legal authorization of enrichment for peaceful purposes. Agreements on levels and quantity of enrichment then become not grants by other more or less generous treaty parties but rather joint assessments of what is commensurate with the authorization found in the treaty.

As I read the JCPOA, Iran has accepted a great number of far reaching constraints and controls because they are commensurate with what is needed for a peaceful nuclear program and Iran wishes to remove the outside world's understandable suspicions that an oversized nuclear program included non-peaceful aims.

There have been arguments about who gains and who pays under the JCPOA. The way I read the agreement no one pays and all gain. The P5+1 and the world simply drops penalties imposed which is not costly. Iran discards parts of a nuclear program that were not needed to obtain electricity and other peaceful benefits. The deal comprises acceptance also of reporting duties and inspection that go far beyond the ordinary rules of the NPT but they are hardly a major burden and they help to give confidence that Iran's nuclear aims are peaceful.

In the current crisis some have warned that if US were unilaterally to re-impose economic sanctions Iran might revive the large former nuclear program. While Iran has said it would not be passive in face of such US action, it is entirely speculative that the country would resume the high costs of an oversized program and be ready to lose the good will it has gained in large parts of the world by respecting the provisions of the JCPOA.

My guess, for what it is worth, is that unless US actions were to comprise military threats, Iran would take the high ground and use the agreement's mechanism for dispute settlement. Iran has good reasons to avoid re-awakening suspicions about its own future actions. Among them are the risk that other states in the region might be triggered to move their nuclear programs toward a weapon option. It is presumably in view of such risks that some experts have advanced the idea that the JCPOA model should be sold to other states at least in the Middle East region. However, at any rate as long as nuclear weapon states are moving toward rather than away from nuclear weapons development I think it is wishful thinking that non-nuclear weapon states will become receptive to the idea.

As in other regions, seeking and bringing about political détente in the Middle East may be the difficult but better way of avoiding further

proliferation. It is possible that the main concern in the Middle East region about Iran — especially after the JCPOA and the lifting of UN mandated sanctions — is not fear of a weapons development, but fear of economic development and political ambition. Perhaps a re-imposition of UN sanctions is not really urged to prevent a weapons development but rather to restrain the political power that would come with a stronger economy? If so, remedies might be more directly sought in political rapprochement and adjustments than in the resumption of sanctions and strengthening of already strict non-proliferation rules.

India and Pakistan

While great global attention is focused on nuclear related issues in the Korean and Middle East regions, the dangers linked to the nuclear armed neighbors India and Pakistan are accorded much less publicity.

The possession of nuclear weapons in the two countries has not tempted neighbors in the region — Bangladesh and Sri Lanka — to move towards these weapons. There is thus not a proliferation risk of the traditional kind.

Neither India nor Pakistan joined the NTP. Accordingly, their developing nuclear weapons is not a breach of the NPT. Nonetheless, it evidently constituted proliferation beyond the five nuclear weapons states recognized in the NPT.

For many years, appeals have been made both to India and Pakistan (as well as to Israel) to join the NPT as non-nuclear weapon states. As these appeals have never been expected to be heeded, and their main effect has been to stop or restrict imports in the nuclear field they have come to look more like punishments.

India is often and probably rightly credited for managing its nuclear capacities so as to avoid contributing to proliferation anywhere in the world and when the US entered an agreement on nuclear cooperation with India, restrictions in nuclear trade with India began gradually to erode. For some time, the US and several other states have been championing India's admission to the Nuclear Suppliers Group.

In contrast to India, Pakistan has been criticized as being less than diligent in preventing nuclear proliferation. It is the home and was the employer of the nuclear scientist A.Q. Khan, who not only developed Pakistan's nuclear weapon but also contributed to nuclear proliferation by selling enrichment technology to NNWS parties to the NPT. There have been concerns about the stability of the country and some fears that fundamentalists could gain control of the nuclear arsenals. There have also been allegations that Pakistan would be ready to assist Saudi Arabia should that country seek to move toward a nuclear weapon. The allegations have been denied. Nevertheless, suggestions that Pakistan should be admitted in tandem with India to the NSG have not had much support.

The major concern about India's and Pakistan's nuclear weapons capacities relate to the risk that a flare up in their controversy over the area of Kashmir could get out of control and lead to a nuclear war. Both countries are conscious of the risk and seek from time to time to create d tente. However, the issue remains highly emotional in both countries and arrangements for restraints, openness, etc. while valuable, do not give full confidence. Only a political settlement will give such confidence.

This conclusion for the India-Pakistan issue applies also for the other two regional issues discussed: Korea and the Middle East. The military people will do their duty. They will show their arms strength in the hope and expectation of deterring the other side and they will hopefully be prudent to avoid that sparks fly from their hardware. It falls to the political people to find ways out of conflicting interests and to avoid putting millions of people at risk.

2.2. NUCLEAR DANGERS IN SOUTH ASIA[1]

Michael Krepon[2]

Scenarios of nuclear catastrophe involving Pakistan and India demand attention, even as we are riveted by the possibility of another conflict on the Korean peninsula. Hopes expressed after India and Pakistan tested nuclear devices in 1998 that offsetting nuclear capabilities would have stabilizing effects have been dashed. Just one year after India and Pakistan carried out these Pakistani Northern Light Infantry troops characterized as freedom fighters crossed the Kashmir divide, sparking a limited conventional war. Cadres from extremist groups carried out an attack on the Indian Parliament building in 2001, prompted both countries to mobilize their armies. Then, cadres trained and equipped within Pakistan rampaged through Mumbai, triggering the 2008 war scare. Offsetting nuclear weapons on the subcontinent clearly have not deterred actions that could escalate across the nuclear threshold.

The situation is ripe for another crisis on the subcontinent that could lead to military conflict. Firing and incidents across the Line of Control

1 This essay draws on the Stimson Center's collection of essays, *Investigating Crises: South Asia's Lessons, Evolving Dynamics and Trajectories*, ed. by S. Lalwani, H. Haegeland. January 2018. Available at: https://www.stimson.org/sites/default/files/file-attachments/InvestigatingCrises.pdf (accessed on 10 February 2018).

2 Michael Krepon — Co-founder and Senior Associate of the Henry L. Stimson Center (former President and CEO, Henry L. Stimson Center; Legislative Assistant, Capitol Hill; Senior Associate, Carnegie Endowment for International Peace; Diplomat Scholar of the University of Virginia) (USA).

(LoC) dividing the old Princely State of Jammu and Kashmir have heated up. Public alienation from Indian rule in Muslim majority Kashmir is again at a high pitch, and civil unrest could well grow. The Government of Pakistan asserts it provides only moral and diplomatic support to disaffected Kashmiris. The Government of India asserts, more convincingly, that Pakistan's military and intelligence services continue to provide material, intelligence and logistical support to militant groups that champion the Kashmiri cause.

The nuclear arms competition between India and Pakistan is accelerating with the introduction of new ballistic and cruise missiles. Both countries are proceeding to place nuclear weapons at sea, with the attendant command and control challenges this entails. Pakistan has advertised its reliance on short-range or "tactical" nuclear weapons to deter conventional advances by the Indian Army, which has adopted a "Cold Start" doctrine of quick mobilizations and shallow thrusts into Pakistani territory. India is contemplating the deployment of ballistic missile defenses that would further increase Pakistan's stockpile size. Both countries are capable of deploying more than one warhead atop missiles, and, as their arsenals grow, both are poised to pursue far more expansive counterforce targeting postures for their nuclear forces. Pakistan's military has already justified its shortest- and longest-range missiles in terms of counterforce targeting.

Meanwhile, diplomacy between New Delhi and Islamabad is stalled. Accomplishments to reduce nuclear dangers are paltry. Neither takes confidence-building and nuclear risk-reduction measure seriously. The last measure, dealing with the notification of nuclear accidents, was negotiated in 2007.

India's Prime Minister Narendra Modi is often demonized in the Pakistani press as a hard line, Hindu nationalist leader with blood on his hands from a pogrom against Muslims as Chief Minister in his home state of Gujurat. Modi, however, did not play to type after becoming Prime Minister. Instead, he reached out to improve relations with Pakistan on three occasions. Each initiative was spoiled by attacks against Indian targets in Afghanistan and Kashmir.

After another attack by extremist cadres on a military camp in September 2016, Modi authorized and then publicized "surgical strikes" across the LoC. The Pakistan military flatly denied the attacks occurred, while the Indian media responded with exultation. Sneak attacks on border posts are not new; publicizing them is. In doing so, the Indian public will expect Modi to respond in similar fashion in response to comparable provocations — and to respond more strongly to greater provocations. If so, the Pakistani military, which was embarrassed by Modi's media tactics, will lose face unless it responds in some emphatic fashion.

One pathway to war could begin with another dramatic strike against an iconic target in India that generates many fatalities and intense press coverage. Since October 2001, when the Legislative Assembly building in Srinagar was car-bombed, all high-profile attacks by militant groups have been carried out against targets in major Indian cities far away from Kashmir, most notably the attack on the Indian Parliament building in 2001 and the 2008 attacks on luxury hotels and the central train station in Mumbai. There is no shortage of soft targets that reflect India's growing international stature, its connectivity to the world, its rising economy, or its governmental institutions.

Another pathway to war could begin with a deadly attack on a religious shrine, temple or mosque. Hindu extremists demolished the Babri Masjid in Ayodhya in 1992. Retaliatory bombings the following year at the Bombay stock exchange, hotels, and shopping areas resulted in over 250 deaths. Religious gathering places or holiday events in which Hindus and Muslims take great pride could easily be struck again, including revered temples in Modi's parliamentary district in Varanasi. Other pathways to war and uncontrolled escalation could begin with clashes between troops along the Kashmir divide and a full-blown civil insurrection in Muslim majority Kashmir.

In past crises, both India and Pakistan have counted on the United States to serve as an honest broker, and Washington has depended on Beijing and other capitals to play supportive roles in convincing Indian leaders to exercise restraint and Pakistani leaders to climb down from

untenable positions. Crisis management will become more challenging in the future because New Delhi now expects fulsome support from Washington if it decides to take military action. While Pakistan no longer views the United States as an honest broker, it will still need Washington's help to defuse a crisis.

The first line of crisis prevention lies within the revisionist state, not the state seeking to maintain the status quo. Every crisis on the subcontinent since 1990 has been initiated by Pakistan. In the past, three possible explanations for the initiation of these crises are possible: Rawalpindi presumed that these crises would be manageable and beneficial, that it could advance claims of plausible deniability, or that it was unaware of the triggering actions of extremist groups. Given the close relationship between Pakistan's military and intelligence services with anti-India groups, few outside of Pakistan consider the last of these explanations to be plausible. The only way for Pakistan's claims that it is not in collusion with anti-India extremist groups to become plausible would be by severing links with cadres that cross the LoC and shutting down groups that recruit, indoctrinate, and train cadres for suicide missions.

Pakistan has been badly tarnished by previous crises triggered by the actions of its Army leadership or by cadres operating in collusion with its intelligence services. After the Kargil War in 1999, the Parliament attack in 2001, and the 2008 rampage in Mumbai, Pakistan's isolation grew and its economic prospects dimmed, while India's fortunes improved. It is not possible to know for sure whether these lessons have been internalized by Rawalpindi, but we do know that there has not been another triggering event since 2008. At the same time, there is scant evidence that Rawalpindi has fulfilled its promises to shut down groups whose actions can trigger crises.

The second line of defense against uncontrolled escalation lies in New Delhi's hands. During the Kargil War, New Delhi exercised great care in pushing back troops of Pakistan's Northern Light Infantry without utilizing air power on the Pakistani side of the LoC. After the "Twin Peaks" crisis triggered by the Parliament building attack, the Prime Minister of

a Bharatiya Janata Party-led coalition government, A.B. Vajpayee, nearly went to war, but ultimately decided that it was not worth sacrificing India's economic growth to the uncertainties of a war with Pakistan. After the 2008 Mumbai attacks, the Prime Minister of a Congress Party-led coalition government, Manmohan Singh, came to a similar conclusion. Many doubt whether Prime Minister Narendra Modi will react with similar restraint to a serious provocation. His decision to publicize "surgical strikes" after lesser provocations strongly suggests otherwise.

The third line of defense against uncontrolled escalation, after Rawalpindi and New Delhi, consists of the United States and other crisis managers. Outsiders do not have the power to prevent triggering actions that prompt a serious crisis or escalatory responses. Washington and other capitals do, however, have influence to prevent a crisis from escalating into limited conventional warfare and to prevent uncontrolled escalation across the nuclear threshold — as long as national leaders in India and Pakistan support these objectives.

The stakes in preventing uncontrolled escalation on the subcontinent are very high. The top-most priority for the international community would be to maintain the taboo against the detonation of nuclear weapons on a battlefield. What remains of the nuclear safety net constructed with difficulty and care over the past six decades depends on holding the line against battlefield use. If this taboo were broken, escalation control would become even more imperative and more difficult.

The environmental and humanitarian consequences of battlefield use could be horrific, depending on how many detonations occur, placing a premium on crisis managers to intervene quickly under extraordinarily intense pressures. Even though India and Pakistan are not signatories to the nuclear Non-Proliferation Treaty, a crossing of the nuclear threshold on the subcontinent could well hollow out this treaty and accelerate the demise of other nuclear treaties. Resumed battlefield use could also prompt resumed nuclear testing by several states.

What would the world look like if the norms of battlefield use and restraints on nuclear testing were broken? The world would look like the

day after Nagasaki, only worse. We would need to start from scratch to create norms that reduce nuclear dangers from an estimated 15,000 nuclear weapons in the possession of nine states.

The whole world would be shocked by these events — but would it be shocked enough to take heroic actions to prevent additional nuclear catastrophes? This was not the case after World War II. Only with great difficulty and the passage of time were useful steps negotiated to reduce nuclear dangers — steps that are now unraveling. The norms of non-battlefield use and non-testing of nuclear weapons were built up after many decades; they can vanish quickly. After they disappear, nuclear arms competitions that are already gaining momentum are likely to accelerate.

Even in the absence of mushroom clouds resulting from deliberate choice, breakdowns in command and control, or accidents, crises on the subcontinent could significantly increase nuclear dangers if nuclear assets and fissile material fall into the wrong hands. During a severe crisis, nuclear assets are likely to be moved to avoid pre-emption, to signal resolve, and to speed up external diplomatic intervention. Nuclear safety and security could be compromised when nuclear assets are moved from heavily protected storage sites to the field. Increased readiness could also be accompanied by accidents.

If heightened readiness measures result in the theft of a nuclear warhead or fissile material by insiders or by non-state actors, the threat of nuclear terrorism would rise precipitously. Concerns about breakdowns of command and control, accidents and theft are focused primarily on Pakistan because of Rawalpindi's perceived requirement for "tactical" nuclear weapons that would need to be placed close to the forward edge of potential battles and because of the presence of non-state actors near these battlefields.

To assess how intense an evolving crisis is, one can look to the readiness and movement of combat aircraft and missiles capable of delivering both conventional ordnance as well as nuclear weapons. Increased readiness related to conventional forces can sometimes trigger steps to increase the readiness of nuclear capabilities. Signaling by means of conventional

military forces could range from preparations for limited military action to significant troop mobilization. As conventional indicators intensify, nuclear indicators are likely to intensify as well.

