PREVENTING THE CRISIS OF NUCLEAR ARMS CONTROL AND CATASTROPHIC TERRORISM

INTERNATIONAL LUXEMBOURG FORUM ON PREVENTING NUCLEAR CATASTROPHE

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1. INTRODUCTION BY VIATCHESLAV KANTOR[1]

This joint conference marks an important stage in the collaboration between the Luxembourg Forum and the Nuclear Threat Initiative.

Until now we have collaborated in other formats, including the two round table discussions — one in Geneva (June 2014) and one in Prague (December 2014) — which enjoyed the participation of both heads and representatives of ten major international organizations dealing with nuclear arms control.

I. The currently prevailing situation in the area of nuclear arms control is unprecedented even when compared to the Cold War period, not to mention the period since then. The Prague New START Treaty, which entered into force in 2011, is the only nuclear arms reduction treaty that remains in effect. The open-ended INF Treaty on the Elimination of Intermediate-Range and Shorter-Range Missiles has been, if not hard hit, then certainly jolted by both the parties. And there is nothing else.

Even back in the Cold War period, and in the more recent past, as soon as the US and USSR or Russia had signed a treaty to reduce

1 Viatcheslav Kantor — President of the International Luxembourg Forum on Preventing Nuclear Catastrophe, Ph.D. (Russia).

strategic nuclear weapons, they would immediately initiate consultations and talks on the next treaty.

However, recently this extremely vital process was brought to a halt, even before relations between the US and Russia soured so badly due both to the events in Ukraine and to other reasons. All of this intrinsically heightens the risk of an inadvertent or precipitate use of nuclear arms in certain regions, with the prospect of unforetold escalation. In addition, this situation severely hampers consolidation of the nuclear non-proliferation regime.

The major nuclear powers of the era, — the US and the USSR, and subsequently Russia — have done a colossal amount of work over the last 50 years in order to ward off the risk of any unauthorized or accidental nuclear missile launch. As far as those two countries themselves are concerned, one can be fairly sure that the element of chance has been ruled out; this applies to the UK, France and China as well. In principle, however, there is no such thing as a 100 percent guarantee.

In the new nuclear states, though, and I am thinking here of Pakistan, India, Israel, and North Korea, no such failsafe system is likely to have been put in place. In fact, a deliberate provocation by North Korea cannot be dismissed entirely. Yet even a single nuclear strike could trigger an unforeseeable spiraling of nuclear reprisals. This could largely be attributed to the expunging of historical memory and partial loss of the knowledge of the catastrophic cost that the use of nuclear weapons would entail for all humanity.

In this context, the statement our conference will address to the leaders of the US and Russia should contain appeals, recommendations, and proposals for immediate steps along the following lines:

first, to begin consultations and talks aimed at further reductions of strategic offensive arms and at non-strategic nuclear arms control and transparency, as prescribed by Article VI of the Treaty on the Non-Proliferation of Nuclear Weapons;

second, to resolve the disagreement over what impact the US Missile Defense program, Russia's Aerospace Defense, and high-

precision strategic non-nuclear weapons have on strategic stability, given that our analysis suggests that they do not affect the two states' security; and

third, to modify the outdated Cold War criteria governing the use of US and Russian strategic offensive arms by extending the two states' missile launch decision times in response to early-warning alerts.

II. After years of grueling negotiations by the P-5+1 (Russia, US, UK, France, China, and Germany), the Joint Comprehensive Plan of Action with Iran was welcomed by the world community; this is true no matter how long the process to implement the agreements might take, and even though experts might question its viability, given the experience from previous dealings with Teheran.

III. I see it as essential to highlight the constantly growing threats of nuclear terrorism, in whatever potentially diverse forms, ranging from the detonation of a "dirty" bomb or the destruction a nuclear facility to a full-fledged nuclear explosion.

It is doubtful that ISIS, with its considerable financial resources, will confine itself to the one recorded instance of its use of chemical weapons and that it will not strive to acquire components of various types of radiological weapons. Nor is it alone in that regard, as other internationally renowned terrorist organizations are pursuing similar objectives.

In the context of the fierce confrontation between the West and Russia over the crisis in Ukraine, the rise in military activities both in the West and in the East, and the refugee conundrum in Europe, combatting nuclear terrorism seems to have slipped down the agenda; this is something I consider to be extremely dangerous.

It is thus crucial that:

a) the leaders of Russia and the US, as well as of key states in Europe and beyond, make countering nuclear terrorism the highest priority in upholding international security;

b) cooperation under all previously adopted UN Security Council initiatives and resolutions on nuclear terrorism be revived without delay and intensified forthwith;

c) the US, Europe, Russia, and countries of the Middle East agree at last to closely coordinate and step up real actions against ISIS; and

d) maximum permissible collaboration be ensured between intelligence agencies and special operations services in order to uncover and foil attempts at seizing nuclear materials and preparing nuclear terrorist attacks.

I am confident that this conference will conclude with an agreed final joint statement to US and Russian leaders which, I hope, will receive serious consideration. After all, the statement will be issued by the world's most eminent and illustrious scientists and policy-makers who have vast experience in analyzing and addressing the major security problems of our world.

2. INTRODUCTION BY SAM NUNN[2]

The Joint Conference of the International Luxembourg Forum on Preventing Nuclear Catastrophe and the Nuclear Threat Initiative on "Preventing the Crisis of Nuclear Arms Control and Catastrophic Terrorism" was an important reminder of the benefits of dialogue, particularly at this low point in U.S.-Russia relations. Bilateral cooperation has largely been frozen and channels of communication are few and far between. As Igor Ivanov recently wrote in The Moscow Times, "Our will to work together has not only weakened, it has sunk to an historic low." Unless we change course together, we risk leaving behind a more dangerous world for our children and our grandchildren than the one we inherited.

At the height of tensions of the Cold War, we worked together to maintain strategic stability by fostering an open, direct military and policy dialogue. If we could do it then, why can't we do it now?

Our challenges are both clear and dangerous:

- There is a corrosive lack of trust undermining cooperation between US and Russian leaders.

2 Sam Nunn — Co-Chairman of the Board of Directors and Chief Executive Officer, the Nuclear Threat Initiative; Member of the Supervisory Board of the International Luxembourg Forum (former Chairman of the Armed Services Committee and the Permanent Subcommittee on Investigations of the U.S. Senate).

- Aggressive rhetoric regarding nuclear weapons is being used.
- There is no agreed process or an agenda for next steps on nuclear arms control and risk reduction. Both the US and Russia have announced major and very expensive nuclear modernization programs -- new missiles, new submarines, new bombers.
- Nuclear security cooperation has largely come to a standstill at a time when threats from terrorist organizations are on the rise.
- The CFE treaty has eroded, but strategic stability and crisis prevention continue to require clear understanding of intentions and force postures.

No doubt strong disagreements over Ukraine and Syria have severely damaged the US-Russia relationship, as well as trust across the Euro-Atlantic region. These disagreements have led to military forces deployed in close proximity and an increased danger of accident or miscalculation. This is a high-risk situation in a region with a significant concentration of both conventional and nuclear forces.

Alexei Arbatov recently wrote that: "The great paradox of our times is that since the late 1980s, the number of nuclear arms has been reduced almost by an order of magnitude, but the threat of their use is presently higher than a quarter century ago."

He also raised a number of important questions that are worth reflecting on by our leaders:

- Can our leaders still agree there can be no winners in a nuclear war?
- Can our leaders still agree that strategic stability is of utmost importance to our bilateral relations?
- Can our leaders agree to cooperate on common interests, like nuclear security and the fight against radical extremism?
- And can our leaders set aside Cold War "zero-sum" thinking to advance our mutual security and reduce major risks?

I would add one more question: Can our leaders and our citizens recognize that we are in a new era where nation-states no longer have a monopoly over weapons of mass destruction and disruption?

The bottom line is that we are in a race between cooperation and catastrophe, and cooperation seems at best to be taking a very slow walk.

So how do we begin to restore a modicum of trust and move toward a better relationship? Let me offer just a few thoughts:

First, prominent leaders must realize that reckless rhetoric creates an atmosphere that could lead to dangerous misunderstandings and miscalculations, including throughout the military chain of command. As Henry Kissinger reminded us recently, "the fate of US and Russia remain tightly intertwined."

Second, the United States and Russia must revive and strengthen channels of communication. We can no longer afford to treat dialogue as a bargaining chip. "You upset us and we will punish you by not talking" is not a sound strategy for two countries that control over 90 percent of the world's nuclear weapons and materials. Continuous dialogue is essential between our military leaders and our intelligence communities. The NATO-Russia Council should be utilized effectively or disbanded. And as a former member of the US Senate, I strongly recommend beginning a dialogue between our parliamentary leaders as we had even during the Cold War.

Common sense would seem to tell us that it is counterproductive for both the U.S. and Russia to have sanctions on individuals and policymakers who need to talk to each other to protect the security of the citizens they represent.

Third, the United States, NATO and Russia should expand mechanisms that reduce the chances of military misunderstandings between us. Last year's events in Turkey related to the unfortunate shoot-down of the Russian jet serve as a powerful wake-up call that we need to reduce the chances of accidental encounters between NATO aircraft and Russian aircraft as well as ships at sea.

Fourth, the United States and Russia should agree on confidence-building measures to reinforce strategic stability and further reduce the chances of miscalculation, including bolstering military-to-military communication. We should also utilize more robustly the Nuclear Risk Reduction Centers that we set up decades ago.

Fifth, the United States and Russia must work together in the fight against ISIS and violent extremism. The threat posed by ISIS directly

affects the core national interests of both our countries. In particular, Russia and the United States must work together to ensure that ISIS never acquires nuclear or radiological weapons, as well as other weapons of mass destruction. Our two countries have the technical expertise and unique knowledge to lead this effort. We have been doing such work in our own countries for two decades. This mission seems to me to fit well under the legal framework of UN Security Council Resolution 1540 as well as the Global Initiative to Combat Nuclear Terrorism. Most importantly, we must lead on a bilateral basis by developing a prioritized list of actions that we can take together to prevent catastrophic terrorism. This is urgent and must be a priority issue.