These steps have had, and could have in the future, clear escalatory potential. Because large-scale troop mobilizations can be precursors to war, they are clear indicators of the severity of a crisis. Large-scale military exercises could also mask preparations for war, prompting countermoves. Key indicators for mobilizations and large-scale military exercises include canceling leaves, requisitioning trains to move troops and heavy equipment toward fighting corridors, moving entire strike corps to forward holding areas, and moving ammunition to supply forward-deployed troops. When these indicators are evident, a very serious crisis is unfolding.

A serious crisis can also be marked by missiles movements and, if the crisis extends long enough, by missile flight tests conducted to send deterrent messages. In a serious crisis steps will be taken to increase the readiness of nuclear-capable delivery vehicles in visible ways. For example, missiles and their accompanying security and equipment needs can be moved out of garrisons and storage facilities. While these steps might not conclusively indicate the intentions of an adversary, in the heat of a crisis these indicators are more likely to be viewed through the prism of a worst-case scenario — as preparations for launch — rather than as defensive measures. Likewise, the mating of warheads to delivery vehicles — if they can be identified — would be an extremely serious development in a deep crisis.

The weight attached to nuclear signaling depends significantly on the status of conventional forces during a crisis. The movements of nuclear delivery vehicles are far more worrisome when accompanied by large-scale mobilizations and military exercises. Only the extended Twin Peaks crisis was accentuated by flight tests. The absence of missile flight tests during the 1990 Compound crisis and 1999 Kargil War helped prevent these events from becoming more severe. The 2008 Mumbai crisis was too short to accommodate the preparations necessary for missile flight testing.

As both countries' nuclear capabilities expand and diversify, nuclear signaling during crises could evolve as well. A broader spectrum of missile delivery systems would grant policymakers a wider range of options by which to engage in nuclear signaling. Where some previous crises were marked by the movement of short- and medium-range ballistic missiles, leaders in future crises could also employ longer-range missiles and sea-based capabilities to signal nuclear readiness.

Several nuclear-capable delivery vehicles — such as Pakistan's Nasr short-range missile and India's supersonic cruise missiles — have yet to play roles in a crisis scenario. Rules of engagement could be of critical importance in the event of limited warfare, as both systems are dual capable and could be considered high-priority targets for air force pilots. The timeframe for decision-making regarding nuclear signaling and responses could well be compressed in a future crisis. Uncertainty regarding the deployment and alert level of varied nuclear-capable assets could prompt leaders to make rapid decisions based on partial information and incorrect inferences, resulting in significant escalation. Alternatively, great uncertainty and extremely high stakes could reinforce caution if decision-makers in both countries have internalized the risks of escalation control and seek assistance to de-escalate the crisis.

For every reason to hope that severe nuclear-tinged crises might be in the rearview mirror, there is a corresponding reason to expect another one. Indian Prime Ministers from both Bharatiya Janata Party- and Congress-led coalitions have looked hard at the precipice of escalating warfare under the nuclear shadow and have walked away, deciding the gains would be ephemeral and pains long-lasting. They have instead chosen the path of restraint and the acceptance of temporary embarrassment. Prime Minister Modi might well think and act differently — but this does not mean that uncontrolled escalation would necessarily follow.

The primary sources of crisis stability within India to date have been the priority New Delhi has placed on economic growth, the paucity of important targets within Pakistan-administered Kashmir where escalation can be most easily controlled, the high sensitivity of striking important

targets elsewhere, and its concerns over uncontrolled escalation. We do not know the extent to which Rawalpindi has internalized how much Pakistan has been hurt by previous crises, even when New Delhi has decided to stand down. Nor do we know whether a nearly decade-long record of non-intense crises can be attributed to private understandings between Pakistan's military and intelligence services and violent extremist groups to avoid high-profile events that would spark a serious crisis. If these considerations are in play, then additional factors militating against uncontrolled escalation exist on the Pakistani side.

If Rawalpindi takes visible and nonreversible steps against anti-India extremist groups, Pakistan's claims of innocence will receive a fair hearing and the potential to defuse a crisis and escalatory moves will grow. Conversely, until Rawalpindi clarifies responsible policies toward anti-India groups, presumptions of collusion and the potential for uncontrolled escalation will remain.

There is reason to hope that Rawalpindi has internalized the lessons of Kargil as well as the Parliament and Mumbai attacks. The Kashmir cause has not been advanced by these dangerous misadventures. Whenever Rawalpindi has sought to change the status quo in Kashmir by such methods the status quo has been reaffirmed, while Pakistan's standing has been deeply diminished along with its economic prospects. Rallying to the Kashmir cause has advanced neither Pakistan's well-being nor that of Kashmiris. Instead, New Delhi's position in Muslim-majority areas has been undermined by its own unforced errors. Breathing room can only be found in a relaxation of tensions between India and Pakistan as well as in a relaxation of New Delhi's grip on the valley. And yet, the moral imperative of associating with the Kashmir cause and the instinct to inflame India's Achilles' heel have been staples of Pakistan's existence.

The potential for new crises exists because the underlying causes of friction between Pakistan and India have not been addressed. Nor has the pall cast by nuclear weapons encouraged sustained efforts to improve ties between India and Pakistan. In the near-decade since the last intense

crisis, diplomatic efforts to normalize ties have been easily blocked by minor provocations that have not even risen to the level of a crisis.

The next major crisis could evolve from the dynamics of hostility along the Kashmir divide as noted above. Another route to an intense crisis could be yet another attack against an iconic structure in or near a metropolitan area in India. Those that hate India enough to carry out such an attack hate its promise and rise, so the target of their attack might again symbolize India's rising power and connectivity to the world.

There is no shortage of soft targets in India, no shortage of means to inflict damage, and no shortage of recruits to carry out attacks. Would another dramatic attack against a symbol of India's rising power or an equivalent outrage prompt a strong military response? All of the prior reasons for Indian restraint remain in play. New Delhi might again choose to exercise escalation control, in part due to the absence of significant military targets across the Kashmir divide. Significant targets associated with violent extremist groups in southern Punjab remain obvious but continue to pose serious risks of escalation. At the end of the day, fighting Pakistan continues to remain a detour to India's rise.

And yet, Indian forbearance, especially in the Modi government, cannot be taken for granted. Prime Minister Modi has upped the ante by publicizing the common practice of attacking posts across the Kashmir divide. By setting the precedent of publicizing a sharp response after an attack by cadres from anti-India extremist groups, Modi would appear to be obliged to respond in similar fashion in the future, calibrated to the provocation. The next time this occurs Rawalpindi is likely to be ready with a "befitting" response.

Another big explosion could occur at any time, whether by accident, a breakdown in the chain of command, extremely rash acts by risk-taking decision-makers, or the provocations of wild men. Unrest in Kashmir could spiral into another major crisis. Nuclear dangers are rising on the subcontinent, awaiting a flashpoint. If so, national leaders and diplomats will be hard-pressed to defuse the crisis and, failing that, to control escalation.

2.3. ISSUES OF NUCLEAR NON-PROLIFERATION IN NORTH-EAST ASIA

Victor Esin[1]

The current deterioration of the situation regarding nuclear non-proliferation in North-East Asia (or the Far East, as it is known in Russia) is due to the fact that the Democratic People's Republic of Korea (the DPRK), having left the six-party talks on the denuclearization of the Korean Peninsula[2] in 2009, has, over the last two years, dramatically stepped up its nuclear program whilst also developing and testing long-range ballistic missiles capable of delivering nuclear warheads. What is more, Pyongyang continues to show complete disregard for both the international community's concerns about its nuclear-related activities and for the UN Security Council's sanctions resolutions that call on the DPRK to end its nuclear and missile tests, as these pose a serious threat to peace and security in the

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2 The Six-Party Talks began in August 2003 in Beijing on the initiative of the People's Republic of China (the PRC). The six parties involved were the PRC, the USA, Russia, Japan, the Republic of Korea, and the DPRK. The DPRK broke off the talks in 2009. For further details about these negotiations, see: Kile Sh.N., Fedchenko V., Gopalaswamy Bh., Kristensen H.M. North Korea's military nuclear capabilities. In *SIPRI Yearbook 2011: Armaments, Disarmament and International Security*. Oxford: Oxford University Press, 2011. Pp. 351-352.

Asian region. Meanwhile, by carrying out joint military exercises on the Korean Peninsula on an unprecedentedly large-scale and with scenarios designed for inflicting military defeat on the DPRK and changing its system of government, the US and the Republic of Korea are merely adding fuel to the fire. The upshot of all this is the highly fraught situation we are seeing on the Korean Peninsula and which could spiral into a large-scale military conflict with unforeseeable consequences.

Against this brief overview of the situation in Northeast Asia, an assessment of the state of the DPRK's nuclear and missile programs will be carried out, followed by a discussion of what Pyongyang hopes to achieve through them. Finally, a number of measures will be suggested, which, if implemented, could hopefully defuse the military and political tension on the Korean Peninsula and prevent any further nuclear proliferation in Northeast Asia.

North Korea's nuclear program

North Korea's nuclear program began in the middle of the last century, with active support from the Soviet Union.[3] China also helped it along at first, mainly by training nuclear scientists for it.

According to Russian foreign intelligence analysts, the political decision by North Korea's leaders to start developing nuclear weapons domestically was taken at the turn of the 1970s.[4] So far, the country has been very successful in implementing this decision. A full-scale scientific research, testing and production complex for developing and producing nuclear weapons was built. The centerpiece of these facilities is the Nuclear Scientific Research Centre in Yongbyon (86 km to the North of Pyongyang). Its production unit includes:

- a gas-graphite reactor with an electric capacity of 5 MW (thermal power — 25 MW), used for producing weapons-grade plutonium;[5]

3 In 1956, the USSR and the DPRK signed a cooperation agreement for training nuclear scientists, and in 1959 they also concluded an agreement on the peaceful use of nuclear energy.

4 *A New Challenge After the Cold War: The Proliferation of Weapons of Mass Destruction*. Moscow: SVR RF, 1993. Available at: http://www.svr.gov.ru/material/2-1.html (accessed on 10 September 2017).

5 This reactor was brought into operation in 1986, but was then frozen in late 1994 following the conclusion of the Framework Agreement between the DPRK and the United States. It was brought back online in February 2003 before being stopped again and then partially dismantled in 2007. The reactor was restarted for the third time in September 2013 after rehabilitation works that began in March of the same year. In 2015, the reactor was modernized and is now operating at full capacity. It is estimated that it can produce between 6 and 8 kg of weapons-grade plutonium. See: Yongbyon: Monitoring Activities During Shutdown of 5 MW Reactor. Institute for Science and International Security. December 5, 2014. P. 2. Available at: http://isis-online.org/uploads/isis-reports/documents/Yongbyon_December5_2014_Final.pdf (accessed on 10 September 2017); Sychev V. Pyongyang builds the H-bomb: How North Korea has succeeded with its nuclear program. Meduza Project. Available at: http://meduza.io/feature/2015/12/13/phenyan-sozdaet-vodorodnuyu-bombu (accessed on 10 September 2017).

— a radiochemical laboratory for separating plutonium from irradiated nuclear fuel (INF);[6]

— a plant for the isotopic enrichment of uranium through the centrifugal process;[7]

— a nuclear fuel plant, the raw material for which is produced by two uranium enrichment plants with a total production capacity of 150 tons of uranium concentrate per year.[8]

A nuclear power plant with an experimental light water reactor (ELWR) of North Korean design has been under construction at this nuclear center since 2010. It is estimated that its electrical capacity will be 25-30 MW (with a thermal output of more than 100 MW). It could potentially churn out up to 20 kg of weapons-grade plutonium per year.[9] This reactor is expected to be brought into operation in 2017-2018.

In addition to these production facilities, the Yongbyon Nuclear

6 This laboratory can process up to 110 tons of INF per year. See: North Korea Yongbyon Nuclear Complex. A Report by Siegfried S. Hecker. Center for International Security and Cooperation. November 20, 2010. Available at: http://cisac.fsi.stanford.edu/publications/north_koreas_yongbyon_nuclear_complex_a_report_by_siegfried_s_hecker (accessed on 10 September 2017).

7 In 2013, the size of the plant's production area was practically doubled, and installation works for additional centrifugal equipment began. These works were completed towards the middle of 2015 and now, according to estimates, the plant's production capacity is 60 to 80 kg of weapon-grade uranium per year. See: Nuclear Proliferation Case Studies. Safeguards Information Paper. World Nuclear Association. November 2014. Available at: http://www.world-nuclear.org/info/Safety-and-Security/Non-Proliferation/Appendices/Nuclear-Proliferation-Case-Studies (accessed on 10 September 2017); Sychev V., Op. cit.

8 These uranium enrichment plants are located near Pakchon and Pongsan (70 km north and 95 km southeast of Pyongyang respectively). See: Esin V. Nuclear and Missile Ambitions of DPRK. In *Russia: Arms control, disarmament and international security. IMEMO supplement to the Russian edition of the SIPRI Yearbook 2015*. Moscow: IMEMO, 2016. P. 45.

9 Albright D., Walrond C. North Korea's estimated stocks of plutonium and weapon-grade uranium. Institute for Science and International Security. August 16, 2012. Available at: http://isis-online.org/uploads/isis-reports/documents/dprk_fissile_material_production_16Aug2012.pdf (accessed on 10 September 2017).

Centre also features a scientific research zone, including an operational IRT-2000 light-water research reactor (with an electricity generation capacity of 2 MW and thermal output of 8 MW),[10] as well as a number of research laboratories, equipped with a betatron, a cobalt gamma-ray source and other scientific and technical equipment, supplied by the Soviet Union between the 1960s and the 1980s.

According to reliable and publicly available estimations by experts,[11] since entering into operation the Yongbyon Nuclear Centre's production facilities could have produced at the end of 2016 a total of maybe 52 to 68 kg of weapons-grade plutonium and 320 to 480 kg of highly enriched uranium (HEU), also of weapons-grade quality. Roughly 10-15 kg of that weapons-grade plutonium and 70-120 kg of the weapons-grade HEU may have been used for making the explosive nuclear devices that were exploded during the five nuclear tests conducted in 2006, 2009, 2013, and 2016.

That supposedly leaves enough weapons-grade nuclear material to make 20 to 30 implosion-type nuclear munitions.[12] These munitions can be built into air bombs and delivered to their targets by Chinese-made H-5 frontline bombers[13] or (front end) re-entry vehicles (RV) on ballistic missiles (from 2016 onwards).

It should be said here that the DPRK's research and development (R&D) since the start of this decade aimed at reducing both the mass and size of its nuclear munitions appear to have been crowned with success. In 2016 North Korea built and then tested in September of the same year a small and light nuclear fusion-boosted charge.[14] The power

10 The IRT-2000 reactor was built with the help of the USSR and became operational in 1966. It has been refurbished several times. This reactor is not capable of producing significant quantities of weapon-grade plutonium. See: Esin V. Op. cit. P. 45.

11 North Korea: Nuclear. Nuclear Threat Initiative. December 2017. http://www.nti.org/learn/countries/north-korea/nuclear/ (accessed on 10 January 2017).

12 Gorynov V. The DPRK's nuclear and missile programs // Zarubezhnoye voyennoye obozreniye. 2017. No. 7. P. 21.

13 This bomber is analogous to the Soviet Il-28 frontline (tactical) bomber, which was certified to carry a nuclear bomb of a mass of up to 3000 kg that would be mounted on a rack inside the bomb bay. Esin V. Op. cit. P. 46.

14 This nuclear charge is built using thermonuclear material as an effective source of additional neutrons, making it possible either to increase the yield of the charge without increasing the amount

of the explosion was, according to various estimates, somewhere between 10 and 30 kilotons.[15] By this stage, North Korean scientists had also learnt to master the technology needed for creating compact re-entry vehicles for ballistic missiles capable of resisting the intense heat and severe overloads that occur when the vehicle re-enters the Earth's atmosphere.[16] In doing so they had accomplished the task of equipping North Korean ballistic missiles with nuclear warheads.

Let us now focus on the DPRK's sixth nuclear test at the Punggye-ri site, carried out on September 3, 2017. Pyongyang declared that it had successfully tested a hydrogen bomb.[17] According to unofficial reports published in the South Korean and Japanese media, the nuclear detonation triggered an earthquake measuring between 5,7 and 6,3 on the Richter scale, and the energy released by the explosion of the nuclear charge was of 70 to 100 kt.[18] If this information is confirmed by the Executive Committee of the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (and this can only be done after a thorough review and analysis of the data collected on September 3, 2017, and the following few days by the monitoring stations of the International Nuclear Explosion Monitoring System), then it will be possible to affirm that the DPRK has made considerable progress in improving its nuclear arsenal. Note should also be taken of the statement made on the September 4, 2017, by the Republic of Korea's Defense Minister, Song Young-moo, in which he said that "Pyongyang has succeeded in reducing the weight of a nuclear charge to 500 kg."[19] This statement should however be taken with a pinch of salt, as many officials from the Republic of Korea often exaggerate the DPRK's achievements,

of weapon-grade plutonium or HEU needed or to achieve the same yield with smaller amounts of these materials.

15 Gorynov V. Op. cit. P. 21.

16 Foreign Military Chronicle // Zarubezhnoye voyennoye obozreniye. 2016. No. 7. Pp. 91-92.

17 The DPRK announces it has successfully tested a hydrogen bomb for ICBMs // Kommersant. 2017. 3 September. Available at: https://www.kommersant.ru/doc/3401720 (accessed on 10 September 2017).

18 Korostikov M., Dzhordzhevich A., Yusin M. 100 kilotons of Juche ideas: The DPRK tests its most powerful bomb in history // Kommersant. 2017. 4 September.

19 Korostikov M., Safronov I. The DPRK compresses nuclear charges to dangerous sizes" // Kommersant. 2017. 5 September.

both in terms of its nuclear activities and of its missile engineering. Moreover, experts still have serious doubts as to whether the bomb tested on September 3, 2017, was indeed a hydrogen bomb.[20] It is more likely that what was detonated was an explosive nuclear device of a more sophisticated design than its predecessors, combining fusion boost with weapon-grade plutonium and HEU. What actually happened will become much clearer once, as described above, the Executive Committee of the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization publishes its findings.

As part of their North Korea Nuclear Futures research project, the US-Korea Institute at the John Hopkins University and the US National Defense University produced a forecast for the development of North Korea's nuclear program up to 2020 and presented it in Washington in February 2015. According to their projections, by 2020 the DPRK's nuclear arsenal could increase to 50-100 weapons.[21] An arsenal of 50 to 60 weapons is more realistically achievable, given that the DPRK's nuclear weapons complex is currently able to produce no more than seven nuclear munitions a year, a number which will increase to ten a year as of the end of 2018.

North Korea's missile program

The DPRK acquired its initial missile capabilities in the 1960s. Back then, it bought from the Soviet Union several mobile tactical missile systems (on a quad-axle wheeled chassis) fitted with the unguided solid-fuel rocket Luna.[22] North Korean scientists then upgraded this rocket to the Luna-M version (known as Hwasong-3 by its Korean name).[23] In 1980, three mobile short-range missile systems

20 Notably, such doubts were expressed by A.V. Khlopkov, a well-known expert on North Korea's nuclear program and the director of the Russian Center for Energy and Security Studies. See: Korostikov M., Dzhordzhevich A., Yusin M. Op. cit.

21 Esin V. Op. cit. P. 49.

22 Sidorov A., Gorachev Yu. The DPRK's ballistic missiles and missile-launching vehicles // Zarubezhnoye voyennoye obozreniye. 2016. No. 2. P. 68.

23 The tactical missile Hwasong-3 has a gross lift-off weight of 2.3 tons, is fitted with a non-detachable 450 kg warhead and has a range of 65 km. See: Esin V. Op. cit. P. 49.

(on a quad-axle wheeled chassis) with the liquid-fuel ballistic missile R-17 (8K14) of Soviet make[24] were acquired from Egypt. North Korean scientists managed, in a very short time, to start producing their own R-17 missile which was christened Hwasong-5 (or Skud-B in NATO's classification),[25] and then, towards the end of the 1980s, they created an improved version of it, called Hwasong-6 (or Skud-C), with the help of Chinese scientists.[26]

The DPRK started developing and producing its own ballistic missiles in 1988.[27] The objective of this program was to create a mobile (on a five-axle wheeled chassis) missile system with a single-stage liquid-fuel intermediate-range ballistic missile (IRBM). This IRBM, which was named Hwasong-7 (Nodong-1),[28] was introduced into service in the late 1990s-early 2000s. In 2010, a lighter version of this IRBM, the Hwasong-9 (Nodong-1M)[29] was made operational.

In the mid 1990s, the DPRK bought a mobile tactical missile system (on three-axle wheeled chassis) from Syria, with a Tochka[30] Soviet-made solid-fuel ballistic missile. This missile served as the basis for the development of the solid-fuel short-range ballistic missile Hwasong-11 (KN-02),[31] which was introduced into service in 2007.

At present, the ballistic missiles Hwasong-3, Hwasong-5, Hwasong-6, Hwasong-9 and Hwasong-11 are equipped with conventional warheads (of the blast fragmentation and cluster types), but the Hwasong-7 can also carry a nuclear warhead.[32]

24 Esin V. Op. cit. P. 49.

25 The short-range missile Hwasong-5 has a gross lift-off weight of 6.4 tons, is fitted with a non-detachable warhead with a mass of 1000 kg and has a range of 300 km. See: Esin V. Op. cit. P. 49.

26 This rocket has a longer range of 300 to 550 km, achieved by lengthening the fuel tanks and decreasing the warhead's mass from 1000 to 700 kg. See: Esin V. Op. cit. P. 49.

27 Sidorov A., Goryachev Yu. Op. cit. P. 68.

28 The Hwasong-7 IRBM has a gross lift-off weight of 16 tons, is fitted with a detachable warhead of a mass of 1000 kg and has a range of 1000 km. By reducing the weight of its warhead to 700 kg, it can reach a range of 1300 km. See: Esin V. Op. cit. P. 50.

29 The Hwasong-9 IRBM has shorter fuel tanks (by 1.5 m) compared to its baseline model and can be fitted with a 500 kg warhead. Its range can reach 1300-1500 km. See: Esin V. Op. cit. P. 50.

30 Sidorov A., Goryachev Yu. Op. cit. P. 70.

31 The short-range ballistic missile Hwasong-11 has a gross lift-off weight of 2 tons, is fitted with a non-detachable warhead of approximately 480 kg and has a range of 140 km. See: Esin V. Op. cit. P. 50.

32 Gorynov V. Op. cit. P. 21.

Apart from the ones mentioned above, North Korea's Strategic Missile Forces have not introduced into service any other missile systems equipped with ballistic missiles.[33] That said, the DPRK is conducting a great deal of intensive R&D in order to create new missile systems with intermediate-range and intercontinental ballistic missiles.

In 2010, the single-stage liquid-fuel IRBM Hwasong-10 (Musudan) was shown for the first time during a military parade in Pyongyang.[34] It was carried on a six-axle wheeled missile transporter-erector-launcher, equipped with the gear to elevate the missile to a vertical position.[35] The missile measured 1.5 m in diameter and 12 m in length. Flight testing for it began in April 2016. Between then and the end of 2016 a total of eight flight tests for this missile took place, of which only one (the June 22 test) proved successful. In 2017, no launches of the IRBM Hwasong-10 were reported. According to the latest reports by foreign media, the Hwasong-10 IRBM's maximum range could be around 2000-2500 km for a 500 to 600 kg warhead. If flight tests for it resume very soon, then the Hwasong-10 could enter into service in late 2019 or 2020.[36]

In May 2017, the first successful flight test of the single-stage liquid-fuel IRBM Hwasong-12 (KN-17)[37] took place. Hwasong-12 appears to be a more developed version of its predecessor, the Hwasong-10. On August 29, 2017, this missile was successfully flight-tested for a second time,[38] and then for a third time on September 15, 2017.[39] These

33 The Strategic Rocket Forces were established as a standalone armed service within the Korean People's Army in 2012 (until then all missile units with land-based missile systems were part of the Korean People's Army's ground forces).

34 Sidorov A., Goryachev Yu. Op. cit. P. 69.

35 After the rocket is elevated to a vertical position, the launch pad is detached from the mobile launcher and is installed on a support structure placed on the ground on the prepared site. Then the missile with its four footpads is installed on the launch pad. See: Khrustalev V. North Korea is upgrading its missiles // Novyy oboronnyy zakaz. Strategii. 2017. No. 5. P. 36.

36 Gorynov V. Op. cit. P. 21.

37 The missile was fired on a lofted trajectory (with an apogee of 2112 km) and travelled 787 km. See: Gorynov V. Op. cit. P. 22.

38 The missile flew over the Japanese island of Hokkaido before landing in the Pacific Ocean. It travelled about 2700 km and reached an altitude of 550 km. See: The DPRK rocket made a breakthrough // Gazeta.ru. 2017. 28 August. Available at: https://www.gazeta.ru/politics/2017/08/29_a_10862894.shtml (accessed on 20 September 2017).

39 The missile flew over Japanese territory and then landed in the Pacific Ocean about 2000 km from Cape Erimo, which is located on Hokkaido. The missile flew about 3700 km and reached an altitude of 770 km. See: The media: the missile launched by the Democratic People's Republic of Korea probably flew 3,700 km, reaching an altitude of 770 km // TASS. 2017. 15 September. Available at: https://www.kommersant.ru/doc/3413850 (accessed on 20 September 2017).

successful launches of the Hwasong-12 suggest that this IRBM is currently in the final stages of flight testing and will soon be brought into service. Its maximum range has been estimated at 4500-4800 km for a 500 to 600 kg warhead.[40]

Since 2012, the ballistic missile Hwasong-13 (KN-08) has been displayed on military parades in the DPRK, and since 2015 so has the Hwasong-14 (KN-20), a modernized version of it.[41] By the looks of them, these missiles appear to be two-stage liquid-fuel missiles. They are both transported on eight-axle wheeled transporter-erector-launchers.[42]

So far, no flight tests for the missile Hwasong-13 have been detected; it is therefore not yet possible to say how fit-for-purpose its design is. As for the Hwasong-14, a first test-fire was carried out on July 4, 2017 followed by a second[43] on July 28, 2017. Both tests were declared successful. The missiles were launched on a steeply lofted trajectory and sank in the Sea of Japan, along with their warheads that became detached from them. According to North Korean data, which are in line with data from Japan, during the first test the missile reached an altitude of 2802 km and travelled 933 km,[44] whereas for the second test these figures were 3725 km and 998 km respectively.[45] From these flight trajectories, the renowned American scientists Theodore Postol, Markus Schiller and Robert Shmuker calculated the maximum achievable range these rockets could have travelled had they been flown with a loft angle designed to optimize range, and found it to be between 7500 and 9000 km.[46] However, in their calculation the real weight of the

40 Khrustalev V. Op. cit. P. 35.

41 Gorynov V. Op. cit. Pp. 21-22.

42 The chassis for this launcher is borrowed from the Chinese multi-axle off-roader vehicle Wanshan, which itself is an imitation of the Belarussian Volat family of heavy transporters. See: Chuprin K. Our timber truck, fly on // Voyenno-promyshlennyy kur'yer. 2017. 26 April.

43 Dvorkin V. How North Korea's nuclear missile capabilities pose a threat to the world // Zarubezhnoye voyennoye obozreniye. 2017. 8 September.

44 The US military carried the missile launched by the DPRK to a new type The US military carried the missile launched by the DPRK to a new type The US military carried the missile launched by the DPRK to a new type // RBC. 2017. 5 July. Available at: http://www.rbc.ru/politics/05/07/2017/595d17d59a79476eb2b12a01 (accessed on 20 September 2017).

45 North Korea announced the second successful launch of the Hwasong-14 missile // Kommersant. 2017. 29 July. Available at: https://www.kommersant.ru/doc/3371614 (accessed on 20 September 2017).

46 Postol T., Schiller M., Schmucker R. North Korea's "not quite" ICBM can't hit the lower 48 states // Bulletin of the Atomic Scientists. 2017. 11 August. Available at: http://thebulletin.org/north-korea's-"not-quite"-icbm-can't-hit-lower-48-states11012 (accessed on 20 September 2017).

missiles' payload was left out of the equation, so it is not yet possible to establish the maximum achievable range of Hwasong-14 with certainty. The only thing that is certain is that this missile fits the definition of an intercontinental ballistic missile (ICBM) used in the Soviet-American and Russian-American treaties on strategic offensive arms (these treaties consider ICBMs to be missiles with a range of more than 5500 km).

That said, it would still be premature to assert that the DPRK already possesses ICBMs, though North Korean and foreign media claim this to be the case. The July launches of the Hwasong-14 ICBMs were just tests, and global experience in missile engineering suggests that it will take at least another three or four years before their development is complete.

It is worth mentioning here another project North Korea has been working on since the start of the century, and that is the creation of the two-stage liquid-fuel ballistic missile Taepodong-2, with a stated range of up to 6000 km for a 700 kg warhead. The technology behind this missile design was tested during the launches of the Unha[47] space launch vehicles. Now it seems that there is no longer the need to create a Taepodong-2 missile. In fact, tellingly, flight tests for it have still not begun.

A key, new thrust in the ramping-up of the DPRK's missile capabilities is its development of submarine-launched ballistic missiles (SLBMs).

According to foreign data, construction of North Korea's first large diesel submarine, of a new class and capable of carrying ballistic missiles, began in 2010 at the Sinpo South Naval Shipyard, the DPRK's lead submarine-building enterprise.[48] This submarine was first launched in 2014 and was dubbed Sinpo by Western media.[49] It is now currently

47 The last time a Unha-3 space launch vehicle was launched was in February 2016. On that occasion, the Earth observation satellite Kwangmyongsong-4 weighing up to 100 kg was launched into low-earth orbit // Esin V. Op. cit. P. 52.

48 Lodkin V. Pyongyang's "underwater fist" // Zarubezhnoye voyennoye obozreniye. 2017. 2 June.

49 The Sinpo submarine has a draught of approximately 2500-3000 tons, for a length of 67 m and a width of 6,7 m. The central part of the fin (conning tower) contains one or two silo launch systems for ballistic missiles. The submarine's surface speed is of 16 knots, its underwater speed is around

undergoing intensive at-sea testing.

The development of the two-stage solid-fueled SLBM Pukkuksong-1 (KN-11),[50] designed for deployment on the Sinpo submarine, has been underway since the start of this decade. From May 2015 to July 2016, a submerged test barge was used to carry out what are referred to as "ejection tests" for this SLBM, including first-stage motor ignition.[51] In August 2016, a prototype of the SLBM Pukkuksong-1[52] was successfully launched for the first time. For the payload and for the missile's second stage, full-scale and weight mock-ups were used. The test-firing took place underwater from the submerged barge.[53] The missile travelled about 310 miles in the direction of Japan.[54] As of yet, no full-scale test launch of the SLBM Pukkuksong-1 (with the propulsion engines of both stages being launched and the RV detaching itself from the missile) has been reported, which indirectly indicates that the development of this missile has run into difficulties. Consequently, it is not yet possible to say when the SLBM Puukykson-1 might enter into service.