Finally, when we do work together — as we did recently with the Iran agreement — we must learn to express our appreciation publicly so that political leaders, the media, as well as ordinary citizens of both of our countries recognize not just disagreements and confrontations, but also points of mutual interest and areas of success. As Igor Ivanov recently said, "We must identify areas where our interests converge such as combating international terrorism, preventing political extremism, managing migration flows, and solving the refugee problem, strengthening cyber and food security, tackling environmental issues and coordinating on climate change."

Once trust is lost, it must be rebuilt step by step by solving problems and reducing risks together. In order to do so, I see two priority steps: first, both our countries and our partners in the region need to work together to fully implement the terms of the Minsk Agreement. And second, all sides must make a good faith effort in ensuring the effective implementation of the "Cessation of Hostilities in Syria Agreement".

On a positive note, when the United States and Russia do manage to cooperate on regional or global issues, great things can happen for the mutual benefit of both our countries and indeed the world. To avoid catastrophe, we must choose cooperation, not confrontation. As former US Secretary of Defense Bob Gates said, "One Cold War was enough."

3. ESCALATING THE NUCLEAR RHETORIC

Alexey Arbatov[3]

With the crisis in the Ukraine, talk of the possible use of nuclear weapons — the basis of a nuclear deterrence strategy — has regained political currency. In an interview he gave in August 2014, Vladimir Putin declared, "Our partners...should always remember that it is best not to tangle with Russia. I will remind you that Russia is one of the major nuclear powers. These are not mere words. It is the reality. And, what is more, we are building up our nuclear deterrence capability."[4] Russian officials, independent experts and journalists aired and published their own views on the same subject. They proposed that the Russian Military Doctrine be expanded to include provisions on the operational use of nuclear weapons in local confrontations as a "preventive" measure, to "demonstrate resolve" and to "de-escalate conflicts."[5] Ambassadors and prominent news commentators publicly

3 Alexey Arbatov is Deputy Chairman of the Organizing Committee, International Luxembourg Forum; Member of the Board of Directors, Nuclear Threat Initiative; Head of the Center for International Security of the Primakov Institute of World Economy and International Relations (IMEMO), Russian Academy of Sciences (RAS); Scholar-in-Residence of the Carnegie Moscow Center; Academician, RAS (Russia).

4 Foreign Media: Putin Threatens the West with Nuclear Weapons. Available at: http://therussiantimes.com/news/12416.html (accessed 19 January 2015).

5 Boitsev M. Military Doctrine Terminology. Available at: http://nvo.ng.ru/concepts/2014-10-31/10_doctrina.html (accessed 19 January 2015); Sivkov, K. The Right to Strike. Available at: http://vpk-news.ru/articles/19370 (accessed 19 January 2015).

began threatening Europe with nuclear strikes and America with the prospect of being reduced to "nuclear dust." Regrettably, the authorities never once distanced themselves from such statements, which has been interpreted as an expression of tacit approval.

In the US, high-ranking representatives of the administration started stating the need to gear up for armed conflict with a modernized Russian army, while experts called for an expansion of the nuclear arsenal in Europe.[6] US Defense Secretary Ashton Carter disclosed the possible response to Russia's new nuclear systems. "The range of options we should look at from the Defense Department could include active defenses to counter intermediate-range ground-launched cruise missiles; counterforce capabilities to prevent intermediate-range ground-launched cruise missile attacks; and countervailing strike capabilities to enhance US or allied forces... The range of options we should look at from the Defense US responses must make clear to Russia that if it does not return to compliance our responses will make them less secure than they are today."

According to press reports, Russian tactical *Iskander* missiles have been deployed in Kaliningrad Region and medium Tu-22M bombers have been relocated to Crimea. The US has made a show of transferring two strategic B-2 bombers to the UK and has plans for the newly improved B-61-12 nuclear bombs to be housed in the US tactical nuclear weapons storage facility in Germany.

Reacting to President Putin's announcement of the Russian plan to deploy 40 new ICBMs in 2015, NATO Secretary General Jens Stoltenberg said, "This nuclear sabre-rattling of Russia is unjustified, it's destabilising and it's dangerous."[7]

According to press reports, Russian tactical *Iskander* missiles have been deployed in Kaliningrad Region and medium Tu-22M bombers have been relocated to Crimea. The US has made a show of

6 Marshall T.C. Hagel, Jr. Praises Army's Strength, Resilience. Available at: http://www.defense.gov/news/newsarticle.aspx?id=123425 (accessed 19 January 2015).

7 NATO Condemns Putin's Nuclear 'Sabre-Rattling' (June 16, 2015). Available at: http://www.bbc.com/news/world-europe-33153703 (accessed 22 April 2015).

transferring two strategic B-2 bombers to the UK and has plans for the newly improved B-61-12 nuclear bombs to be housed in the US tactical nuclear weapons storage facility in Germany.

Western public opinion and political circles have been quite alarmed about the major powers' rhetorical crossfire and practical moves. The question constantly arises as to whether the nuclear theme is a propaganda ploy by Moscow, or an indication of its actual plans and intentions. As for Russian society, some people fear a re-emergence of the threat of nuclear war, while most (60% according to surveys) support the leadership's assertive stance signaling Russia's re-emergence as an undisputed nuclear superpower.

Russia and the West currently differ in their view of how their relations were during the 1990s. Nonetheless, however you look at it, there is no doubt that both Russia and the United States and their allies enjoyed an unprecedentedly high degree of security relative to the classic and most dreaded threat, i.e. the threat of a major war between the leading powers. This danger had loomed over Europe and the rest of the world for centuries, but after 1945 it acquired a terrifying nuclear dimension. The 1990s ushered in two decades of international détente and a shift in focus to the economy and new types of threats. As a result, policymakers, most experts, and the general public in Russia and the West forgot about the world's remaining nuclear arms stockpiles.

As the probability of a military confrontation between the major powers and their alliances practically disappeared, nuclear capabilities were overshadowed by current political concerns. Admittedly, in numerical terms, the parties' nuclear forces were substantially (by close to an order of magnitude) cut through treaties and unilateral measures. Nonetheless, the remaining weapons were still sufficient to destroy human civilization. However, this topic became the preserve of a narrow and isolated group of military and civilian experts. Far from the public eye, new weapons systems were being created, and plans drawn up for their use in combat. And, unlike in the past, they were not the subject of extensive political debate.

The overwhelming majority of people alive today, including those at various echelons of government, only started their working lives after the end of the Cold War. They lack the experience of previous generations who lived through a series of extremely dangerous crises, when global warfare seemed a realistic next phase in the course of events: (e.g., the 1957 Suez crisis, Berlin in 1961, the 1962 Cuban missile crisis, the Middle East in 1973). Soviet and American leaders of the day experienced directly what crisis management in the nuclear age was all about. Decisions had to be taken under severe emotional stress, with a shortage of time and contradictory information about events. When armed forces were poised for war, any chance incident could have caused things to spiral out of control. Thankfully, the leaders of the time managed to avert the irremediable and to recognize the ultimate limits to the use of nuclear weapons in policy-making, not to mention in war.

Having lived through trying times, Soviet, American, and European leaders exerted tremendous efforts to ward off a global disaster. That took the form of arms limitation treaties, as well as special documents that reflected the general understanding of security problems in the nuclear age. In May 1972, for example, the USSR and the US signed the "Basic Principles of Relations between the United States of America and the Union of Soviet Socialist Republics," in which it is stated, "The USA and the USSR attach major importance to preventing the development of situations capable of causing a dangerous exacerbation of their relations. Therefore, they will do their utmost to avoid military confrontations and to prevent the outbreak of nuclear war."[8] A year later, in June 1973, the two superpowers concluded a special "Agreement between the United States of America and the Union of Soviet Socialist Republics on the Prevention of Nuclear War," which explicitly affirmed "that nuclear war would have

8 Text of the "Basic Principles of Relations Between the United States of America and the Union of Soviet Socialist Republics" (May 29, 1972). Available at: // http://www.presidency.ucsb.edu/ws/?pid=3438 (accessed 11 November 2015).

devastating consequences for mankind." Conscious of that fact, the parties agreed "that an objective of their policies is to remove the danger of nuclear war and of the use of nuclear weapons... Accordingly, the Parties agree that they will act in such a manner as to prevent the development of situations capable of causing a dangerous exacerbation of their relations ... and as to exclude the outbreak of nuclear war between them."[9]

Soviet-American relations continued to be animated by the same concerns, despite the ongoing Cold War and the periodic crises of that period. The joint communiqué presenting the final conclusions of the 1985 Geneva summit a decade later reaffirmed the mutual understanding that "nuclear war must never be unleashed. There can be no victors in it.... Any conflict between the USSR and the USA could have catastrophic consequences."[10] The same provisions were made legally binding in the Preamble to the 1991 START I treaty.

It is remarkable that these were not mere political declarations. In 1990, in the lead-up to the signing of the aforementioned treaty, the parties signed a Joint Statement translating that political aspiration into military categories as part of a concept of strategic security. This meant that they agreed to understand such a state of strategic relations as would remove "incentives for a first strike." Stability would be consolidated through reductions in strategic arms, more particularly by "decreasing the concentration of warheads on strategic delivery systems" and by "giving priority to enhanced survivability systems," while taking into account the "relationship between strategic offensive and defensive arms."[11]

It would appear that present-day government leaders have scant knowledge of that chapter in history and remain indifferent to it. They

9 Agreement Between the United States of America and the Union of Soviet Socialist Republics on the Prevention of Nuclear War (June 22, 1973). Available at: //http://www.state.gov/www/global/arms/treaties/prevent1.html (accessed 18 November 2015).

10 Holdren J.P., Rotblat J. Strategic Defence and the Future of the Arms Race. London. June. 1987. P. 77.

11 Soviet-United States Joint Statement on Future Negotiations on Nuclear and Space Arms and Further Enhancing Strategic Stability (June 1, 1990). Available at: http://www.presidency.ucsb.edu/ws/?pid=18541 (accessed 29 November 2015).

came into office at a time of unprecedented international détente and major arms control achievements, take them for granted, and treat that legacy occasionally with supreme nonchalance. A twenty-year gap appeared between the generations in terms of how they perceive the specifics of nuclear weapons and their place in policy and war. Today this is fraught with considerable danger as nuclear arms return center stage due to an unprecedented escalation of tension between the great powers.

In this regard, certain questions must be put to the leaders of the great powers. The answers to these questions had previously been self-evident, but now, after the subject has been forgotten for twenty years, they give rise to large and sobering differences of opinion.

First and foremost, do the leaders still believe that a nuclear war cannot be won? The fact that the total nuclear arms arsenals for Russia and the US were reduced, according to various estimates, from 50,000 to 7,000[12] warheads over a few decades does curb their strike capacity against military targets, but in no way diminishes the potential to destroy civilians and the economy concentrated in several dozen major cities. It has been projected that massive strikes would produce a death toll of tens of millions on both sides within the first few hours of war, and disaster over the following days and weeks for the rest of the world. Neither American missile defense systems, nor Russian Air-Space Defense forces, nor high-precision conventional weapons, including the prospective Prompt Global Strike systems, can do much of anything to alter that outcome.

Next, do government officials believe that a first nuclear strike, which by definition will be more powerful than a nuclear response, could gain them any real strategic advantage if retaliation by the opponent's surviving forces can in any event wipe out the main administrative and industrial centers of the side that initiated the war?

Advisors may persuade their political leadership that a preemptive nuclear strike — because of its superior force and the reliable

12 Thakur R., Evans G. Nuclear Weapons: the State of Play. Australian National University. 2015. P. 18.

functioning of its command-control systems — is the lesser evil and the necessary choice should war prove unavoidable. In this regard does the political leadership comprehend that it is the first strike, and nothing else, that makes a nuclear war unavoidable? All other information can be flawed: It is virtually impossible to distinguish between an opponent's operational deployment of strategic forces for a first strike and for a retaliatory strike. Even satellite and radar data warning of an impending missile attack can be a false alarm, as has many times been the case in the past. Yet, when in a crisis nuclear forces are on high alert, such a breakdown could prove fatal.

Another question is: In continually calling for a maintenance of "strategic stability," do Russian and US leaders still take that to mean a state of strategic relations between the two powers that is devoid of any incentive to deliver a first strike (since neither party could evade unacceptable loss from a retaliatory strike), as was stipulated in the 1990 Joint Statement?

And, finally: Do state leaders believe a limited nuclear strike could be a rational option in the context of a local armed conflict? Do they realize that any confrontation with a nuclear power is more likely to provoke a nuclear response than any "de-escalation," and that such a response would almost inevitably bring about a swift and uncontrollable escalation, to the point of massive nuclear exchange?

President Putin addressed the subject at the Valdai Discussion Club in October 2015. "With the appearance of nuclear weapons, it became clear that there could be no winner in a global conflict. There can be only one end: guaranteed mutual destruction... Incidentally, the world leaders of the 1950s, 1960s, 1970s, and even 1980s did treat the use of armed force as an exceptional measure. In that sense, they behaved responsibly, weighing all the circumstances and possible consequences." Calculating "that the victory of one party in a world conflict was again possible — without irreversible, unacceptable... consequences for the winner" was, in Putin's estimation, an "illusion" that could bring about a dangerous loss in value of the deterrent effect of nuclear weapons.

Statements like that are to be roundly welcomed. To be sure, one would like to hear straight and unequivocal directives from the highest level spelling out the Russian leadership's current position on the matter, yet even such indirectly stated considerations are quite timely. Similarly welcome would be a correlation between such statements and nuclear weapons development programs, the conduct of military exercises and arms control initiatives. However, it is obvious that such activities could be pursued only on a mutual, bilateral, and, eventually, multilateral basis.

There have long been no authoritative statements from the American administration on that subject, possibly because it is assumed there that nuclear war is a non-starter. All the same, given the huge importance and high acuteness of the subject, a public response from the US president would be very appropriate.

Nuclear arms are a physical reality, both in this day and for the foreseeable future. However, such arms are not an effective instrument of policy or war, but rather, figuratively speaking, a suicide bomber's belt binding the nuclear powers to one another. They require the utmost caution and sense of responsibility in their handling. This applies not only to official pronouncements but also to practical actions, e.g. military exercises, demonstration flights, missile launches, and surprise drills to test the combat readiness of forces and arsenals, as well as the deployment of nuclear weapons to specific regions.

In the age of global confrontation and irreconcilable Cold War conflicts, statesmen of the time summoned the wisdom and the will to avert a nuclear apocalypse. There is all the more need for this in our time, in a polycentric, globalized world with many common security threats. However acute the current contradictions between Russia and the West may be, the nuclear dimension is not something that should enter into relations, except as a backup "security insurance policy" defined within the clear bounds of a common understanding of strategic stability and arms control agreements.

It is for Moscow and Washington together, at the highest level, to confirm their previous mutual understanding that there can be no winners in a nuclear war, and that any such war must be prevented. Maybe that is precisely the initial premise upon which the process of normalizing Russian-American relations should begin.

4. COMPREHENSIVE CRISIS OF ARMS CONTROL

Alexey Arbatov

While the number of nuclear arms in the world after the end of the Cold War has decreased by 5-6 times (or even by an order of magnitude - depending on counting rules), we are witnessing a comprehensive crisis of the system of nuclear arms control treaties and negotiations, which may lead to a new large-scale arms race, disintegration of nuclear non-proliferation regimes and degradation of the international safety standards of nuclear materials.

Beside crumbling legal limitations on nuclear arms, the stalemate of negotiations has removed an important channel of strategic communication between Russian and American leaders. In the past, this channel served to forge their joint perceptions of the substance and rules of mutual nuclear deterrence, limited utility of nuclear weapons and dangers of crisis escalation. Presently any common understanding of strategic stability has evaporated. Against the background of high political and military tensions between Russia and NATO in the aftermath of Ukrainian crisis this creates — for the first time in three decades - a real danger of the actual use of nuclear weapons as an operational option, by accident or terrorist act in the foreseeable future.

Since the ratification of the 2010 New Strategic Arms Reduction Treaty (New START) in 2011, during the ensuing five years, there have been no

negotiations on a follow-on treaty. This is in a stark contrast to the past (even during the times of the Cold War) when after concluding each consecutive agreement negotiations immediately started on the next treaty with both sides coming with a prepared agenda for next steps.

Russia's principal objection to resuming the process is US/NATO ballistic missile defense (BMD) program. Since the United States has abandoned the Anti-Ballistic Missile Treaty (ABM Treaty) in 2002, all US-Russian talks on cooperative development of missile defense system have failed. Moscow's condition for the next START treaty has been "legally-binding guarantees" that US/NATO system would not undercut Russian strategic nuclear deterrent (which implies technical limitations). Washington has ruled out any agreed limits on its BMD program. For its part, the United States has insisted on inclusion of sub-strategic (tactical) nuclear arms in any future arms control negotiations, which Russia flatly rejects, demanding withdrawal of American tactical nuclear bombs from Europe as a precondition.

Repeating these positions has become routine, but it looks like the real obstacle to the progress of nuclear arms control is that neither side is viewing resumption of talks as a political priority due to international and domestic political impediments.

Starting in 2011-2012 Russia initiated its own massive strategic defense system (integrated in its Air-Space Defense armed forces and program), as well as a large package (seven types) of offensive land- and sea-based missile systems designed to counteract any projected US defenses. In a few years the United Sates plans to start its own cycle of expanded modernization of strategic nuclear forces: development and deployment of a new type strategic bomber, land-based and sea-based missile systems and long-range air-launched (stand-off) cruise missile. The prolonged pause in strategic talks creates a growing uncertainty about the strategic stability after 2021, when the New START expires and both powers may reengage in a nuclear arms race.

One of the fundamental international nuclear agreements - the Comprehensive Nuclear Test Ban Treaty (CTBT) — is still not ratifies by the US Senate, two decades after it was concluded. At the same time,

Washington has accused Russia of violating the 1987 Intermediate-Range Nuclear Forces (INF) Treaty. In this connection Republicans in the U.S. Congress have argued for renouncing this treaty and even by withdrawing from New START.[13]

Russian statesmen, for their part, have blamed Americans for non-compliance with the INF.[14] Numerous nongovernmental analysts have proposed abandoning the New START, the CTBT and even withdrawing from the nuclear Non-Proliferation Treaty (NPT).[15]

Apart from the two nuclear superpowers, other states with nuclear weapons are as reluctant as ever to join the disarmament process. Great Britain, France, and China which are "legal" nuclear weapon holders by the NPT Article IX definition[16], have not agreed to any legally binding nuclear-weapons limitation. Instead, these states continue to demand that Russia and the United States (still possessing about 90 percent of the world's nuclear arsenal) should undertake reductions to levels close to their own as a precondition for starting multilateral disarmament process. The Russian official position is that any further reductions must include other nuclear arms states[17], but apparently no serious thought has been given as to the sequence, concept (quotas, proportionality, parity, stability), subject (classes and types of arms), or verification requirements of multilateral nuclear disarmament.