The SLBM Pukkuksong-1 is being used as the basis for developing the land-based IRBM Pukkuksong-2 (KN-15) which is deployed on a tracked TEL.[55] The development of this missile is proceeding at a fast pace. In February 2017, a first test flight was carried out,[56] before a second one on May 21, 2017.[57] Both launches were declared successful,

10 knots. It can travel a distance of 1500 miles // Lodkin V. Op. cit.

50 The SLBM Pukkuksong-1 measures up to 1.4 m in diameter and is stored in a transport launch cell (container) or TLC. Its estimated range is of 1200-1250 km // Lodkin V. Op. cit.; Khrustalev V. Op. cit. P. 35.

51 During these ejection tests, the serviceability of both the rocket design and the silo launch system, adapted for ejecting the missile from its TLC using the cold-launching or "mortar" method (compressed gas), was tested.

52 Gorynov V. Op. cit. P. 21.

53 The submarine Sinpo has not yet been used for launching the SLBM Pukkuksong-1 (probably because of the high risk of losing the submarine were the missile launch to fail).

54 Lodkin V. Op. cit.

55 Gorynov V. Op. cit. P. 21.

56 Ibid.

57 Naka K. The DPRK's leader issues the order to equip the Army with the Pukkuksong-2 missile. RIA Novosti. 2017. 22 May. Available at: https://ria.ru/world/20170522/1494764139.html (accessed on 20 September 2017).

especially the second one. The leader of North Korea himself, Kim Jong Un, was present at the second and described its results as "the final validation before the combat deployment of the missile" and gave the order to "proceed as quickly as possible to its to large-scale production for equipping the army with it."[58] This was of course a populist statement by North Korea's leader, but it is impossible not to acknowledge the fact that these successful flight tests of the IRBM Pukkuksong-2 in the first half of 2017 have brought the time of its entry into service nearer. This could in fact happen in 2018, and when it does it will be a milestone for the DPRK, as it will bring into the fray a missile system with a range of up to 1200-1250 km capable of striking a target within 10-15 minutes after receiving the command. North Korea's liquid-fuel ballistic missiles do not have such a capability; indeed, they require sixty to ninety minutes for pre-launch procedures.

This assessment of the DPRK's missile program shows that, in recent years, the country has achieved impressive results in missile engineering, and this despite the fact that it has been under significant pressure due to the sanctions imposed on it by the international community. Admittedly, both the missile systems under development and those already in active service in North Korea still fall short in terms of maturity of design and reliability, as evidenced by the large number of failed missile launches. But with time this situation will correct itself, and a number of ongoing, promising projects aimed at building long-range ballistic missiles point to the fact that, in the not too distant future, the DPRK's Strategic Missile Forces will possess almost the full array of ballistic missile types, from tactical to intercontinental ones.

What is Pyongyang hoping to achieve?

Pyongyang believes that, unless the DPRK acquires sufficient nuclear missile capabilities, the United States will not only not engage in dialogue with it but will also use military means to obliterate it at

58 Ibid.

the first opportunity. Against the backdrop of unprecedented levels of US and South Korean military activity on the Korean Peninsula, these fears appear increasingly realistic. The situation is further compounded by the highly aggressive rhetoric used by the current American authorities against the DPRK. For instance, when addressing the plenary of the UN General Assembly in New York on September 19, 2017, the President of the United States, Donald Trump, vowed to totally destroy the DPRK if Pyongyang does not come to its senses.[59] Pyongyang took this threat as a declaration of war.[60]

The DPRK's military and political establishment is now geared towards achieving two key and interrelated goals. The first of these is to create the threat of nuclear-missile attacks against American bases in the region and against America's allies there, such as the Republic of Korea or Japan, in order to give itself a strong potential for indirect deterrence (with a high probability of success) vis-á-vis the United States. If the DPRK can sustain the current pace of development of its nuclear and missile programs, it will in all likelihood achieve this goal very soon, probably in late 2018 or 2019.

Pyongyang's second goal is to avail itself of a direct deterrent against the USA, even if only a minimal one, by creating the threat of a direct nuclear missile strike against major cities on US territory itself. It will take Pyongyang longer to accomplish this, probably at least four to five years. But the first steps towards doing so have already been taken, as members of the US military itself have recognized.[61]

This course of events would clearly be unacceptable for the US.

59 Trump from the rostrum of the United Nations promised to "completely destroy" North Korea // Lenta.ru. 2017. 19 September. Available at: https://lenta.ru/news/2017/09/19/untrampsaid/ (accessed on 26 September 2017).

60 Kim Jong Un compared Trump's speech to the United Nations with the declaration of the war of the DPRK // TASS. 2017. 22 September. Available at: https://tass.ru/mezhdunarodnaya-panorama/4583234 (accessed on 26 September 2017).

61 In particular, during a hearing before the US Senate's Armed Services Committee in June 2017, the Director of the US Defense Intelligence Agency Lieutenant General Vincent R. Stewart said that though it is currently impossible to predict when Pyongyang would succeed in putting nuclear missiles that could pose a direct threat to the United States on combat duty, the DPRK had been so committed to staying the course that sooner or later this would happen // Ivanov V. America Ensnared From All Sides // Zarubezhnoye voyennoye obozreniye. 2017. 16 June.

Therefore, there is a very real risk that the US may attempt to disarm the DPRK through a military operation, with catastrophic consequences for Northeast Asia. This risk is much higher now than in previous years, due to the current US administration's virulent hostility towards the DPRK leader, Kim Jong Un. For the US, there is a great temptation to seize the moment and rid itself of the North Korean nuclear threat while it can still be certain of success, i.e. by acting before Pyongyang acquires nuclear ICBMs and while any counter attack by North Korea (even a nuclear one) can only strike the Republic of Korea and Japan. There can be no doubt that the Pentagon has already drawn up plans for a military operation against the DPRK.

What needs to be done?

First and foremost, the top priority is to reduce the political and military tension on and around the Korean Peninsula in order to rule out the risk of a "war by accident" which, as far as can be seen, nobody really wants, despite the belligerent rhetoric of President Trump and his North Korean counterpart, Kim Jong Un. To do so, all of the states involved in the confrontation — the DPRK, the United States, the Republic of Korea and Japan — must show restraint, refrain from any provocative actions or saber-rattling and demonstrate willingness to engage in dialogue.

The first step towards defusing the situation should be the implementation of the Russian-Chinese "double freeze" initiative (a freeze on North Korea's nuclear and missile programs in exchange for a freeze on joint US and South Korean large-scale military exercises).[62] The DPRK should introduce, as a voluntary political decision, a moratorium on its testing of explosive nuclear devices and ballistic missile launches, in exchange for which the US and the Republic of Korea should declare that they will abstain from conducting joint large-scale

62 See: Joint Statement by the Russian and Chinese Foreign Ministries on the Problems of the Korean peninsula. Official website of the Ministry of Foreign Affairs of the Russian Federation. July 4, 2017. Available at: http://www.mid.ru/ru/foreign_policy/news/-asset_publisher/cKNonkJE02Bw/content/id/2807662 (accessed on 28 September 2017).

military exercises. Only vigorous diplomatic efforts by China, Russia[63] and major European states, such as Germany,[64] France and the United Kingdom, can persuade the DPRK, the US and the Republic of Korea to take these steps. Without mediation from these countries, a "double freeze" will prove impossible.

It is only once this "double freeze" has been achieved that conditions will become conducive to the resumption of dialogue within the six-party talks that were suspended in 2009. That said, it should be clearly understood that Pyongyang will not agree to return to these negotiations if they are to be limited to the sole issue of the denuclearization of the Korean peninsula. The format and scope of future negotiations should, without there being any pre-conditions to their taking place, encompass the full range of major security-related issues in north-eastern Asia and take into consideration the views of all stakeholders. Moreover, the only way to actually reach a settlement on the North Korean nuclear missile problem is to gradually establish a mechanism for peace and security on the Korean Peninsula and in the region as a whole and to foster the normalization of relations among all states in the region.

But to assume that there can be a quick and easy solution to the North Korean nuclear missile problem would be a terrible mistake, leading to a dead-end. Returning to the agreement reached in 2005 through the six-party negotiations, when the DPRK agreed to eliminate

63 At a press conference following talks held in New York on September 20, 2017, with the US Secretary of State, Rex Tillerson, Russia's Minister of Foreign Affairs Sergey Lavrov said that "Moscow calls on Washington to not condemn or threaten Pyongyang in a bid to influence it, but to invite the DPRK to engage in dialogue". See: Lavrov: Russia calls on the US not to condemn and threaten the DPRK, but to conduct a dialogue // TASS. 2017. 20 September. Available at: https://tass.ru/politika/4575600 (accessed on 28 September 2017).

64 In an interview given to the newspaper *Deutsche Welle* on September 20, 2017, German Chancellor Angela Merkel criticized the United States' President Donald Trump for saying he would destroy North Korea. She said: "I am against threats of this kind. And speaking for myself and for the government I represent, I must say that we consider any type of military solution to the [North Korean] problem to be totally inappropriate; we are counting on diplomatic efforts. That is the path that must be unswervingly followed... That is why we categorically disagree with the American President". According to Merkel, Berlin is prepared do its utmost to help resolve the conflict on the Korean peninsula. See: Merkel criticized Trump for his intention to destroy North Korea // Lenta.ru. 2017. 20 September. Available at: https://lenta.ru/news/2017/09/20/merkel_vs_trump/ (accessed on 28 September 2017).

its military nuclear program in exchange for promised preferential treatments, is not an option now. What does seem feasible to begin with is an intermediate solution in which Pyongyang, in exchange for security guarantees and a significant easing of sanctions, would suspend its nuclear and missile programs for a specified period, say for ten years. For this to be possible, a legally binding agreement needs to be struck, similar to the Joint Comprehensive Plan of Action (JCPOA) on Iran's nuclear program but taking into account the specificities of the North Korean case. And, of course, for that to happen the US must not set the precedent of withdrawing from the JCPOA (for doing so would undermine trust in any similar agreements).

It is only with time, once Pyongyang will have convinced itself over this ten-year period that the arrangements reached are beneficial to it and, above all, that the security guarantees it was given are respected and that there is no threat to the country's government regime, that it will be possible again to resume work towards the denuclearization of the Korean peninsula. For Pyongyang to agree to nuclear disarmament, it will need not only convincing proof of its security guarantees, but also certain preferences (the nature and scope of these will be the subject of future agreements), since the country has already spent vast resources on building its nuclear weapons and its nuclear disarmament will also entail considerable costs. And this sui generis payment should not be viewed as a one-sided concession to Pyongyang. On the contrary, the preferences that will need to be given to the DPRK will seem negligible compared to the significance for international security of the stability that such a "deal" would bring to the Korean peninsula. Whether Pyongyang can be persuaded to enter into this "transaction" is another matter however. This will largely depend on the state of relations between the DPRK and the United States when the time comes. If their relations are not too conflictual, then the aforementioned "deal" could be struck. If, however, their relations remain fraught with potential for conflict, then no such "deal" will take place. To put it otherwise, only a normalization of relations between the DPRK and the United

States, on a long-term and legally binding basis, can turn the Korean Peninsula into a nuclear-weapons-free zone. There is no alternative here. If only Washington could come to see this, no matter how abhorrent it finds the North Korean regime.

One final point. All of the above ideas on what can be done to resolve the North Korean nuclear missile problem are based on the understanding that Washington and Pyongyang will choose cooperation over confrontation. Should their choice tip the other way, then none of the steps suggested above will be possible at all.

III. PROSPECTS ON STRENGTHENING THE NUCLEAR NON-PROLIFERATION REGIME

3.1. RISING NUCLEAR DANGERS. STEPS TO PREVENT A NUCLEAR CATASTROPHE

Rolf Ekéus[1]

There are many problems facing the efforts to strengthen the nuclear non-proliferation regime, after the failures of the 2015 Review Conference. But let us start with some good news. The implementation of the 2010 US-Russia New Strategic Arms Reduction Treaty — the New START — is working smoothly and professionally. The Treaty will remain in force for 10 years. As the year 2020 is soon, there is now time for Russia and the USA to engage without delay in a new set of negotiations on the prolongation of the Treaty and further development of nuclear arms reductions. The more urgent this is as these both major nuclear weapon states now are setting aside huge amounts of money to modernize their nuclear weapons arsenals, something that means new challenges for the international non-proliferation regime. Not the least because of the passivity or even failure of the major players of the international community to come to grips with proliferation threats, the potentials of actual use of nuclear weapons are growing. A base for that is an embarrassing lack of creative diplomacy.

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The North Korea challenge

Today, the most immediate problem for the global non-proliferation regime and for international security is the fast moving North Korean nuclear weapons program with its development and production of nuclear warheads and missile delivery systems. This is a development with potentials for a human catastrophe of unique proportions. Already today the North Korean potential nuclear weapons arsenal constitutes a threat against the neighbors, the Republic of Korea and Japan. A special responsibility falls upon the USA, maybe in cooperation with China, as a guarantor of security of those two states. But also, the USA itself is now gradually falling within the range of a nuclear threat as the North Korean weapons development appears to reach a strategic range, possibly within a few years. With the development of the North Korean nuclear weapons arsenal during the last few years, it is becoming clearer that military options, like air attacks and an invasion of the territory of the DPRK are no longer functioning alternatives. Such actions could not prevent North Korea from responding with military attacks, including possibly nuclear weapons, on South Korea and even Japan.

Therefore, there is now high time for diplomacy — creative and constructive diplomacy, to convince Pyongyang to put an end to its nuclear weapons development and production program. An immediate and unconditional demand on North Korea to halt its development and construction of nuclear weapons will certainly be met with denial. When Pyongyang is arguing its case, it maintains that the nuclear weapons option is the most important guarantee for preserving its political system and to keep its leadership in place. In this context it refers frequently to the case of Libya and the destiny of the Libyan leader, Muammar Gaddafi, who in negotiations with the USA and UK cancelled his nuclear weapons development program and eliminated his chemical weapons storage. Thereafter Libya was attacked by France and Great Britain and by the USA "leading from behind." The regime was broken to pieces and Gaddafi himself was killed. Saddam

Hussein met with a similar destiny, but not before the United Nations had cleaned up Iraq from all weapons of mass destruction. Given these examples, Kim Jong Un, the leader of North Korea, deals with international proposals and initiatives with considerable caution and with the preservation of his regime above all in mind.

The United Nations Security Council has repeatedly chosen to impose harsh economic sanctions on the DPRK as a punishment for the violation of the Council's own resolutions (binding under Chapter VII of the UN Charter) forbidding the country to acquire nuclear weapons. It is worth noting that China, which rarely was supportive of the American policy towards North Korea before, now appears to have got enough of Kim Jong Un's reckless pursuit of nuclear warheads and missiles and therefore has lined up with the sanctions proposed by the USA in the Security Council. China can be motivated by the hope that sanctions could become enough of an action against the DPRK's nuclear policy — so that the deployment of major US missile defense system in South Korea can be avoided, a system which would otherwise have an (unintended) impact of diminishing the relevance of China's missile capacity in its northern region.