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13 The Russian Aggression Prevention Act — Section by Section. Available at: http://www.corker.senate.gov/public/_cache/files/9fb69acf-ec5a-4398-9721-66321a9e14cd/Section%20by%20Section%20-%20Russian%20Aggression%20Prevention%20Act%20-%20043014.pdf (accessed 11 February 2016); Starr S. "The Russian Aggression Prevention Act" (RAPA): A Direct Path to Nuclear War with Russia. Available at: http://www.globalresearch.ca/the-russian-aggression-prevention-act-rapa-a-direct-path-to-nuclear-war-with-russia/5397171 (accessed 11 February 2016); Ivanov V. [America does not need a nuclear 'thick wall'. Available at: http://nvo.ng.ru/realty/2014-12-19/10_nuclear.html?auth_service_error=1&id_user=Y (accessed 11 February 2016).

14 Meeting of the Valdai International Discussion Club. Available at: http://en.kremlin.ru/events/president/news/50548 (accessed 11 February 2016); INF Treaty Can't Last Endlessly, Ivanov Said. Available at: http://ria.ru/defense_safety/20130621/945019919.html (accessed 11 February 2016).

15 Brezkun S. Pacta Sunt Servanda, but with Responsible Partners Only. Available at: http://nvo.ng.ru/concepts/2014-08-22/4_dogovor.html (accessed 11 February 2016).

16 The Article IX.3 defines NPT nuclear weapon states as those, which had conducted a nuclear explosion before January 1, 1967.

17 Deputy Foreign Minister Sergey Ryabkov's Response to a Rossiya Segodnya Question on the Future of Russian-US Nuclear Reduction Talks. Available at: http://www.mid.ru/en/web/guest/maps/us/-/asset_publisher/unVXBbj4Z6e8/content/id/2064261 (accessed 11 February 2016).

Against the background of deadlocked nuclear disarmament the nonproliferation regime too is in disarray, despite the successful Iranian deal of 2015. Shortly before its conclusion, the NPT Review Conference once again ended in failure. North Korea is increasing its nuclear potential (after having abandoned the NPT in 2003 in violation of its withdrawal provisions) and has conducted four nuclear explosions and numerous missile tests of ever longer range. This is an shameful demonstration of the impotence of the great powers and the UN Security Council at imposing non-proliferation norms.

Negotiations toward a Fissile Material Cut-Off Treaty have been at a standstill for many years, and their prospects remain bleak. Meanwhile, the Nunn-Lugar Cooperative Threat Reduction Program to eliminate Russian nuclear and chemical weapons and decommission atomic-powered submarines was ended in 2013. In 2014 Russia and the United States decided to discontinue their cooperation on the safety and security of nuclear facilities and materials. For the first time, Moscow refused to participate in the consecutive (fourth) Nuclear Security Summit in Washington in 2016. Further proliferation of nuclear materials and technologies and degradation of their safety will make them an easier subject for acquisition by international terrorists.

Hence, the present revival of many features of the Cold War relations between Russia and the West, as damaging as it is, should not be considered the source of the crisis of nuclear arms control. It started much earlier — in the late 1990's - and became obvious in 2011: in the course of the New START ratification debates in the US Senate and Russian State Duma and after a failure to reach an agreement on ballistic missile defense issues. Hence, it would be wrong to wait till current international tensions subside, as desirable as it would be. The crisis of nuclear arms control should be addressed without further delay and on its own terms. In fact such initiatives may prove conducive to a general de-escalation of political and economic confrontation between Russia and the West.

The weakest link in the nuclear arms control system is presently the INF Treaty. Its abrogation by one or both sides can trigger a chain

reaction of total disintegration of nuclear arms control. The controversies over the INF Treaty have been gaining momentum since 2007 and peaked in July 2014, when President Obama made an official statement addressed to President Putin with accusations of treaty violation. Beside the politics of the crisis, there are several issues of contention, of which two are technically most serious and require specific resolution. In particular, Washington is accusing Moscow of testing ground-based R-500 cruise missile on *Iskander* launcher[18] with a range of over 500 km, which is prohibited by the INF. Russia in return is accusing the United States of the planned deployment of Standard-3 Block IIA BMD interceptors in Rumania and Poland (during 2016 and 2018 respectively). These antimissiles are presently deployed on the US surface ships in the universal Mark-41 tube-launchers which also house *Tomahawk* long-range sea-launched cruise missiles (SLCMs). Beside Moscow's concerns about possibility of a tacit deployment of these offensive missiles in place of BMD interceptors, NATO plan may be considered a technical violation of the INF since the Treaty prohibits deployments of not only missiles, but corresponding land-based missile-launchers (Articles IV and V). Although the BMD launchers in Rumania and Poland will be externally different from ship-based tubes, Russia will not be able to make sure that those differences are functionally related (i.e. making it technically impossible to launch *Tomahawk* SLCMs). Needless to say, each side denies the validity of the accusations of the other party.

In the past such controversies would have been not too hard to resolve in the Special Verification Commission, created by the Treaty for exactly such questions (Article XIII). But the unprecedented escalation of tensions between Russia and the West had made a compromise agreement very difficult. Besides, unlike their American counterparts, some high-ranking Russian officials, as well as many experts and politicians, have been for years expressing negative attitude towards the Treaty, which fortifies US suspicions and accusations.

18 This ground-mobile launcher is also used for launching *Iskander* tactical ballistic missile with shorter range.

One danger that lies ahead is the deployment of the US BMD interceptors in Rumania and Poland, which will fortify the case of Russian proponents of withdrawal from the INF, if only as a political gesture. Removing this possibility implies diplomatic solution to the technical issues mentioned above.

For example, in a supplement to the INF it could be agreed that Russia will have the right for short-notice on-site inspections of the BMD launchers in Rumania and Poland to make sure that they contain *Standard-3* interceptors and not the *Tomahawk* cruise missiles (which look very differently to be sure). Obviously the agreement of the two NATO states would be required too. In response, Russia might take an obligation to accept the same type of inspections at the deployment areas of the *Iskander* launchers equipped with cruise missiles to verify that they do not exceed 500 km range. The verification key may be a measurement of the volume of the fuel tank, which for longer range cruise missile is larger than for a short-range one.

There should be no illusion that the above or similar technical solutions would be sufficient for saving INF and opening the way to resuming the arms control process in other areas. Positive political changes in relations between Russia and the West are needed to ensure success of such diplomatic efforts.

If and when the current US-Russian crisis de-escalates, the parties should start untangling the knot of military and technical questions that have so far blocked any progress in nuclear arms control. In this way in the mid-1980's the Soviet Union and the United States were able to break out of a stalemate at Nuclear and Space Talks. Separating the main subjects of the talks opened the way to the INF and START I.

In place of reaching a new ABM Treaty or (still less realistic) developing a joint BMD system, some confidence-building agreements may serve as a temporary solution. For example, Washington may repeat its proposal of 2011 to Russia to monitor Standard-3 interceptors' tests, which could serve as an assurance that this system is not designed for boost-phase intercept. This is exactly the mode that is of greatest concern

to Moscow regarding the US BMD deployment close to Russian territory (in Rumania, Poland, on ships in the surrounding seas).

As for the long-term US BMD program, which has an open-ended nature and thus worries Russia, some assurances could be worked out: mutually agreeable geography of BMD deployment outside national territories, elaborating delineation between destabilizing defense against each other's strategic forces and stabilizing BMD systems against missiles of "rogue" states. It goes without saying that any such agreement would be based on reciprocity (thus affecting Russian Air-Space Defense) and would have a standard withdrawal provision.

Another Moscow's concerns is the long-range precision guided conventional missiles, foremost those developed under the US Conventional Prompt Global Strike (CPGS) program, which allegedly may acquire a counterforce capability against Russian strategic forces. Development of such systems has been repeatedly mentioned during the last few years as an obstacle to any START follow-on[19]. As one possible solution the future boost-glide hypersonic systems should be included in the next strategic arms reduction agreement with provision of their adequate definition. It is absent from the New START, which however sets a useful precedent by limiting all strategic ballistic missiles regardless of their warhead class. Such an agreement would strictly limit the number of the new class of arms, making them ineffective counterforce instrument.

Reaching the above solutions would facilitate the next step in reducing US and Russian strategic forces on a bilateral basis after 2020 (for example, down to around 1,000 deployed strategic warheads, hopefully with more realistic counting rules for missiles and bombers). For its turn a new strategic agreement might encourage progress at other directions of arms control (i.e. sub-strategic nuclear arms, non-weaponization of outer space, conventional arms control in Europe, third states' involvement in nuclear arms limitation etc.), nuclear non-proliferation, and safety of nuclear sites and materials.

19 Deputy Foreign Minister Sergey Ryabkov' Response to a Rossiya Segodnya Question on the Future of Russian-US Nuclear Reduction Talks. Available at: http://www.mid.ru/en/web/guest/maps/us/-/asset_publisher/unVXBbj4Z6e8/content/id/2064261 (accessed 11 February 2016).

5. ARMS CONTROL, STRATEGIC STABILITY AND THE FUTURE

Linton Brooks[20]

Arms control is not an end in itself. Instead, it is one of many tools to ensure national security. Arms control improves security primarily by increasing strategic stability. This essay will examine the theoretical possibilities and current feasibility of arms control in improving strategic stability between the United States and the Russian Federation given existing political realities.[21] Consistent with the mission of the International Luxembourg Forum on Preventing Nuclear Catastrophe, the focus will be primarily, though not exclusively, on nuclear issues.

The analysis will proceed in four steps. First, we will examine the meaning of strategic stability today, focusing on the importance of avoiding war, especially nuclear war. Next, we will examine the potential contribution of arms control to stability were we living in an ideal world. We will then consider what arms control contribution to stability (if any) is actually feasible, given current political realities in the US — Russian relationship. Finally, because the gap between what is theoretically desirable and what is politically attainable is discouragingly large, the analysis will conclude by suggesting some steps that might be feasible in the near

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21 Although the analysis focuses on Russian-American relations, it may have insights for other bilateral relationships, specifically that between India and Pakistan.

term in order to make modest improvements in stability and maintain dialogue until political conditions improve.

Arms control is often taken to include only formal treaties. It is true that such treaties are generally the most valuable form of arms control for three reasons. First, they tend to be more detailed than other types of commitment. Such detail provides a clarity that makes compliance easier. Second, formal treaties have a stated duration, thus improving predictability.[22] Finally, states tend to be more meticulous in adhering to legally-binding commitments even though there is no international authority that can compel observation of bilateral arms control treaties.

Despite these advantages, formal treaties are not the only important arms control mechanisms. Reciprocal unilateral actions (such as the Presidential Nuclear Initiatives undertaken between the United States and first the Soviet Union and later Russia in 1991—1992), confidence building measures, reciprocal restraint, and regular strategic dialogue and military-to military discussions can all make a contribution to stability and thus should be included in a more expansive definition of arms control. One of the early theoreticians of arms control in the West wrote "Arms control in its broadest sense comprises **all** [*Emphasis added — auth.*] those acts of military policy in which antagonistic states cooperate in the pursuit of common purposes even while they are struggling in the pursuit of conflicting ones."[23] That is the definition used in this essay.

Strategic stability in the twenty-first century

During the Cold War, analysts in both the Soviet Union and the United States had a similar, clear understanding of the basic premises of strategic

22 This is true even though such treaties almost always have withdrawal provisions allowing either side to leave the treaty after giving relatively short notice when they consider that such a step is required by their supreme national interests. In practice, such decisions are rare and come only after lengthy consideration. For example, the United States withdrew from the Anti-Ballistic Missile Treaty of 1972 effective June 13, 2002. This step followed years of internal discussion and debate.

23 Bull H. Introduction to the Second Edition. The Control of the Arms Race (New York: Praeger, 1965); Bull H. Arms Control and World Order. International Security. Vol. 1. No. 1 (Summer 1976).

stability. They understood that the concept was primarily bilateral and was about preventing nuclear war. Since the end of the Cold War, many analysts have broadened the term so much that it often seems to be a synonym for overall foreign and military policy.[24] This broadening is sometimes useful, but in the US — Russian bilateral relationship, the Cold War definition of stability is still valuable. The goal of strategic stability is the prevention of war, especially nuclear war. To foster such stability, the United States and the Russian Federation should jointly seek policies, forces, and postures that meet three criteria:

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

It is important to recognize that these criteria are meaningless unless there is at least some possibility of conflict between two states. Such states need not be enemies or even adversaries, but there must be some plausible path to war. Thus it makes little sense to speak of strategic stability between the United States and the United Kingdom or between Russia and India. Strategic stability means that war is possible but made far less likely by the policies, forces, and postures the two sides adopt.

Cold War strategic stability between the United States and the Soviet Union rested upon the back of mutual assured destruction. Because each side maintained forces that could survive a first strike and inflict damage in retaliation that the attacker would find unacceptable, nuclear war became irrational. Each side worried about how many forces must survive and how much damage they needed to be able to inflict, but the basic notion that stability depended on the mutual ability to inflict unacceptable

24 For a discussion of the multiple options being considered within the U.S. analytic community, see: Colby E.A., Gerson M.S. (eds.) Strategic Stability: Contending Interpretations. US Army War College Press (February 2013).

damage in retaliation became the operating premise of both states.[25] Since a major conventional war in Europe could result in nuclear escalation, that became unthinkable as well.

Strategic stability between Russia and the United States continues to rest on the foundation of mutual assured destruction. Because this appear inconsistent with the partnership that both sides sought to forge (and that many still hope for, despite present political tensions), there have been efforts in both countries to find an alternate model for the nuclear relationship. In the United States, the concept of "mutual assured stability" has been put forward as a possible model. A report by the State Department's International Security Advisory Board described the concept this way:

> A relationship among nations and international organizations (such as the European Union) in which nuclear weapons are no longer a central feature for their security, deterrence based on nuclear destruction is no longer necessary, and the likelihood of nuclear war is treated as remote because their relationship is free of major, core security issues such as ideological, territorial, or natural resource competition issues, and the benefits from peaceful integration in economic, political, and diplomatic spheres provide a counterbalance to the perceived advantages of nuclear conflict.[26]

The Russian effort to find an alternate model that has received the greatest visibility in the West was proposed by Academician Alexei Arbatov and General-Major Vladimir Dvorkin in their book *Beyond Nuclear Deterrence: Transforming the US-Russian Equation,* where they write eloquently about moving beyond mutual assured destruction as

25 The 1983 Strategic Defense Initiative of the Reagan administration (popularly referred to as "Star Wars") sought to change the basis of stability through deploying highly effective national missile defense that would deny the attacker confidence of the effectiveness of an attack. This effort proved technically and financially difficult (some would say infeasible) and was abandoned when the Cold War ended.

26 Report on Mutual Assured Stability: Essential Components and Near Term Actions. US Department of State. International Security Advisory Board (August 14, 2012).

a basis for the US — Russia relationship. Their plan is based on a three step approach:

> The first of the three avenues toward the end of nuclear deterrence is to "de-alert" and further reduce the Russian and American nuclear forces. The second is to develop and deploy a joint ballistic missile early warning system...and a missile proliferation monitoring system. The third is to develop and deploy joint [ballistic missile defense] systems. Initially, the second and third avenues would be limited to nuclear and missile proliferation threats, but eventually—in parallel with transformation of the nuclear forces of both sides—they would embrace a growing part of the strategic assets of the two powers and their allies, and would transform their present mutual nuclear deterrence into a qualitatively new type of strategic relationship.[27]

Neither the Russian nor the American approach has captured the imagination of governments and thus there has been no progress in transforming the relationship beyond one based in part on mutual assured destruction. This result was probably inevitable. Mutual assured destruction is not a policy to be embraced or rejected, but an inescapable fact to be managed. Therefore we must continue to seek strategic stability in a world where both Russia and the United States have the ability to absorb an attack and retaliate in a manner that is unacceptable to the attacker, thereby making the attack pointless.

Using arms control to enhance strategic stability: the ideal

A regime of restraint, ideally codified in one or more formal agreements, can contribute to all dimensions of stability. One clear

27 Arbatov A., Dvorkin V. Beyond Nuclear Deterrence: Transforming the US-Russian Equation. Carnegie Endowment for International Peace. Washington DC. 2006.

requirement for such a regime is transparency. Transparency leads to predictability and predictability is a prerequisite for all three variants of stability, especially arms race stability. Transparency means more than numbers of weapons. It also applies to areas like military policy or escalation management. Thus robust military-to-military discussions, which help us understand each other's thinking and doctrine, are every bit as important as meetings of technical verification bodies. This doesn't mean we can ignore verification, which remains crucial. Knowing—rather than just hoping—that each state understands the size and composition of the other state's nuclear forces is essential.

Moving beyond predictability, how else might arms control and related techniques improve stability? Let us consider each of the three criteria give earlier (crisis stability, first strike stability and arms race stability).

Crisis stability requires that in time of great tension, there be no incentive to be the first to use military force, whether it be nuclear or conventional. It is difficult to see how the United States and the Russian Federation can be on the brink of war except in the context of NATO-related developments in Europe. Assuming that neither side is determined to begin a war, the main risk is that one side will take action that it intends to be seen as demonstrating a combination of resolve and restraint. If the other side misinterprets such actions as a precursor to an attack it may elect to attack first in an attempt to gain a military advantage. Similarly a demonstration attack remote from the scene of the crisis (whether carried out by conventional or nuclear means) may be intended to demonstrate both resolve and the importance of the issue that caused the confrontation. The other side, however, may interpret such an attack as the beginning of hostilities and respond not with restraint but with escalation.[28]

There is a limited role for formal arms control in this type of scenario. In early stages of a crisis, the Open Skies Treaty or the 2011

28 For an example of US concerns, see the discussion on non-nuclear deterrence in Adamsky D. Cross-Domain Deterrence: The Current Russian Art of Strategy. Proliferations Papers. No. 54 (November 2015). It implies a Russian willingness to take a series of actions at the brink of war which, while intended to deter, could result in significant escalation.

Vienna Document could, at least in principle, help distinguish between large scale mobilization suggesting a build-up for an attack on the one hand or retention of most military forces in garrison with only symbolic movements on the other hand. Unfortunately, the realities of modern warfare and the ability to move forces rapidly makes such information perishable and thus of limited value.

The real way to avoid misunderstanding in crisis is for each side to have a deep knowledge and understanding of the military and strategic thinking of the other. This implies a need for a broad range of military to military contacts, including high-level meetings that last long enough for genuine discussion, reciprocal assignment of students to both senior and mid-level military educational institutions like the U.S. National War College or the Russian General Staff Academy, and extensive exchange of observers at both command post and field military exercises. In a world where both sides sought to improve stability, such exchanges would be valued as a complement to formal agreements.

First-strike stability implies the absence of any incentive to be the first to use nuclear weapons, whether in an extreme crisis or during a conventional conflict. At the strategic level, such stability requires each side have a significant component of its strategic forces that are effectively invulnerable. Arms control can contribute to this goal by encouraging force structures containing a significant number of either mobile ICBMs or submarine-launched ballistic missiles (SLBMs).Historically, the United States has favored SLBMs because of its easy access to both the Atlantic and Pacific Oceans. Mobile ICBMs have been and remain more attractive to the Russian Federation than to the United States because of the much larger area available for their operation. During negotiation of the first Strategic Arms Reduction Treaty (START I), the United States insisted on limiting the numbers of mobile ICBMs, despite the fact that they were stabilizing. It took this position because of the difficulties in verifying the number of such missiles, given their relatively small size and mobility. In a treaty devoted to stability, the two sides would seek agreement on a verification regime that provided high confidence in the overall numbers but

did not compromise survivability (and thus stability) by revealing information that could be used to preemptively attack those forces. (The same principle of course applies to ballistic missile submarines, but the technical challenges are far less.)