It should be noted that Pyongyang insists that it (like India, Pakistan and Israel) has not violated any international nuclear weapons related treaties such as the Treaty on the Non-Proliferation of Nuclear Weapons, NPT (the DPRK is no longer a party to the Treaty) or the Comprehensive Nuclear-Test-Ban Treaty, CTBT (not yet entered into force, and not signed by the DPRK). However, there is clear evidence that years ago North Korea acting against the principles of non-proliferation, assisted Syria in building a uranium enrichment plant, later destroyed by the Israeli air force. Generally, there are reasons to be concerned that North Korea, now under tough UN economic sanctions, could be tempted to export nuclear weapons technology, thus undermining the international nuclear non-proliferation regime. However, the DPRK has in confidential talks (track 1 diplomacy) firmly stated that the country now has no intentions to export nuclear weapons

related items and technology. At the same time North Korean officials declare a modified no first use nuclear doctrine in regard to its nuclear weapons arsenal, namely that nuclear weapons will only be used if an enemy force violates the country's territory.

If diplomatic contacts (or at least track 2 talks) could be established, efforts could be made to convince the DPRK to halt its nuclear and missile tests in exchange for reduction of sanctions and limitation of the US-South Korean military exercises in the waters outside the North Korean coastline. Russia and China should be invited at the right moment to engage in consultations and the search for diplomatic solutions on the humanitarian and economic dimensions of the situation.

The Iranian nuclear deal

If the problem on the Korean peninsula gives reason to deep concerns we should note a major success for the nuclear non-proliferation regime, namely the Iran nuclear deal — the Joint Comprehensive Plan of Action (JCPOA). The United Nations Security Council adopted unanimously on July 20, 2015, resolution 2231, endorsing the deal which entered into force a couple of months later on October 18. The deal was reached between Iran on the one side and the five NPT recognized nuclear weapon states and Germany on the other and with a special role for the European Union. The JCPOA is an outstanding example of smart diplomacy. It is also an encouragement for the NPT and all the non-nuclear weapon states having joined the Treaty with the hope of moving towards a world free of nuclear weapons. With JCPOA, the five NPT nuclear weapons states have taken steps to shoulder their responsibility in accordance with Article VI of the Treaty. And Iran has recognized its responsibilities under the NPT and should at the same time gain relief from the economic sanctions under which it had suffered many years.

However, there are now concerns, both in Teheran and internationally, that the USA, as President Donald Trump has indicated, may break the nuclear deal with Iran, by refusing to lift the economic sanctions on

Iran. Clearly, in such an event it could be possible, even probable, that the other parties to the deal — the EU, UK, France and Germany, as well as Russia and China, would separate themselves from the American position. In the case of an American break out of the deal, there would also be a risk that Iran could return to its earlier enrichment of uranium and other related activities and move into the direction of building a nuclear weapons capacity, with the dramatic impact on the security in the whole Middle East region such a development would have. Under any circumstances, such an American break-out of the Iranian nuclear deal would harm the prospects for further negotiations to settle other problems, like the Korean situation, as it would put into question the credibility of the American political and diplomatic undertakings and leadership.

The Non-Proliferation Treaty

The Non-Proliferation Treaty still remains the major legal instrument for global nuclear weapons control. However, the most recent 2015 NPT Review Conference did not succeed in reaching an agreement on a final document outlining the continuation of the work on the implementation of the Treaty. Neither could it register any new progress (other than the New START) as regards the implementation of the disarmament provision under Article VI of the NPT. Nor could the participating states detect any signs of implementing the ten steps on nuclear disarmament agreed upon already in the Review Conference in year 2000. However regarding the significant NPT safeguards inspection system, it should be noted that after the failure of the IAEA safeguards inspections of Iraq during the 1980s, the Additional Protocol adopted by the IAEA in May 1997 has now been recognized and accepted by an overwhelming majority of state parties to the Treaty. The Protocol provides the IAEA inspectors with radically improved abilities to control nuclear fuel materials and related activities among the non-nuclear weapon states. However, there are still a number of significant states which have not joined the Protocol. It should be an important

goal to strive for all relevant states joining. In this context it should be noticed that the verification and monitoring arrangements of the Iran deal, the JCPOA, are built on the Additional Protocol thus lending credibility to the implementation of the deal.

The preparatory work for the next 2020 NPT Review Conference is now under way. The basic reason why the 2015 Review Conference concluded without an agreement on a final document was a failure, in spite of considerable efforts, to reach an agreement on a Middle East zone free from nuclear weapons and other weapons of mass destruction. The Arab states, and especially Egypt, which many years ago initiated the idea of such a zone, refused to accept a zone that did not include Israel (a non-NPT state) and were also concerned about the position of Iran (before the JCPOA). In spite of the lack of success of the latest zone initiative, there should be renewed efforts for the same purpose. Of value to such a renewed initiative would be registering the JCPOA as a new component of the zone project. This would be a stabilizing contribution to possible negotiations on the issue.

The Treaty on the Prohibition of Nuclear Weapons

On July 7, 2017, a conference under the UN General Assembly adopted a draft Treaty on the Prohibition of Nuclear Weapons with 122 votes in favor. None of the nuclear weapons states — neither the five NPT nuclear weapon states, nor the other four states (Israel, India, Pakistan, and North Korea) — participated in the deliberations or voting. Neither did any of the non-nuclear NATO member states, with the exception of the Netherlands which however voted against the Treaty. Under the Treaty the parties undertook under no circumstances to develop test, produce, manufacture, otherwise acquire, possess or stockpile nuclear weapons or other nuclear explosive devices, transfer or receive nuclear weapons, or use or threaten to use nuclear weapons and not allow any stationing, installation or deployment of any nuclear weapons in their territory or any area under their control. The Prohibition Treaty is in harmony with Article VI of the NPT which

obliges all NPT parties — not only the nuclear weapons states, but also the non-nuclear weapons states — to engage in negotiations on a treaty on general and complete disarmament. It is a major addition to the two already existing treaties forbidding weapons of mass destruction, the 1975 Biological Weapons Convention (BWC) and 1997 Chemical Weapons Convention (CWC). The BWC does not have a verification system, while the CWC has a most elaborate and well managed verification system — the Organization on the Prohibition of Chemical Weapons (OPCW).

Clearly it is hardly probable that in the near future any of the NPT nuclear weapon states or any of the other four would change their policy and voluntarily give up their nuclear weapon status, even if most of them theoretically have indicated their willingness to work towards a world free from nuclear weapons. Still the Prohibition Treaty will have an impact on the overwhelming majority of the world's non-nuclear weapons states and clearly support the anti-nuclear movement in the world. In that way the Treaty will contribute to the strengthening of the NPT, and will open the road to a world free of nuclear weapons. The five NPT-recognized nuclear weapons states, with the United States and Russia in the lead, should respect this declaration of will by a large proportion of the world. Instead of complaining that non-nuclear states used the Treaty to express their dream of ending the threat of massive destruction for the coming generations, the P5 should engage in making real their own declared long-term goal of disarmament by starting a dialogue on identifying incremental steps which can be effective in the process towards future nuclear disarmament negotiations. The five should appreciate that a majority of the world by joining the Treaty undertook not to acquire nuclear weapons fully in the spirit of the Nuclear Non-Proliferation Treaty.

It is clear that the "trust but verify" principle by President Reagan maintains its relevance for today's multilateral agreements on nuclear disarmament and should be considered in the implementation of the Prohibition Treaty. In that case there is no doubt that the IAEA

safeguards, improved through the Additional Protocol, would be crucial, but far from enough for such an endeavor. But for the Treaty, special organizational arrangements for verification of the weapons dimension should be linked to the UN Security Council (as in the case of concern over violations of the BWC). As in the case of Iraq, the Security Council established in 1991 a special commission, UNSCOM, to verify and manage the complete elimination of Iraq's weapons of mass destruction, including — in cooperation with the IAEA — its nuclear weapons capabilities. Thus, the Security Council could establish an international expert commission tasked to review the whole set of problems and propose an organizational structure under the Council for the verification of the implementation of the Prohibition Treaty.

Nuclear deterrence

The declared driving philosophy behind keeping nuclear weapons on the part of the nuclear weapons states is the doctrine of nuclear deterrence. There is a widespread belief in deterrence as a basis of international security not only among nuclear weapons states, but also among the NATO member states. That belief explains the reluctance of nuclear weapons states and their allies to reduce and eliminate nuclear arsenals. The rational for nuclear arsenals under the deterrence doctrine is to prevent their use. However the deterrence philosophy of the two major nuclear powers, the USA and Russia, has over the years been gradually undermined. Thus, the nuclear doctrine of the US and NATO is now based on principles of first use. Likewise has Russia, which for years had maintained a doctrine of no first use, gradually modified its doctrine to become one of first use like NATO's, probably as an effort to balance the conventional military forces superiority of the US/NATO in the European area. Even if the deterrence doctrine is seriously undermined, the arguments against the Prohibition Treaty will continue to be based on that doctrine.

A dilemma with strategic deterrence is that it can be credible only if there is a significant possibility that nuclear weapons can be used

at short notice and thus are kept on high alert. However, such short notice/high alert status can lead to accidental use. Therefore, proposals by the US statesmen Sam Nunn and William Perry on increasing launching time and separating warheads from missiles should be considered by Russia and the United States. In addition, to be credible the deterrence posture requires a political/psychological readiness to use the weapons to inflict disaster and suffering of almost unthinkable magnitude on an adversary, its people, another nation. Furthermore, deterrence can have an impact only on reasonable, rational actors and opponents.

The terrorist threat

What we have learned from actions by terrorists in modern time, is that there are those with destructive and suicidal agendas on whom nuclear deterrence would have no effect whatsoever. During the years after the 2001 Al Qaeda attack on the United States, the international community has experienced the emergence and growth of terrorist groups and movements like Al Qaeda and ISIS in the Middle East, Europe and Russia. Clearly nothing could be more attractive for a terrorist movement than to take control over nuclear weapons or nuclear material which could be transformed into nuclear or radiological weapons, dirty bombs. One can argue that the probability of such a development is small, but still the risk of a terrorist infiltration in or an attack on a nuclear weapons base, for instance in Europe (Turkey), is real. This is a risk that has been growing with continuing accessibility of nuclear weapons technology and with the expansion of terrorist presence in Europe which could imply damage, destruction, or even theft of nuclear weapons from the NATO nuclear weapons storages in Europe. The United States has during the last decades been moving to reduce the relevance of forward-deployed nuclear weapons in Europe and their stockpiles in several countries. This would reduce the risk of terrorism and instability. However, now it appears that this policy will be changed and that the USA instead of removing the weapons from

vulnerable sites intends to keep them in place.

The 1992 agreement between the United States and Russia on cooperative threat reduction which was inspired by the two US statesmen Sam Nunn and Richard Lugar, provided the fundament for the US-Russia cooperation over years on consolidating and securing material and technologies associated with nuclear weapons, and became one of the most important instruments in arms control history of preventing proliferation of nuclear weapons. This agreement expired in 2013 and ironically at a time when new threats of terrorism-related proliferation are emerging. There is now an urgent international interest that the two major nuclear weapons powers enter into a new dialogue on how to coordinate their efforts to secure nuclear material from falling into wrong hands.

A fast-growing threat of proliferation of nuclear weapons into the hands of terrorists, like Al Qaeda and ISIS, is emerging in Pakistan. The nuclear weapons in Pakistan have over the years been kept reasonably safe in the hands of a well-structured and disciplined army. The US military have over the years quietly and steadily supported Pakistan in its efforts to maintain a stable control structure for the nuclear weapon storages in the country. This is a task that over the years has become more complex and difficult with the growing security chaos in the neighboring Afghanistan which tends to have a spill-over effect on Pakistan. To handle the situation the Pakistani government searches for ways to cooperate with and giving support and sanctuary to the Taliban forces which are fighting the Afghan government forces which in their turn are supported by the American military in Afghanistan. At the same time, the US government has over the years been providing Pakistan with billions of dollars in aid, even if the Trump administration for the time being is withholding this year's aid.

Thus, the major US concern is the security of Pakistan's nuclear arsenal. A concern that is well motivated, as Al Qaeda's most lethal operators after September 11, 2001 moved over the border from Afghanistan into Pakistan where they appear to remain. In such a situation, the

stability of the Pakistani government is essential for keeping its bombs out of terrorist hands. Therefore, there must be limits to how much outside pressure can be brought on the country. China, which is Pakistan's most important ally, also appears to have serious concern about the safety of the nuclear arsenal and strives to protect Pakistan from outside pressure on terrorism and nuclear proliferation issues. Russia seems seriously worried over the prospect of Pakistan's nuclear weapons falling under the control of terrorist structures like Al Qaeda or ISIS. Therefore one wonders if now it is time for those concerned — the United States, Russia, China, and also Iran — to work closely together and prioritize high-level diplomacy to eliminate the risk of terrorists gaining control over Pakistani nuclear weapons.

Fissile materials

The experience of nuclear proliferation and the spread of production of weapons usable fissile material in countries like Pakistan, North Korea, Libya, Iraq, and Syria should make it an urgent task for all states, especially the P5, to take serious initiatives to launch substantial multilateral negotiations on an international treaty banning the production of fissile material for weapons purposes, a Fissile Material Cut-Off Treaty (FMCT). The sole forum for negotiating multilateral arms control treaties, the Conference on Disarmament (CD) in Geneva, would be ideal for that task which was demonstrated by the complex but successful CD negotiations in the 1990s shaping the Convention on Chemical Weapons, and the Comprehensive Nuclear-Test-Ban Treaty. However, for years since then the CD has been unable to reach consensus on its agenda which gives reasons for skepticism.

It is especially disturbing that the Conference has not been able to unite around starting negotiations on the FMCT. This demonstrates a serious lack of political leadership among the official nuclear weapons states as such a treaty definitely would be in their own interest. It would be difficult to imagine any better or more effective legal and political step than the FMCT for strengthening the international non-

proliferation regime and the NPT. The failure to initiate such negotiations can only serve the interests of those states and non-state actors who consider acquisition of nuclear weapons. It is also remarkable that in the CD, one state, Pakistan, has taken the lead in blocking the start of FMCT negotiations using the CD rule of consensus by voting "no". Pakistan, itself a challenge for nuclear security, appears to act unchallenged on the part of its two security guarantors, the United States and China. Hopefully the members of the CD, and especially nuclear weapons countries, will take steps to open consultations aiming at formal negotiations on the FMCT.

The world economy and its energy supply remain fundamentally dependent upon civil nuclear energy, and will remain so for the foreseeable future. Therefore it is now urgent to promote a global nuclear materials security regime and build support for global norms governing the nuclear fuel cycle. An example of considerable importance in this respect is the initiative of the Nuclear Threat Initiative led by the former US Senator Sam Nunn to create an international fuel bank owned and managed by the IAEA. The bank which has recently became operational has its headquarters in Astana, Kazakhstan. The IAEA bank will provide countries with a guarantee that they could access nuclear fuel for their civilian energy production in an unusual case of an interruption of their supply. The assurances provided by the bank will rein in the urge of countries to produce their own nuclear fuel and nuclear weapons material.

The above essay lists challenges on the road map to nuclear zero. We must keep in our mind that the nuclear weapons are above all tools of destruction — their use causes irreparable devastation and environmental degradation. Disarmament and non-proliferation are the humanitarian answers.