A long-standing stability concern is the dangers posed by a force structure with a large number of silo-based MIRVed ICBMs. The concern is that such weapons make tempting targets since, if fired they can destroy multiple targets but they can be eliminated before firing by one or two warheads. Therefore stability can be improved by limiting the numbers and degree of fractionation of such ICBMS. In contrast, fixed single warhead ICBMs are not destabilizing since most analysts assume that it takes more warheads to destroy them than they carry. Arms control can improve stability by banning fixed MIRVed ICBMs (this was one of the major accomplishments of the 1992 START II Treaty, which unfortunately never entered into force). If no such ban exists, states can unilaterally elect to deploy ICBMs that only carry a single warhead, as the United States has done with its Minuteman III missile.

First-strike stability requires that each side be able to impose unacceptable damage even after an initial attack. A highly effective national ballistic missile defense system that could prevent such retaliation would reduce first strike stability (although retaliation with bombers and cruise missiles would still be feasible). Most destabilizing of all would be a system that could not prevent a first strike but could defeat a far smaller retaliatory strike. Currently, technology does not permit deployment of such a system, although ballistic missile defense systems with less capability are widespread, including an American national defense system that is designed against small attacks by unsophisticated ballistic missiles from Iran or North Korea. In an ideal world, the two sides would agree to share enough data on such systems so that each side could confirm that the defenses of the other side posed no threat to its strategic systems.

Some Russian analysts are concerned with the implications for first strike stability of with what are sometimes referred to as "conventional

strategic weapons," especially sea-launched cruise missiles. They assume that such missiles could be used as a precursor to a nuclear first strike and could destroy a number of strategic assets including silos.[29] This concern is often coupled with a fear that European ballistic missile defense, although designed and justified as a counter to the Iranian ballistic missile threat to European members of NATO, could intercept Russian strategic ballistic missiles. In an ideal world, these issues would be subject to careful joint technical analysis to determine their impact (if any) on stability.

Finally, while first-strike stability primarily refers to strategic systems, there is a limited sense in which it can be applied to non-strategic nuclear weapons. Stability is enhanced when such weapons are not forward deployed in areas of potential conventional conflict and thus are not subject to early "use or lose" risks. It is also enhanced when plans do not demand early use of such weapons. This is not an area where formal arms control has obvious relevance. Instead it depends on reciprocal restraint backed up by the deep understanding of each other's military policies flowing from detailed, sustained military to military dialogue.

Arms race stability depends on the twin beliefs that a state cannot gain an advantage by building more weapons and that it will not be put at a disadvantage by failing to expand its forces. Arms race stability does not preclude modernization, especially to improve safety, security and reliability. The main contribution arms control can make to arms race stability is transparency through regular exchanges of information. For example, America and Russia could agree to an annual exchange of procurement plans for strategic forces and national-level ballistic missile defense during the next ten years, along with an explanation of the general reason(s) for specific procurements. They could further agree not to change those plans without giving timely notice to the other side. This would allow each side to adjust its plans as necessary while discouraging

29 See, for example, Myasnikov E. The Air-Space Threat to Russia (Arbatov A., Dvorkin V. (eds.) Ballistic Missile Defense: Confrontation and Cooperation). Carnegie Moscow Center. Moscow. 2013.

major expenditures based on an erroneous belief that the other side is seeking to alter the strategic balance.[30]

Arms race stability also requires dealing with new technology that may have strategic implications. A current example is provided by boost-glide technology. The New Start Treaty gives each party "the right to raise the question of such a strategic offensive arm for consideration in the Bilateral Consultative Commission." In an idea world, the sides would go beyond this to have detailed discussion of the implications (if any) of such weapons for strategic stability.

In the ideal world just described, both sides would place a high value on strategic stability. They would use a combination of treaties, other agreements, unilateral restraint and deep and continuing dialogue to reinforce such stability. When issues arose, they would move quickly to resolve them. Finally, in such an ideal world the rhetoric of national leaders would emphasize the importance of stability, would reinforce a policy of restraint and would avoid attempts at nuclear coercion. How does this ideal world compare with the situation Russia and America face today?

Current realities in arms control and stability

Turning from the theoretical to the actual situation is discouraging. Current political realities and the tension between Russia and the United States make it difficult to see how we can move forward. Without one side making a major change in position, the dispute over US ballistic missile defense in Europe is unsolvable. Russia shows no interest in further reductions or in an approach to controlling non-strategic nuclear weapons. The United States is largely ignoring Russian concerns with conventional strategic weapons. Some American experts are privately suggesting that the more bellicose stance of the Russian Federation on nuclear issues may require increases in US strategic

30 I am indebted to Ambassador Steven Pifer, a long-time arms control expert now at the Brookings Institution for this idea.

forces above New START levels. Finally, it is a political impossibility in the United States to seek further arms control negotiations without resolution of the issue of Russian compliance with the Treaty on Intermediate Range Nuclear Forces (INF Treaty).[31]

Americans and Russians are currently unable to use arms control (or any other tool) to improve strategic stability because they disagree on the threat to stability. This disagreement begins with broad political issues that have significantly degraded relations. From the US perspective, Russian actions associated with Ukraine pose major problems. Some Russians appear to believe that the United States seeks to destabilize the government of the Russian Federation and that the various "color revolutions" of recent years were US — sponsored rehearsals.[32]

Russia and the United States also differ on specific threats to strategic stability. For the United States stability is endangered by Russian INF violations and by nuclear saber-rattling in an attempt to coerce America's European allies.[33]Russians are concerned with US ballistic missile defense, especially in Europe, and with conventional strategic weapons. Some Russians believe that these two issues reflect a US desire to attain a first-strike capability against Russia. Russians have their own concerns with INF Treaty compliance. The launchers of the Aegis missiles associated with European missile defense are variants of at-sea launchers that can also fire the *Tomahawk* cruise missile. If the launchers deployed ashore in Romania and Poland were also capable of firing that missile, their deployment would be a clear INF violation.[34]

31 The United States has formally determined that the Russian Federation is "in violation of its obligations under the INF Treaty not to possess, produce, or flight-test a ground-launched cruise missile (GLCM) with a range capability of 500 km to 5,500 km, or to possess or produce launchers of such missiles, see 2015 Report on Adherence to and Compliance with Arms Control, Nonproliferation, and Disarmament Agreements and Commitments. U.S. Department of State (June 5, 2015). No additional information has been released by the U.S. government, although US officials assert, both publically and privately, that in discussions with the Russian Federation since 2013 they have provided adequate information to allow identification of the violation. Russia has rejected the allegation.

32 For amplification see Report on U.S. — Russia Relations. US Department of State. International Security Advisory Board (December 9, 2014).

33 See, for example, Russia Threatens Denmark with Nuclear Weapons If It Tries to Join NATO Defence Shield. Independent (UK, March 22, 2015).

34 In fact, the shore-based launchers being deployed will be incapable of launching cruise missiles and thus will not raise INF Treaty compliance issues. The United States has not, however, demonstrated to Russia why this is so.

As a result of these differing perspectives, the actual prospects for using arms control to improve strategic stability are quite limited. Consider once again each of the three criteria (crisis stability, first strike stability and arms race stability).

With respect to **crisis stability**, there are currently no military to military discussions that that can help avoid misinterpretation of actions taken during a time of crisis. Therefore the risk will remain that actions taken by one side to demonstrate resolve and restraint will instead be misperceived as the beginning of hostilities.

First-strike stability implies the absence of any incentive to be the first to use nuclear weapons. The "use or lose" risk posed by silo-based MIRVed ICBMs will remain. There will be no data sharing on ballistic missile defenses to allow more accurate assessment of their capability. There will be no assessment of the validity of concerns over conventional strategic forces. Finally, the lack of any discussion on non-strategic nuclear weapons means there will be no opportunity to discuss "use or lose" risks in time of conventional conflict.

The most significant first-strike stability issue may be differing perspectives on European ballistic missile defense. Since the nuclear agreement with Iran was concluded, Russian leaders have argued with increasing intensity that the United States said ballistic missile defense in Europe would not be necessary if the Iranian threat went away. They note that agreement has now been reached to eliminate this threat, yet deployments continue. For example, in October 2015, at the Valdai Discussion Club, President Putin said:

> What does this mean? It means we were right when we argued with our American partners. They were simply trying yet again to mislead us and the whole world. To put it plainly, they were lying. It was not about the hypothetical Iranian threat, which never existed. It was about an attempt to destroy the strategic balance

...to have the opportunity to dictate their will to all: to their geopolitical competition...[35]

The threats to **arms race stability** that are not being addressed involve boost-glide technology and somewhat amorphous Russian concerns with future space-strike weapons.

A path forward?

Given the contradiction between what would be desirable and what is politically feasible, what should the United States and Russia do? Many have argued for finding a new approach to preventing nuclear war. An obvious alternative would be the abolition of nuclear weapons. By definition, if there were no nuclear weapons, there could be no nuclear war.[36] This was the basis for US President Obama's 2009 declaration in Prague that "I state clearly and with conviction America's commitment to seek the peace and security of a world without nuclear weapons."[37] Despite widespread enthusiasm among many former world leaders, no government of a state possessing nuclear weapons

35 Inexplicitly, the US response to these concerns has been limited to press talking points that deployments will continue. There is of course a reason for the U.S. position: (1) the Iranian agreement does not constrain ballistic missiles and Iran continues to develop them in violation of other United Nations Security Council resolutions, (2) freeing up Iranian resources and ending ballistic-missile related sanctions after eight years makes that development easier, (3) Iran has not yet demonstrated sustained compliance with its new obligations (such compliance cannot be assumed given its past behavior) and (4) the one-year breakout period that is the goal of the agreement with Iran is significantly shorter than the time needed to complete European ballistic deployment if the current program were to be interrupted.