3.2. CONTINUITY AND CHANGE IN NPT POLITICS: PROSPECTS FOR STRENGTHENING THE NUCLEAR NON-PROLIFERATION REGIME

William C. Potter[1]

Introduction and historical context

2017 was not a good year for nuclear non-proliferation. Nevertheless, in assessing the state of the nuclear non-proliferation regime and considering the prospects for strengthening the NPT and its associated institutions, it is worthwhile to take note of elements of both continuity and change over the past decade with respect to the most pressing proliferation challenges and the appropriate international community's response to the question: "Chto delat'?" (What is to be done?). In this regard, several observations are pertinent.

Observation One. The NPT regime almost always has appeared to be in a precarious position: that was the prevailing perception before the 1995 Review Conference, the 2000 Review Conference, and even more so prior to the Review Conference in 2005. The failure to forge a consensus document at the 2015 NPT Review Conference again has elicited much handwringing about the increased fragility of the NPT, the potential for its unraveling, and an anticipated surge in the spread of nuclear weapons. While it is possible that this forecast of impending proliferation doom may be true this time round, it certainly is not new — witness the wildly exaggerated forecasts by US intelligence in the 1950s and 1960s, President Kennedy's famous but faulty proliferation prognosis in 1963, the very sophisticated but mistaken futurology of proliferation chains by Herman Kahn and Lew Dunn in the mid-1970s, and similar prognoses of proliferation cascades, waves, dominoes, etc. by a number of contemporary analysts.[2] In fact, the non-proliferation regime has demonstrated considerable resilience over time and it would be imprudent to over-interpret signs of its imminent unravelling. That being said, one also should be alert for indications of possible changes in trends and deviations from standard past practices.

Observation Two. In assessing the current non-proliferation scene, it is important to distinguish between resilience and relevance. Without denigrating the NPT, it is fair to say that what we often observe in the NPT review process has little in common with or connection to proliferation developments writ large. One may find this fact to be encouraging or discouraging, but in either case it cautions against treating the "success" or "failure" of any NPT Review Conference as a meaningful test of the health of the NPT or the well-being of the broader nuclear non-proliferation regime — witness the usual reluctance of states parties at NPT meetings to discuss issues such as the behavior of the DPRK, nuclear brinkmanship in South Asia, or, for that matter, US-Russian nuclear force modernization. Illustrative of this aversion to addressing pressing proliferation issues in the NPT review process, was the request reportedly made by a senior representative of China to the Chair of the 2017 NPT Preparatory Committee (PrepCom), in advance of the meeting in Vienna that he avoid any discussion of the DPRK at the PrepCom — an odd request given the stated purpose of the review process and North Korea's nuclear testing behavior in the preceding year.[3] In other words, we must face up to the fact that there

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2 For a discussion of past proliferation prognoses, see Potter W.C., Mukhatzhanova G. Divining Nuclear Intentions: A Review Essay // International Security. 2008. Vol. 3, No. 1. Pp. 139-169.

3 Author's interview with a person privy to the conversation, April 2017, Vienna.

is a surreal quality to the NPT review process, and we should not place too much faith in its improved performance regardless of the acuteness of the threats that arise.[4]

Observation Three. A third observation is that while there certainly are some important, new proliferation challenges, about which more will be said below, it also is the case that there has been far more continuity than change since the NPT entered into force in 1970. It is instructive, for example, to compare the situation today with the first NPT Review Conference in 1975, which unfortunately few contemporary analysts can recall from first-hand experience. Indeed, William Epstein's 1976 chronicle of the 1975 RevCon in a book called *The Last Chance* reads as if it were written only yesterday.[5] The potential catalytic effects of India's "peaceful nuclear explosion" in 1974, the failure of the 1970 Treaty on the Non-Proliferation of Nuclear Weapons to live up to its expectations, and even the danger of terrorists acquiring nuclear weapons led Epstein to conclude that the mid-1970s represented "probably the last chance for the NPT and the prevention of an uncontrollable nuclear arms race."

If it is correct to emphasize continuity over change in the world of non-proliferation politics over most of the nearly half-century of the NPT, what are new and noteworthy developments that could possibly alter this dynamic in the future? Among potentially significant new developments, in no particular order of importance, are the:

- Negotiation of the Prohibition of Nuclear Weapons Treaty, which opened for signature on September 20, 2017;
- Demise of US-Russian cooperation, including the total absence of trust between Washington and Moscow and the greatly increased potential for military conflict arising from accidents, miscalculations, and involvement in third party conflicts;

4 For different perspectives on how best to strengthen the NPT review process see Einhorn R. The NPT Review Process: The Need for a More Productive Approach // Arms Control Today. September 2016; and Rauf T. The Strengthened Review Process for the Nonproliferation Treaty // Arms Control Today. October 2016.

5 Epstein W. *The Last Chance: Nuclear Proliferation and Arms Control*. New York: The Free Press, 1976.

- Increased risk of the abrogation of the INF Treaty;
- Capability of North Korea to deploy nuclear-armed intercontinental ballistic missiles;
- Dangerous changes in nuclear doctrine and employment policies on the Indian subcontinent;
- Increased potential of the unravelling of Joint Comprehensive Plan of Action (JCPOA);
- Greater reliance by nuclear weapon states (NWS) on nuclear weapons;
- Growing divide between NWS and non-nuclear weapon states (NNWS) and the absence of any credible bridge-builders or prospects for their emergence;
- Significant ignorance and complacency regarding nuclear disarmament and non-proliferation issues on the part of most citizens and their elected representatives in most, if not all, countries;
- Changing nature of catastrophic nuclear terrorism;
- Increasing erosion of key international institutions in a world beset by the forces of populism and extremism;
- Growing disinterest in and diminished attention given to the negotiation of a WMD-free zone in the Middle East;
- Absence of ongoing US-Russian bilateral arms control negotiations;
- New role of cyber and other disruptive technologies as contributors to strategic and crisis instability;
- Diminished recognition of the contribution of the NPT to national and international security; and the
- Crisis in US leadership.

All of these issues — and others — deserve attention, but this essay focuses on only four of the developments — the Prohibition Treaty, the demise of US-Russian non-proliferation cooperation, a world in increasing disarray, and the crisis in US global leadership. Several of these developments are unlikely to alter the fundamental manner in which the NPT is reviewed and implemented in the near term, but

others — if sustained — have the potential to be far more disruptive and detrimental to the nuclear non-proliferation regime.

The Nuclear Weapons Prohibition Treaty. At a time when the United States and Russia find it hard to agree on anything, one issue on which their views correspond closely is a condemnation of the Treaty on the Prohibition of Nuclear Weapons, which was concluded at the United Nations in New York on July 7, 2017. One may argue about the value added or detracted by the treaty with respect to nuclear disarmament and non-proliferation. Regardless of the merits and demerits of the treaty, it almost certainly will enter into force before the 2020 NPT RevCon. As such, little is gained by casting aspersions about the motivations of the treaty's negotiators, especially as those most inclined to do so boycotted both the treaty's negotiations as well as the deliberations of the Open Ended Working Group in 2016, which gave rise to UN resolution mandating the negotiation of a treaty — occasions when critics could have influenced the subsequent course of events. What counts today, and merits serious examination, is how the conclusion of the Prohibition Treaty and its likely entry into force will impact on the nuclear non-proliferation regime in general and the NPT review process in particular. Will it lead to the unravelling of the NPT as some of its critics suggest, and will it give rise to more rampant proliferation? The answers to both of these questions is "no" or at least, "not necessarily."

First, there is no objective reason why the existence of the new treaty — flaws and all — should significantly affect the health of the NPT, which was fractured on many fronts well before the Prohibition Treaty was a glint in anyone's eye. That being said, if NPT states parties come to the 2018 PrepCom in Geneva in April with a view to scoring debating points about the virtues and liabilities of the treaty and the motivations of its critics and defenders, one can imagine a scenario in which a bad situation is made much worse, conceivably even leading to a walkout by some NWS along the lines of what Egypt foolishly did in 2013. In order to avoid that unlikely but possible situation, it would be highly

desirable if the NWS and their NNWS allies: (1) acknowledge that a Prohibition Treaty exists, will be widely ratified by many countries who participated in its negotiation, and will likely enter into force prior to the 2020 RevCon; (2) work to ensure that the perceived shortcomings of the Prohibition Treaty do no damage to international safeguards and verification regimes; and (3) develop a meaningful, alternative "progressive agenda" for nuclear disarmament and risk reduction. A good starting point would be agreement on minimum measurable steps for implementing Action 5 of the 2010 NPT Review Conference that was adopted by consensus. That Action item specified that the NWS commit to accelerate concrete progress on the steps leading to nuclear disarmament, contained in the Final Document of the 2000 Review Conference, in a way that promotes international stability, peace and undiminished and increased security. To that end, states were called upon to *inter alia*:

- rapidly reduce the global stockpile of all types of nuclear weapons;
- diminish the role and significance of nuclear weapons in their security concepts, doctrines, and policies;
- reduce the operational status of nuclear weapons; and
- reduce the risk of accidental use of nuclear weapons.

In this regard, it is pertinent to note that these steps, for the most part, also enjoyed very considerable support at the 2015 NPT Review Conference and were present in the 2015 NPT Review Conference draft final document presented to delegates by the Conference president, although the document ultimately was not adopted.[6]

By the same token, proponents of the Prohibition Treaty, having succeeded in achieving their primary objective, should take to heart their oft-stated declarations during the March 2017 negotiations in New York — but less evident in the June and July negotiations of the same year — that the NPT is the cornerstone of the international non-proliferation regime and that the new treaty must build on an strengthen the

6 For a detailed analysis of this issue see Potter W.C. The Unfulfilled Promise of the 2015 NPT Review Conference // Survival. 2016. Vol. 58, No. 1. Pp. 151-178.

NPT rather than replace it. Among other things, that means improving international safeguards, enhancing verification, undertaking renewed efforts to bring into force the Comprehensive Nuclear Test Ban Treaty, as well as devoting far more energy than they have to date to addressing that part of the Open Ended Working Group mandate that dealt with nuclear risk reduction.

While all these steps should be pursued, their endorsement by both NWS and NNWS at the next NPT Review Conference would not necessarily forestall North Korean nuclear brinkmanship, inhibit further nuclear proliferation, or shore up the NPT. More likely to have a bearing on these developments is the state of US-Russian relations.

Demise of US-Russian cooperation for non-proliferation. It is impossible to estimate with much confidence the relative impact of different scenarios on the health of the NPT. Nevertheless, a good case can be made that continuation of the current nose-dive in US-Russian relations is more likely to impact negatively on the non-proliferation regime than the acrimony associated with the Prohibition Treaty. In this regard, it is critical to recall the history of US-Soviet, as well as US-Russian cooperation for non-proliferation, and how central that cooperation was to both the NPT and the broader non-proliferation regime. Although a distant memory — or less — to many of today's non-proliferation practitioners in the United States and Russia, for much of the Cold War the views of Washington and Moscow with respect to nuclear weapons spread tended to correspond more often than not, making it possible to negotiate the NPT and to cooperate closely in its implementation. Especially after the Indian nuclear test in 1974, the two countries found their nuclear non-proliferation and export control policies to be closely aligned, a circumstance that facilitated cooperation on many non-proliferation matters in the NPT context, the Nuclear Suppliers Group, and in other fora. This cooperation continued across both Democratic and Republican administrations in Washington and during some of the most frigid moments of the Cold War. Today, it is no longer obvious if this cooperation will persist, and senior US and

Russian officials privately have expressed concerns about their ability to coordinate policies in the current NPT review cycle, notwithstanding their mutual disdain for the Prohibition Treaty.

At a time of increased US-Russian acrimony, one would do well to recall the observation made by Ambassador Roland Timerbaev, a key Soviet negotiator of the NPT. In an interview in the September 2017 issue of *Arms Control Today*, Timerbaev observes how the change in attitude by the United States and the Soviet Union toward "nuclear weapons and the idea of signing the NPT had much to do with the 1962 Cuban missile crisis."[7] Given the loss of institutional memory in both countries of arms control and non-proliferation cooperation and an atmosphere of extreme distrust, we cannot afford another Cuban Missile Crisis to restore sanity to our bilateral relations — in part, because we cannot assume it would have a peaceful resolution.

A world in disarray. In one of the most important books of 2017 — *A World in Disarray* — Richard Haass paints a very bleak picture of the contemporary world in deep crisis involving the breakdown of the four hundred-year old Westphalian system of international relations, the core of which was respect for sovereign nations states. In essence what he observes is a world described vividly in the poem "The Second Coming" by William Butler Years: "Things fall apart; the center cannot hold." Moreover, Haass predicts that the current trend is for more disorder on the horizon, fueled by a failing global order beset by growing populism and extremism, including in mature democracies, and political dysfunction at the national and international level. It would be surprising if this observed erosion of support for international institutions did not also impact negatively on international treaties, including the NPT and its associated institutions such as the International Atomic Energy Agency.

It is beyond the scope of this essay to undertake this assessment in any systematic fashion. It also is very difficult to gauge the evolving importance states place on the integrity of the NPT for their own

7 Roland Timerbaev: The Nuclear Nonproliferation Treaty Has Largely Achieved Its Goals (Interview conducted by A.V. Khlopkov) // Arms Control Today. September 2017.

national security interests and/or for the well-being of the greater international community. It is the author's impression, however, that since the NPT was extended indefinitely in 1995, for many countries the centrality of the treaty for their security has diminished over time. Consistent with this view is the recollection of many observers of the General Debate during the first week of the 1995 NPT Review and Extension Conference at which state after state — large and small, developed and developing — articulated why the NPT was vital to its nation's security and should be extended. The explanations that were provided varied considerably, but there was little doubt about the sincerity of the convictions that were expressed. Today, at recent Review Conferences and Preparatory Committee meetings, one continues to hear expressions of support for the NPT and the important role the treaty plays as the cornerstone of the international non-proliferation regime. One has the impression, however, that for the representatives of many countries who express this sentiment, the statements are repetitions of views once strongly held but today are voiced in rote-like fashion without deep conviction or understanding about how the NPT serves the particular security interests of their countries or the international community at large. This is admittedly more an impression than empirical fact, but it is consistent with the lack of emphasis given to the NPT in the final text of the Prohibition Treaty and in the debate during the last three weeks of the treaty's negotiation — an observation also made pointedly and repeatedly during the last week of the negotiations by the head of the delegation of Sweden.[8]

One might also argue that erosion of support for the NPT can be inferred by the disregard by both NWS and NNWS for some of the key decisions taken at past Review Conferences. For example, although many NNWS assert that the NWS are most negligent in regard to failing to implement their nuclear disarmament obligations, alternatively one could point to the "cherry picking" approach employed by both

8 Author's observations during the Prohibition Treaty deliberations from July 3-7, 2017.

NWS and NNWS on matters such as nuclear trade with non-NPT parties, in direct violation of Paragraph 12 of the Decision on Principles and Objectives for Nuclear Non-Proliferation and Disarmament — an integral part of the package of three decisions and one resolution adopted at the 1995 NPT Review and Extension Conference. This provision explicitly prohibits new nuclear supply arrangements by NPT states parties with states lacking full-scope/comprehensive safeguards. Failure to adhere to this politically-binding NPT obligation by engaging in nuclear trade with India has the effect of devaluing membership in the NPT as a non-nuclear weapons state. Even more detrimental to the NNWS norm and the NPT over the long term is nuclear trade with India by states belonging to Nuclear-Weapons-Free Zones (NWFZ), which prescribe in legally-binding fashion trade in the absence of full-scope safeguards (e.g., as is the case with the Rarotonga and Pelindaba NWFZs) or the Additional Protocol (as is required by the Central Asian NWFZ Treaty).

Another contributing factor to the possible decline in support for a robust NPT is widespread ignorance and complacency about nuclear issues on the part of citizens in most, if not all, countries. While this knowledge deficit is lamentable, it also is understandable given the limited opportunities for formal study of the subject of disarmament and/or non-proliferation at the high school, undergraduate, and post-graduate levels.[9]

If this assessment is correct, the aforementioned factors are likely to result in a gradual diminution of support for the NPT. While they may not result in any discernible change in the NPT review process, they are likely to breed less flexible negotiating practices, resulting in fewer compromises and greater difficulty in forging consensus final documents at future review conferences. It is quite conceivable,

9 For two major collections of essays on the subject of disarmament and non-proliferation education see the special issue on "Education for Disarmament" // Disarmament Forum. 2001. Vol. 3, United Nations Institute of Disarmament Research (Geneva, Switzerland), and Celebrating 15 Years of Disarmament and Non-Proliferation Education, Occasional Paper of the United Nations Office of Disarmament Affairs. February 2018.

for example, that 2020 will mark the first time in NPT review process history in which successive review conferences are unable to produce consensus outcomes.

Bankrupt US leadership. A fourth and final observation, perhaps even more gloomy than the current state of US-Russian relations, is the dismal state of US leadership in a world very much in disarray. US instincts appear to be dangerously wrong on almost every issue of non-proliferation significance, be it the utility of the Iran nuclear deal, the need to shore up alliance relations, the absence of a coherent policy to deal with North Korean nuclear brinkmanship, an aversion to the Comprehensive Nuclear Test Ban Treaty and multilateral diplomacy more generally, a disinterest in bilateral or multilateral nuclear arms control and a corresponding embrace of nuclear force modernization, a misguided approach to expansion of the Nuclear Suppliers Group, and an impoverished national security apparatus at whose head sits an individual, who has little interest in or respect for the counsel of the intelligence community or the few remaining senior State Department officials. Perhaps with enough luck the non-proliferation regime could survive shortcomings in one or two of these areas, but the international community will need a great deal more than luck if it is to overcome the tremendous deficit in US leadership and persevere until it is time to celebrate the 15th anniversary of the Luxembourg Forum.

3.3. ELEMENTS AND INSTITUTIONS OF PROLIFERATION-RESISTANT ENVIRONMENT

George Perkovich[1]

The nuclear non-proliferation regime is built on several bargains and multiple institutions and processes. The first bargain was between the two Cold War superpowers — the US and the USSR — who agreed to cooperate in pursuing a treaty that would prevent the further proliferation of nuclear weapons. This cooperation, joined by the United Kingdom, made it possible to seek a broader bargain with the rest of the world to motivate other countries to forego acquisition of nuclear weapons. In this process, which led to the Nuclear Non-Proliferation Treaty (NPT) of 1968, the countries that already possessed nuclear weapons promised peaceful nuclear cooperation to others that would eschew nuclear weapons, and also committed to pursue in good faith negotiations for nuclear disarmament. To pursue these objectives, the Nuclear Suppliers Group, the Zangger Committee, and other entities were created, adding to the International Atomic Energy Agency and the NPT review process. Various nuclear arms control negotiations were pursued in part to reinforce the NPT. All of this, broadly, can be regarded as the nuclear non-proliferation regime.

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To consider how this regime may be strengthened from today's vantage point, one could focus on each and every objective and institutional arrangement. In this essay I follow an alternative approach in order to simplify and shorten a complicated assignment. First, I explore the "supply side" of the nuclear dynamic and address what might be done to strengthen inhibitions and barriers to the supply of materials, equipment, and know-how critical to acquiring nuclear weapons. Second, I evaluate what might be done to reduce demand for nuclear weapons and related critical inputs for their production. Finally, I discuss how challenges to some of the non-proliferation institutions could be managed.

Supply side

The early formation and operation of the non-proliferation regime was informed by several basic premises. First, leading states decided that fissile materials — particularly separated plutonium and highly enriched uranium — were far and away the most important "things" whose supply needed to be controlled. Second, it was assumed that technological barriers made it exceedingly difficult for all but a few technically advanced states to produce fissile materials. Uranium enrichment was considered especially difficult for all but a few states to master. Third, terrorists were not a material concern in the early decades, or until the aftermath of the Soviet Union's dissolution. Fourth, it was believed that nuclear energy would be increasingly attractive as an economical source of power for states, such that commercial incentives would motivate ever more states to undertake ambitious nuclear programs.

Today, these premises need to be updated, with implications that cut in diverging ways.

Acquisition of fissile materials remains the most important variable in determining whether, when, and how proliferation might occur. The challenge of controlling potential supply of these materials has become more manageable regarding plutonium, but more difficult concerning

highly enriched uranium. New techniques for enriching uranium, and the grey and black markets through which their component elements might be procured, lower the technical barrier to proliferation.

Beyond fissile materials, experience suggests that other categories of activity also deserve attention and consideration for possible constraint, in ways that were not addressed by the NPT in 1968. In a five-year project involving nuclear weapons experts from the US, the UK, Russia, France, and China, the Carnegie Endowment utilized technical expertise and historical analysis to identify and define three additional categories of activity that could enhance efforts to detect proliferation and to design nuclear disarmament arrangements.[2]

The first category concerns activities that are indispensable to development, testing, and production of nuclear explosive devices. Many such activities also may serve purposes other than developing nuclear weapons — for example, experiments with multi-point detonators. Non-nuclear-weapon states understandably would resist demands to forego categorically such activities. But there are other activities whose only established purpose is to develop nuclear weapons. The Joint Comprehensive Plan of Action with Iran (Section T), for example, lists four categories of such activities, which Iran, as a non-nuclear-weapon state has now agreed not to conduct:[3]

- designing, developing, acquiring, or using computer models to simulate nuclear explosive devices;
- designing, developing, fabricating, acquiring or using multi-point explosive detonation systems suitable for a nuclear explosive device, unless approved by the Joint Commission for non-nuclear purposes and subject to monitoring;
- designing, developing, fabricating, acquiring, or using explosive diagnostic systems... suitable for the developing of a nuclear explosive device...;

2 Dalton T., Hoffman W., Levite A.E., Bin L., Perkovich G., Zhao T. *Toward a Nuclear Firewall*. Carnegie Endowment for International Peace, 2017.

3 Joint Comprehensive Plan of Action. Official website of the US Department of State. Available at: https://www.state.gov/e/eb/tfs/spi/iran/jcpoa/ (accessed 13 January 2018).

- designing, developing, fabricating, acquiring, or using explosively driven neutron sources or specialized materials for explosively driven neutron sources.

It is entirely consistent with the spirit and letter of the NPT to seek to prohibit such activities in all states that are obligated not to acquire nuclear weapons and/or that have undertaken nuclear disarmament.

A second category of activity that could or should be encompassed in a strengthened non-proliferation regime involves military activities that, based on historical experience, strongly indicate a state is preparing to acquire and operate nuclear forces. Examples include military involvement in the administration and coordination of an ostensibly civilian nuclear program; military management of construction of nuclear facilities; involvement of nuclear experts in Space-Launch Vehicle programs and activities. The idea is not that such activities could be prohibited. Rather, a norm could be established: when such activities appear, the state conducting them should be expected to explain why others should be reassured that the state in question is not preparing to acquire nuclear weapons. This norm would extend the basic logic of the non-proliferation regime's treatment of nuclear facilities and materials.

A third category involves assessing the compatibility of a state's nuclear program and related activities with the many other states' programs that are widely regarded, including by the IAEA, to be purely peaceful. Examples of seemingly incompatible activities include all of the ones mentioned above as well as a long list of indicators detailed in the Toward a Nuclear Firewall report. A straightforward metric of a state's peaceful nuclear status would be whether it has ratified and is implementing the four treaties or conventions covering nuclear safety, the handling of spent and irradiated fuel, physical protection of nuclear materials, and nuclear liability. All countries with purely peaceful nuclear programs have done so, except Iran.

Space here does not allow a detailed description of how these and other additional categories of analysis and potential constraint could

be incorporated into the norms, rules and procedures of the non-proliferation regime. The basic idea is this: when states and the IAEA detect a significant number of activities within these three categories that together suggest a state's purpose is not purely peaceful, the state in question would be expected to redress such concerns transparently. This expectation would be particularly salient in cases of states that pursue inherently dual-use nuclear activities such as separation of plutonium and/or enrichment of uranium. The presumption would be that cooperation in redressing evidence-based concerns would be an important confidence-building measure, and therefore would not be too much to ask for.

Returning to the original premises of the non-proliferation regime, terrorist acquisition of nuclear materials and/or weapons has become a more pressing challenge than it was in 1968.[4] This challenge is prone to exaggeration and, fortunately, it is comparatively easy to redress. It is extremely difficult for terrorists to produce fissile materials and, subsequently, nuclear weapons, without direct assistance from states or state-based sources. In four Nuclear Security Summits since 2010, more than forty states have identified what needs to be done in order to secure nuclear materials and reduce risks that terrorists could acquire them. State leaders have pledged to undertake the identified actions. UN Security Council Resolution 1540, passed in 2004, requires all states to adopt and enforce laws to prevent non-state actors from developing, acquiring, manufacturing, possessing, transporting and transferring nuclear, chemical, or biological weapons. This agenda for countering WMD terrorism is relatively non-controversial. The challenge is to maintain enough high-level political attention so that bureaucracies are motivated to implement agreed policies.

The economic attractiveness of nuclear energy has plummeted in all but a few large states, particularly China, Russia, and perhaps India. The increasing costs of new nuclear plants and delays in construction

4 To be sure, the Irish resolutions from 1958 through 1961 that led to the NPT negotiations reflected concerns over possible terrorist acquisition of nuclear weapons.

inhibit demand, as do the declining costs of natural gas, renewables, and efficiency in electricity usage. The major North American, European, and Japanese vendors of nuclear power reactors are all suffering enormous losses. Germany is phasing out nuclear energy. Japan's number of operating reactors has fallen from more than fifty before the Fukushima disaster to three today, with no realistic prospect of new construction. South Korea's government has pledged to phase out nuclear energy. A number of states that formerly planned to develop nuclear energy sectors have changed their minds or expressed doubt, most notably Vietnam. Turkey's commitment to nuclear energy, encouraged by exceptionally generous Russian financing, may be questioned. Bangladesh, Egypt, and Jordan have plans for Russian-supplied and financed power plants, but the actual feasibility of these plans may be questioned.

The plunging economic appeal of nuclear energy is a demand-side issue from the standpoint of the spread of nuclear industry, but it is a supply-side issue from the standpoint of preventing weapons proliferation. The fewer states that seek to develop nuclear programs and acquire related technology and know-how, the fewer avenues that exist for weapons proliferation. With smaller numbers of buyers, vendors, and projects, the challenges of detecting potential proliferation and monitoring activities becomes simpler. In short, in a world where few states will newly undertake significant nuclear energy programs, controlling the "supply" of nuclear materials and know-how should be more manageable than in earlier eras.

However, as I will discuss further below, if nuclear energy remains decreasingly attractive, states that do not already operate nuclear plants and/or plan to acquire them may have less incentive to cooperate in strengthening nuclear export controls and the broader safeguards system. Acquiring assistance in developing nuclear energy was once a major reason for accepting the burdens of the non-proliferation regime; correspondingly, declining interest in such assistance may reduce interest in contributing to non-proliferation efforts.

Further, if non-nuclear weapon states are simultaneously dissatisfied by the lack of progress toward nuclear disarmament, they will resist efforts to strengthen export controls, safeguards, and other elements of the non-proliferation regime. In such a situation, and arguably in any case, the countries that are most interested in non-proliferation will need to innovate the regime to lower the costs and burdens it imposes on non-nuclear-weapon states. One of the benefits of adding several categories of analysis and potential constraint, as developed by the Carnegie project, is that states whose activities within these categories do not illicit concern could be more confidently regarded as posing no threat of proliferation. The extent and costs of safeguard procedures in these states, and restrictions on peaceful nuclear cooperation with them, could be reduced. This would lower the overall burden of non-proliferation on non-nuclear weapon states, while strengthening the non-proliferation regime's capacity to identify and focus on cases of clear concern.

Demand side

The nine states that now possess nuclear weapons will not give them up in the foreseeable future, including North Korea. All of them have rejected the recently negotiated Nuclear Weapons Prohibition Treaty, indicating that their demand for nuclear weapons remains strong. The stalled status of the US-Russia nuclear reduction process and the overall nuclear disarmament agenda reinforces this perception. Global measures such as the CTBT and a still-to-be-negotiated fissile material production cut off remain on the old "to do" list. Meanwhile, at least eight of the nine nuclear-armed states are modernizing their nuclear arsenals (while Israel's program remains opaque).

This essay is not the place to debate the merits and demerits of nuclear deterrence or the policies of nuclear-armed states and their allies that rely on extended deterrence. The point here is that the more a select group of states exercise and gain from nuclear deterrence, the more other that others will want it too. The most obvious example

today is North Korea. North Koreans will tell you that they watched what happened to Iraq in 1991 and 2003 and to Gaddafi in Libya in 2011. Disliked governments without nuclear weapons are more likely to be overthrown than their nuclear-armed counterparts. Conversely, as India demonstrated, once you acquire nuclear weapons, the world learns to accept you. North Koreans explicitly state that they want what India got after it tested nuclear weapons: a deal instigated by the United States to normalize their nuclear status and end sanctions. By dint of nuclear arsenal, Russia enjoys global power status and limits how far others will go to counter its aggressive behavior, as in Ukraine. If France relinquished its nuclear weapons, how much power or status would it be granted?

From the standpoint of the nuclear non-proliferation regime, if nuclear-armed states act as if the benefits of nuclear weapons are so great that they will not genuinely envision giving them up, the rest of the world will be unwilling to invest in preventing others from acquiring these weapons or the capability to produce them.

Yet, there is also reason to argue that if Iran continues to fulfill its commitment never to acquire nuclear weapons, no additional states will "demand" nuclear weapons. There are several elements to this proposition.

First, the process that led to the completion of the Joint Comprehensive Plan of Action (JCPOA) demonstrated that the non-proliferation regime can work when the five permanent members of the UN Security Council cooperate in enforcing it. Iran's breaches of its non-proliferation obligations were detected before it was able to acquire fissile materials. A diplomatic process, complemented by some covert coercive actions such as *Stuxnet*, created a mix of negative and positive incentives for Iran to agree to limits on its future nuclear activities and unprecedented monitoring and verification procedures. In short, the system worked and Iran, thus far, has been prevented from acquiring nuclear weapons. This experience could deter other states from calculating that they could get away with violating the non-proliferation regime. The P5 and the international community could draw

confidence from this instance that cooperation on non-proliferation can succeed.

Second, if Iran continues to eschew acquisition of nuclear weapons, its neighbors — Egypt, Saudi Arabia, the United Arab Emirates, and Turkey — will have less cause to demand nuclear weapons. Relatedly, so long as Iran is restrained, these countries will have reason to believe that the P5 will act to prevent them from acquiring nuclear weapons.