36 It is not clear if abolishing nuclear weapons would increase the likelihood of conventional war. Skeptics of abolition point to the absence of war between major states since 1945 as evidence that nuclear weapons prevent conventional war because they make the risks of escalation too horrendous. For an example, see: Miller F. Disarmament and Deterrence: A Practioner's View (Perkovich G., Acton J.M. Abolishing Nuclear Weapons: a Debate). Carnegie Endowment for International Peace. Washington, D.C. 2009.

37 Endorsing abolition of nuclear weapons in the abstract has been the policy of virtually all US presidents in recent decades. For example, Ronald Reagan, in his Second Inaugural Address, delivered January 21, 1985 said "We seek the total elimination one day of nuclear weapons from the face of the Earth." But in the past, abolition was regarded as a long-term aspiration. In contrast, President Obama was perceived, both domestically and internationally as intending to take specific actions to move toward that goal.

(except for the United Kingdom) gave more than rhetorical support to the concept. The US government has apparently recognized that near-term progress is impossible; there have been virtually no high-level references to eliminating nuclear weapons in recent years.[38]

Similarly, as discussed earlier, alternatives to mutual assured destruction as the underpinning of stability have, thus far, failed to alter the policies of either Russia or the United States. This may or may not be permanently true, but both abolition and any fundamental transformation in the relationship are years—probably decades—in the future. What should we do now? Americans have many ideas for what Russia should do and Russians have many ideas about what Americans should do. The important question is what the two sides can agree to do together. Here are some possibilities:

- First, it is important to find a way to resume formal robust military to military discussions. The United States erred in curtailing such talks in response to the crisis in Ukraine. If it proves politically infeasible to conduct discussions between current military leaders, Russia and the United States should encourage discussions between a small number of senior retired officers. These discussions should focus on crisis and escalation management.
- Second, the two sides need to find a way to implement the transparency offers the United States has made with respect to ballistic missile defense. The Russian Federation erred in rejecting them. The goal of this effort, which should be conducted without preconditions, should be to confirm that the technical capabilities of both the U.S. national ballistic missile defense system and the ballistic missile defense being deployed in Europe are not such as to pose a threat to Russian strategic systems.
- Third, we should encourage Track 2 discussions on dealing with conventional strategic weapons so both sides are ready when arms control finally resumes. Given the importance of cruise missiles in military missions unrelated to Russia, it is unlikely there is a traditional

38 The last major speech in which the President personally referred to abolition was his June 2013 speech at the Brandenburg Gate in Berlin. His description of his goals was significantly less ambitious than in his famous Prague speech.

arms control solution to Russian concerns. The two sides should understand what those concerns are and then look for non-traditional solutions.

- Fourth, we need to find a way to deal with the INF concerns on both sides.
- Fifth, Russian and American leaders, both inside and outside of government, should work together to find ways to defuse the apparent Russian belief that the United States seeks to overthrow the Russian government. As long as that belief persists, true stability is impossible.
- Finally, the current situation is unlikely to improve in the next few years. Russia and the United States should buy time by extending New START for five years. This action is permitted by the treaty. It would not be an amendment and thus would not require ratification. Since the ability to withdraw under the supreme interest clause would remain, such an extension would not disadvantage either side. It might seem more logical to wait until closer to the expiration date. But if political conditions continue to deteriorate it might not prove feasible to extend the treaty at that time.

These steps will not bring us to the ideal world discussed earlier. But they will have some near-term benefit to strategic stability and, more importantly, will help maintain dialogue until political conditions improve.

Conclusion

This has been a gloomy assessment. The actual situation is probably worse. Some Russians may prefer to wait for the 2016 US elections before taking any action, hoping that relations with the United States will improve and it will therefore become easier to act. This is unwise. The United States constantly balances impulses toward depending for its security on "peace through strength" and toward focusing on enhancing international legal regimes. Different Presidents strike that balance in different places. While nuclear issues will play

almost no role in the Presidential campaign, the next US President—of either party—is unlikely to be more favorably disposed to arms control than the current one. Thus we should not wait to move forward on the agenda set forth above.

6. FURTHER NUCLEAR ARMS REDUCTIONS

Vladimir Dvorkin[39]

It is widely acknowledged that nuclear arms control has been in crisis and standstill. The duration of this crisis has no precedent both before and since the end of the Cold War. Primarily to blame are political differences over perceptions of the status and role of the parties at conflict on the existing world arena. And the longer the standstill persists, the more often senior officials use nuclear terminology in their public statements.

With the end of the Cold War, many of us were convinced we would move rapidly beyond the mutual nuclear deterrence of the US and the USSR as the underlying principle of strategic stability. However, this principle only became more significant as relations between the two nuclear superpowers entered a phase of confrontation, while both the number and role of factors affecting strategic stability increased simultaneously.

The Russian leadership and a part of the expert community maintain that US missile defense and its superiority in conventional strategic long-range precision weapons are the chief destabilizing factors.

39 Vladimir Dvorkin – Chairman of the Organizing Committee of the International Luxembourg Forum; Principal Researcher of the Primakov Institute of World Economy and International Relations (IMEMO), RAS; Professor, Major-General, ret. (Russia).

Thus far, this has been an insurmountable obstacle on the path to any further talks on reductions of strategic offensive arms. Therefore, unless the problem of these two destabilizing factors—missile defense and conventional strategic weapons—is resolved, the parties are scarcely likely to engage in any consultations about new levels of strategic offensive arms reductions.

Sufficient analyses exist to virtually dismiss any impact that missile defense and disarming first strikes with conventional high-precision weapons could have on Russia's nuclear deterrent capability. Thus the problems can only lie in the political realm.

There have been some initial signs that the missile defense impasse in our relations could be overcome. In September this year, for example, President Putin announced that Russian nuclear forces would be acquiring in 2015 40 new ICBMs that are capable of overcoming the most technologically advanced missile defense systems. However, these missiles are identical to *Yars*, *Bulava*, and others currently in service. These missiles are indeed capable of effectively overpowering a missile defense system incomparably more advanced than the one the United States is planning to deploy, both in qualitative and quantitative terms. Admittedly, Vladimir Putin did once more say that the US missile defense system was upsetting the strategic balance.

Can these differences be settled? What steps can we expect from the US?

Judging by the established American position, no agreement to limit US missile defense seems realistic. But it would be possible to present an official plan to be completed by 2025—2030 on the technical content of missile defense systems deployed on the American continent (e.g., how many Ground-Based Interceptors (GBI)—50, 60, 70, 80, or 100). Finally, the Data Processing Center project could also be revived.

If the differences over conventional strategic systems can be resolved, then, at the same time, consultations and negotiations could commence to cut strategic nuclear weapons to between 1000 and 1100 warheads.

Another issue to be discussed concerns extending the decision time after early warning systems report a missile attack and/or nuclear missile attack and renouncing counterstrike plans. There are more than enough projects ready to be implemented involving various measures for phased arms reduction.

There are quite a few well-grounded proposals for phased non-strategic nuclear arms control and restriction, beginning, as a first step, with Russia and the US officially releasing the numbers and types of weapons eliminated under the presidential initiatives of the 1990s.

Thus, it is expedient first to resolve Russian and American differences over missile defense and conventional strategic high-precision weapons in order to end the standstill in nuclear arms control. This, in turn, can open up opportunities to commence Russian-American consultations on further reductions of nuclear arms.

7. NEW-OLD THREATS OF CATASTROPHIC TERRORISM

Sergey Oznobishchev[40]

As it invades the peaceful flow of life of a growing number of countries, terrorism is increasingly becoming an alien and hostile part of our civilization. Terrorist attacks causing massive loss of life have regrettably become a reality of our time. Fortunately, however, there have thus far been no recorded cases of so-called catastrophic terrorism involving the use of weapons of mass destruction (WMDs), and specifically nuclear weapons. However, the actual occurrence of such a scenario is not that far-fetched, especially upon critical study of the systemic mistakes of previous years in attempts to counter terrorist attacks.

The new habitat of catastrophic terrorism

The profound and negative changes which have been building up recently in the world, primarily in the area of international security, have increased the possibility for catastrophic terrorist attacks to take place.

40 Sergey Oznobishchev is Deputy Chairman of the Organizing Committee, International Luxembourg Forum; Head of the Section of the Primakov Institute of World Economy and International Relations (IMEMO), RAS; Director of the Institute for Strategic Assessments; Professor of the MGIMO (Russia). See: Financing of the Terrorist Organization Islamic State in Iraq and the Levant (ISIL). FATF report. ANO International Training and Methodology Centre for Financial Monitoring (ITMCFM, February 2015).

Among these new negative factors, the following are noteworthy:

First of all, this includes the emergence of an absolutely new phenomenon, an integral terrorist enclave or quasi-state which has come to be known as ISIS.

Only yesterday, not a single politician or expert, even the most farsighted, could have imagined the emergence of such a phenomenon.

This quasi-state entity is aggressively trying to beat whole swathes of neighboring countries into submission and is irrupting onto the world stage through acts of mass terrorism.

This is not so much a war of civilizations as a declaration of war by a new barbarity (a symbiosis of ancient barbaric ideas and modern capabilities) against world civilization. This phenomenon constitutes a threat for every country, without exception. A conceptual threat to the value systems of developed countries has emerged through the injection of primitivist ideas and false interpretations of such an authoritative religion as Islam, as well by laying a powerful ideological basis for the declaration of a holy war on the entire rest of the world. Some sources suggest that the principal objective of this war is the establishment of none other than a world caliphate.

The conceptual foundation on which the ideology of terrorist attacks is based has created yet another new, extremely dangerous phenomenon: the total absence in the minds of the perpetrators of any fear for their lives, and even a desire to sacrifice their life to the higher goals of illusory promises.

As a result, emergent militant anti-globalism has acquired its own military wing. Its further internationalization has taken place through its acquisition of a powerful army of followers in the form of ISIS itself as well as friendly and affiliated militarized movements and organizations.