The situations and interests of each of these countries are unique and cannot be detailed here. In brief, Egypt's military regime depends on security cooperation from Israel, the US, and perhaps Russia. Nuclear weapons would not solve any of the acute challenges facing the regime; however, hostility from Tel Aviv, Washington and Moscow would certainly add to these challenges. Nor does Egypt have economic resources to devote to a costly effort to acquire nuclear weapons.

Saudi Arabia lacks the human and technical resources to produce nuclear weapons in the foreseeable future. Its political-security interests require that it not invite hostility from the US, Russia, China and other major powers. A nuclear weapon effort likely would mobilize big-power resistance, as long as Iran remains a non-nuclear-weapon state. There are rumors that Saudi Arabia might obtain nuclear weapons from Pakistan, but this would be an exceedingly risky proposition for many reasons.

The United Arab Emirates appears less motivated than Saudi Arabia to acquire nuclear weapons. The UAE also lacks indigenous human and technical resources to do so. Moreover, if the country were to be detected seeking capabilities to acquire nuclear weapons, its high-profile peaceful nuclear energy development with South Korea would be jeopardized.

Turkey presents a more complicated picture as the Erdogan government has become authoritarian. The country remains in North Atlantic Treaty Alliance (NATO) and under the extended US nuclear deterrent. A move to acquire nuclear weapons would sacrifice these

advantages.[5] The West would turn ever harder against Turkey. If one assumes that Russia would not welcome a nuclear-armed Turkey, the complicated Russia-Turkey energy-supply relationship, including its nuclear component, could be jeopardized. Internal opposition to the Erdogan government, perhaps with intensified international backing, could be re-animated if Turkey were to be discovered seeking nuclear weapons. Consequently, while Erdogan's Turkey could perceive incentives to develop a nuclear weapons option, incentives also can be strengthened to prevent this.

In short, one of the most important ways that the major powers and Iran can do to strengthen the global nuclear non-proliferation regime is to implement the JCPOA. As some of the limits agreed under the JCPOA expire, Iran must be motivated to abstain from advancing toward nuclear weapons development.

Northeast Asia is the other region with the most visible potential demand for nuclear weapons. Japan is acutely alarmed by North Korea's nuclear and missile programs and by China's increasing military power and assertiveness. If it chose to acquire nuclear weapons, Japan has the technical and material wherewithal to produce them relatively quickly. Yet, a large segment of the Japanese public remains opposed to acquiring nuclear weapons. The reinvigoration of anti-nuclear sentiment after the Fukushima accident underscores this resistance. Prime Minister Abe is currently seeking a Constitutional Amendment to allow for more proactive military exertions. If this effort is stymied, the prospects of a Japan's acquisition of nuclear weapons will dim further.

The Republic of Korea (RoK) also has the basic capability to develop nuclear weapons relatively quickly. North Korea's nuclear weapon and missile-related activities have prompted increasing calls for the country to reconsider its disavowal of nuclear weapons. However, the recent election of an anti-nuclear president, Moon Jae-in indicates an underlying realization that an independent nuclear arsenal will not serve the RoK's interests.

5 See Ulgen S., Perkovich G. (eds). *Turkey's Nuclear Future*. Carnegie Endowment for International Peace, 2015.

In both cases — Japan and South Korea — the US and China will play important roles affecting potential demand for nuclear weapons. Washington can temper demand by demonstrating the resolve and capability to deter and otherwise prevent North Korea from continuing to threaten and coerce both countries. This requires the US to walk a fine line between diplomacy and coercion with the Democratic People's Republic of Korea (DPRK). Washington must demonstrate resolve without recklessness, and deftly manage the political dynamics between Seoul and Tokyo. China's cooperation is necessary here, too, through words and acts of commission and omission. China must display commitment to exert whatever influence it has on the DPRK (which Washington exaggerates) to constrain Pyongyang's bellicosity. At the same, time Beijing must devote special attention to mitigating Japan's concerns about potential Chinese territorial aggrandizement in the East China Sea. The US will affect China's motivations, for good or ill, depending on how Washington manages the multiple issues of contention between the two countries.

One key in creating a more proliferation-resistant environment in Northeast Asia will be whether and how the US clarifies its willingness to negotiate realistic outcomes regarding the DPRK's nuclear and missile programs. Serious observers recognize that the DPRK will not accept denuclearization in the foreseeable future. A durable normalization of US-DPRK relations is also a requirement of the DPRK. Japanese and South Korean officials will insist that denuclearization remains an ultimate objective. They must be given confidence that intermediate arrangements can be agreed upon and implemented. These measures would comprehensively limit North Korea's nuclear and missile programs and their integration into military forces and potential operations can be agreed and implemented. Such arrangements will need to be paired with ongoing security cooperation among the US, Japan, and the RoK. Russia, too, must be given incentives to cooperate in an overall effort to stabilize the situation between the DPRK and the rest of the region.

Of course, much can go wrong in addressing the demand side of global non-proliferation.

But the possibility of curtailing further demand for nuclear weapons is real and should be a leading policy objective. A number of states are already pursuing all of the initiatives listed above that need to be accomplished to reduce incentives for proliferation. Each of these initiatives would be beneficial in its own right. Conceptualizing them together as a grand strategy to stem further demand for nuclear weapons would clarify thinking and policy-making on this subject and build political momentum for the endeavor.

This effort would, of course, benefit further if the nuclear-armed states reaffirmed their willingness to reduce their own reliance on nuclear weapons and the size of their arsenals. Nuclear-weapon states' recommitment to the disarmament agenda is necessary to motivate many non-nuclear-weapon states to strengthen the non-proliferation regime, as the nuclear-armed states desire. The task of constraining further nuclear weapons proliferation is easier to accomplish if a majority of states, not only the nuclear-armed ones, cooperatively embrace it.

Finally, some governments see nuclear weapons as vital not only to deter or defeat external military aggression, but also to insure against domestic and foreign efforts for regime change. The US, in particular, must devote more analysis and debate to the question: does the perception and/or reality that the US seeks to undermine and help remove adversary regimes reduce demand for nuclear weapons or increase it? Some in the US argue that fostering democratization is the only way to really "solve" the proliferation challenges posed by Iran, North Korea, and Pakistan. The reversal of Russia's and China's nuclear build ups, too, depends on regime change, in this view. The counter-argument is that efforts — direct or indirect — by the US (and others) to seek regime change intensifies these governments' interests in obtaining or retaining nuclear weapons. This set of issues, and their implications, needs more analysis and debate in the United States. International counterparts could encourage and inform such efforts.

Institutionalization

Three international "institutions" are most vital to the operation of the nuclear non-proliferation regime: the NPT review process, the International Atomic Energy Agency, and the Nuclear Suppliers Group. Each is experiencing challenges, which I will cover here briefly. My expertise does not enable me to offer more than rudimentary suggestions for meeting these challenges.

Recent NPT Review Conferences, especially those of 2005 and 2015, highlight severe tensions between nuclear-weapon states and non-nuclear weapon states, and within both groups. The tensions pertain to each of the three main objectives of the treaty: non-proliferation, peaceful nuclear cooperation, and disarmament. These differences are well known, and were summarized above. The most portentous challenge now is to reconcile the demands and expectations reflected in the 2017 Treaty on the Prohibition of Nuclear Weapons with the need to strengthen the non-proliferation regime. Proponents of the prohibition treaty say that it does not and should not undermine the NPT. Opponents of the new treaty fear that a large number of non-nuclear-weapon states will resist measures to strengthen the non-proliferation regime between now and the distant day when nuclear disarmament might occur.

There is little evidence to suggest that either group is prepared to satisfy the other. I believe that the best that could be accomplished is for nuclear-armed states to reaffirm "their unequivocal undertaking to accomplish the total elimination of their nuclear arsenals." This commitment was made by NPT parties in order to win the indefinite extension of the treaty in 1995, and repeated at the 2000 NPT Review Conference. NPT conferences have enumerated specific actions related to arms control and disarmament that would fulfill this obligation. Most of these actions have not been taken. Someone needs to revive this project in thought and deed.

Democratic allies of the US, which do not themselves possess nuclear weapons, but which rely on extended nuclear deterrence, could

lead this effort. Germany, the Netherlands, Belgium, Norway, Australia, Japan, and South Korea — for example — have significant anti-nuclear constituencies that could challenge their governments' continued reliance on extended nuclear deterrence. These states cannot determine whether, how, and when the US and Russia could resolve their dispute over compliance with the INF treaty and resume the arms reduction process. Nor can they make the US and China engage in serious strategic stability talks that could prepare ground for future nuclear and non-nuclear arms control. But these middle powers could conceivably broker understandings between the nuclear-armed states and key non-nuclear weapon states on a package of actions to reinvigorate the arms control and disarmament process and to strengthen the non-proliferation regime. Japan's creation of an Eminent Persons Group to chart ideas for "substantial progress on nuclear disarmament" is a modest move in this direction.[6]

The middle powers that have not signed the prohibition treaty could exercise their influence within the NPT review process to call for an international effort to model how verifiable and enforceable nuclear disarmament could be undertaken. Designing a model nuclear disarmament regime does not require promises in advance to accede to and implement it. States commonly design futuristic weapons systems without deciding in advance to actually develop, procure, and deploy them. Why cannot they do the same thing regarding nuclear disarmament? States could do this individually, bilaterally, and/or multilaterally. They could do it at classified levels and in the open, solely with officials or in collaboration with nongovernmental experts. The core questions to be answered are: how should nuclear disarmament be defined? What capabilities, facilities, materials, and activities should it prohibit and allow? How could potentially dual-use capabilities, facilities, materials, and activities be verified and monitored? How would such a regime be enforced? It seems illegitimate for states to argue that they are even intending to

6 Ministry of Foreign Affairs of Japan, Press Conference by Foreign Minister Taro Kono, September 1, 2017.

pursue negotiations toward nuclear disarmament in good faith if they are not seriously addressing such questions.

Whether or not they design prototype disarmament regimes, states that say that nuclear deterrence remains necessary for security reasons should more explicitly articulate whether and how their policies and actions to redress security challenges can open the way for progress toward nuclear disarmament. Many governments are trying to resolve or prevent conflicts on the European periphery, in the Middle East, on the Korean Peninsula, in Northeast Asia, and in South Asia. Yet, with few exceptions, leaders do not articulate how the immediate actions they are taking to create conditions for reducing reliance on nuclear weapons and reducing their numbers toward zero. It is quite possible that the actions and outcomes one side seeks will not make adversaries feel they can reduce reliance on nuclear weapons. But clarifying this aspect of relations can still be useful in educating the rest of the world about the challenges of actually achieving the aspirations reflected in the ban treaty.

The IAEA is indispensable for maintaining the non-proliferation regime. It now reflects deep tensions between the West and Russia, between nuclear-armed states and non-nuclear weapon states, between Iran and its adversaries, and so on. These tensions are expressed most broadly in debates over whether and how the IAEA should enhance its capacity to gain and use intelligence to evaluate whether states are conducting purely peaceful nuclear programs. Many states as well as the IAEA safeguards staff and secretariat believe that analyzing a wide range of inputs and indicators regarding a state's nuclear-related activities is an effective complement to inputs from safeguards data. These states and experts believe further that the Agency should receive, analyze, and verify whatever intelligence it can gather on its own and from states. Others, led by Russia, oppose this state-level approach to analysis and the expansion of intelligence inputs to the Agency.

I know no one who has a clear sense how and when the discord over these issues can be resolved. Clearly, the objective of strengthening

the non-proliferation regime would best be served by supporting the state-level approach and all it entails. But, for states that have other priorities, limiting the IAEA's approach and capacity is more important.

The Treaty to Prohibit Nuclear Weapons creates another, more manageable challenge for the IAEA. The treaty seems to rely on the IAEA to verify that a state which possesses (or has possessed) nuclear weapons and now wishes to join the treaty has, in fact, disarmed. However, the IAEA and its Board of Governors were not asked whether the Agency would be willing and able to take on this role and have not consented to do so. A number of nuclear-armed states object to all of this. However, the issue does not now pose an acute challenge insofar as no nuclear-armed state seems prepared to eliminate its nuclear arsenal and join the Prohibition Treaty. Furthermore, any imaginable scenario in which a state, for example North Korea, agrees to disarm would probably entail a more specific treaty or executive agreement with its own verification provisions. The IAEA could be tasked by such a treaty or agreement to implement verification, but presumably the negotiations of such an arrangement would include obtaining the IAEA's assent.

Given these circumstances, it seems that states and NGOs that value the IAEA as a non-proliferation asset would best focus on preventing developments that would further undermine it, while they wait for more opportune occasions to strengthen it. An obvious priority here is to prevent disputes over the IAEA's role and performance in verifying Iran's compliance with the JCPOA.

Finally, the Nuclear Suppliers Group (NSG) also faces a fundamental challenge. This one concerns membership in the group. India seeks to be admitted and has the support of the US, Russia, France, and other states that, in part, wish to expand commercial nuclear cooperation with India. A number of other states, led by China, oppose admitting India as a special case. Some do not want the NSG to accept any state that is not party to the NPT (meaning India, Israel, and Pakistan). Others, including China, want new membership to be based on criteria, rather

than special treatment of India. Setting aside what the criteria could and should be, the criteria-based approach has several virtues. It would avoid the political liabilities of exceptionalism. It would create a way for the three states outside of the NPT, as a category, to become at least partially integrated into the broader non-proliferation regime. It would give Pakistan and Israel[7] incentives to meet the criteria, whereas treating India as an exception would not provide such incentives. It would prevent India from gaining membership and then blocking consensus on later admitting Pakistan, which, again, would give Pakistan incentive for meeting the criteria.

Fortunately, the membership issue does not appear to have materially harmed the NSG's functioning as an export control body. But it has distracted the group and diverted energy from other work that could strengthen its non-proliferation role. States are likely to remain stalemated on the membership issue for the foreseeable future, unless India reaches a side deal of some sort with China. The current status of relations between Beijing and New Delhi makes such a side deal unlikely in the near-term.

From the standpoint of strengthening the NSG as an important institution of the non-proliferation regime, the best outcome would be agreement on a criteria-based approach, with robust criteria including measures to end further production of fissile materials for weapons purposes. The second-best outcome would be to admit none of the three non-NPT states.

Conclusion

There is plenty of bad news in the global nuclear domain. North Korea's activities, and the lack of any apparently promising diplomacy to constrain them, are most alarming. The nuclear tensions between

7 The issue of Israel is more complicated and problematic. Israel's neighbors and some other states would be outraged if it were admitted to the NSG, even if Israel met all criteria that India and/or Pakistan would meet. While this is unfair, it is the case. This makes some states want to avoid the issue altogether by admitting none of the NPT states. It makes others prefer to admit India and then treaty Pakistan and Israel separately.

Russia and the West, and the related abeyance of US-Russian arms control efforts cause deep concern. India and Pakistan continue their nuclear arms race and overall confrontation. But not all is bleak. The threat of additional states acquiring nuclear weapons is more manageable than it was in 1976, or 1992, or 2003. The JCPOA with Iran, if it holds, demonstrates how the non-proliferation regime can be utilized to motivate even a large and resourceful state to adhere to its non-proliferation obligations. The Nuclear Prohibition Treaty and the discord among parties to the NPT could weaken the global nuclear order, but these challenges also could, dialectally, stimulate renewed initiatives to restore global cooperation in reducing nuclear dangers.

This paper has offered a few ideas that concerned states and civil societies could debate, improve upon, and perhaps pursue to strengthen the overall non-proliferation regime. None of them would be sufficient to satisfy the various interests that are now clashing. But a few, taken together, could create constructive momentum.