The ISIS pseudo-state has a structured system of governance as well as methods and sources for supporting itself. It devotes particular attention to developing ways and means of funding, mainly through the illegal acquisition of funds. The RAND Corporation estimates that

ISIS has 12 main sources of income. Applying the data of the international organization FATF (Financial Action Task Force), this author has counted no fewer than 15 such sources.[41]

According to the UN data despite the certain achievements in the struggle against ISIS, with the active military involvement of the principal states, going on now it is still the "richest terrorist organization in the world". In 2015 only it's estimated revenues from the sails of oil only were considered to be from 400 to 500 mln. USD [42].

The appearance on the international arena of the ISIS factor along with all its potentialities also creates new conditions for attracting nuclear specialists from developed countries. According to official evidence, "Various estimates put the number of people from Russia and other CIS countries fighting on the side of the Islamic State at 5,000—7,000."[43] These volunteers are coming, as well, from the states having high level of "nuclear knowledge" and developed nuclear programs. Why could not there be, either now or in the nearest future, among these thousands of recruits and volunteers, nuclear technology specialists capable of designing and assembling a nuclear device?

Thus, in the new, changed conditions, the possibility of occurrence of catastrophic terrorism scenarios involving the use of weapons of mass destruction, including nuclear weapons, is considerably enhanced.

Second, we have witnessed the appearance of an absolutely new and unexpected factor: not so much a wave as a veritable tsunami of refugees from the countries of Asia, Africa, the Middle East, and Near East which has virtually engulfed Europe. Such an unexpected spate of poorly controlled applicants for permanent residence on the European continent bears at least two dangers:

1) Terrorists dispatched intentionally by ISIS or other terrorist

41 See: Financing of the Terrorist Organization Islamic State in Iraq and the Levant (ISIL). FATF report. ANO International Training and Methodology Centre for Financial Monitoring (ITMCFM, February 2015).

42 Sails of oil — one of the principal sources of financing of the ISIS activity (in Russian). February 9, 2016. (http://www.un.org/russian/news/story.asp?NewsID=25388#.V3y8m_sgnR0)

43 Meeting of the CIS Council of Heads of State (October 16, 2015). Available at: en.kremlin.ru/events/president/news/50515 (accessed 11 February 2016).

entities. Information from authoritative sources, including government security agencies, indicates that as many as four thousand such terrorists have already arrived in Europe.

2) The vast majority of the recently arrived migrants experience considerable hardship and are consequently susceptible to recruitment, including for terrorist purposes. Two of the participants in the November 2015 Paris attacks were Syrians, and one of them had arrived in Europe as a refugee only one month beforehand.

The danger multiplies tenfold because this mass of people are landing in the vulnerable, sensitive, soft underbelly of the modern, civilized world—on the European continent, amid nuclear infrastructure facilities and hazardous industrial facilities.

A new trend in this context which complicates the work of government security agencies is that the time it takes for potential terrorists to become radicalized is getting shorter and shorter. For the two brothers from Belgium who participated in the preparation and execution of the terrorist attacks in Paris, this amounted to only a few months.

Third, the tactics of carrying out terrorist attacks have considerably improved, as has their level of organization and coordination. The scale of the attacks has also grown. The surprise factor is applied everywhere.

The fact that significant numbers of casualties were caused by a small group of perpetrators has become a characteristic of these attacks. The operation in Mumbai in 2008 was carried out by ten terrorists and the terrorist act in Paris in 2015 — by nine. In Istanbul airport in June 2016 only three terrorists organized the explosions. In all cases there were killed from dozens to hundreds of people. In Nice one terrorist driving an ordinary truck killed more than eighty persons. The biggest terrorist attack of modern times was the catastrophic attack in the US on September 11, 2001, which was perpetrated by 19 terrorists, resulting in approximately 3,000 casualties and enormous material damage.

Such an effect was achieved by using perfectly conventional means of modern civilization—passenger airliners with tanks full of

fuel—for the purpose of mass destruction. However, this feature of organization of the attack makes it similar to terrorist attack methods broadly discussed in expert circles which involve the targeting of hazardous infrastructure facilities. Damage to or the destruction of such facilities would be equivalent to the use weapons of mass destruction (WMD).**Fourth**, over the last few years, a fundamentally new major political crisis, compared to the period of the Cold War, has arisen. The Ukrainian crisis has severely complicated relations and all forms of interaction between Russia and the West. This has included the placing of restrictions on cooperation in combating terrorism.

Fifth, the active involvement of Russia into the events in Syria, including the counter-ISIS activity, hypothetically could open perspectives for closer cooperation and even for alliance-type relations with the West. But the worsening of relations due to the Ukrainian crisis will not allow to switch to the effective close antiterrorist cooperation between Russia and the West.

Sixth, an important factor is the evolution over the period spanning the end of the twentieth and the beginning of the twenty-first centuries of a new organizational and technical environment, one characterized predominantly by modern civilization's heightened dependency on the computer. Among other things, this applies to structures (or production facilities) with a high risk for life and/or that serve atomic facilities, including nuclear military infrastructure.

The high degree of computerization of these facilities not only enhances the effectiveness of their work. It also forms a channel for penetrating control systems with the subversive aims.

According to available data, over the last five years, there have been 5000 hacker attacks on the energy systems of the US. Twenty of those attacks were on nuclear energy facilities. In Russia, since the summer of 2014 to the middle of 2015 only the websites of more than 600 Russian companies and government agencies have been directly hacked by

representatives of the terrorist organization ISIS [44].There is also another aspect of this problem: the use of the Internet (including encrypted communications offered by many providers) for organizing and coordinating the activity of terrorists and collection of funds. Attention has been drawn to these issues by Jamie Shea, NATO's Deputy Assistant Secretary-General for Emerging Security Challenges. According to NATO sources, despite the countermeasures already taken, ISIS "has about 46,000 Twitter accounts." Mr. Shea believes that in order to effectively counter these new threats, it is necessary to create technical tools "of a higher order" than those available to the terrorists.[45]

Thus, it appears that, on the whole, in current conditions, terrorists are enjoying conspicuously more favorable conditions for their activity, including for the carrying out of catastrophic terrorist attacks.

The traditional potential toolbox of catastrophic terrorism – or the old factors treated in a new way

The fundamentally expanded possibilities now available to terrorists, including those related to the aforementioned factors, considerably heighten the danger of catastrophic terrorism scenarios taking place.

First. The most accessible scenario for terrorists is the threat of blowing up (or possibly capturing) an existing civilian nuclear infrastructure facility, e.g. a nuclear power plant. It would be enough, for example, for terrorists to present the government with realistic proof of plans to blow up such a facility so as to bring about the conditions for blackmailing the leadership of one or several states with the aim of fulfilling the demands of the terrorists.

44 Kochegarov P., Raskin A. ISIS hackers began frequent visits to the Russian Internet. 20 October 2015. Available at: http://izvestia.ru/news/593291. (accessed 11 November 2015).

45 Kumar I. NATO: Paris Attacks Must Be a 'Spur' for Greater Intelligence Sharing. Interview with Jamie Shea, NATO's Deputy Assistant Secretary-General for Emerging Security Challenges (November 19, 2015). Available at: http://www.euronews.com/2015/11/19/nato-paris-attacks-must-be-a-spur-for-greater-intelligence-sharing/ (accessed 11 February 2016).

A reactor core meltdown, an explosion destroying its structure and the release into the atmosphere of a large quantity of radioactive materials, such as happened at Chernobyl, could also be achieved by means of sabotage, for example, due to the failure of the reactor's cooling system (This could happen as a result of a change to the reactor's operating mode or clandestine reprogramming of computer software). The extent of the ensuing catastrophe would entail catastrophic consequences far beyond the boundaries of the region.

The infrastructure of modern developed states is literally oversaturated with facilities like these. There are hundreds of industrial and research reactors, and a significant number of them are located on the European continent, where according to the prognosis, by 2020 their number may be over 200. Each of these reactors has several energy blocks. It should be reminded about the drastic consequences that were caused by the explosion of only one block of this kind in Chernobyl in 1986.Unfortunately scenarios mentioned are not so far from reality. According to the available information the terrorist attack against the nuclear power station was already planned in March 2016 in the heart of Europe by the two brothers — terrorists who blew up themselves in the Belgium metro and in the airport. Only by chance it happened that the brothers were deprived of time to start the realization of this plan[46].

Second. Another nuclear terror method that expert circles are seriously evaluating is the threat of environmental pollution by radioactive materials. This could occur by means of the dispersal of radioactive materials in the atmosphere as aerosols, radioactive dust, or their dissolution in water sources. Various types of radioactive materials that can be stolen from civilian or military infrastructure sites could be used to this end. The probability of this type of terrorist attack is high, but it would still be local in character.

46 Report: Islamic Terrorists Were Planning Attack on Belgian Nuclear Plants (March 24, 2016). Available at: http://www.thegatewaypundit.com/2016/03/peaceful-islamic-terrorists-planning-attack-nuclear-plants/ (accessed 22 April 2016).

Third. In the context of catastrophic terrorism, we should also bear in mind the possibility and probability of attempts to acquire components of chemical and bacteriological weapons. This is all the more relevant since ISIS fighters have already shown that they will not stop short of using chemical munitions.

Fourth. There is the hypothetical probability of the creation of a so-called "garage bomb," i.e. the assembly of a nuclear explosive device from separate components in the center of a major city (or, for example, the appearance in a port of a vessel with this type of device on board). A device of this kind, because of the way it could be deployed, would combine the effect of a relatively weak but nevertheless quite impressive nuclear bomb explosion. Moreover, in the case of a nuclear device being used to blow up strategically important infrastructure facilities, the catastrophic effect could be multiplied through the destruction of those facilities, such as, for example, a dam at a hydroelectric power plant.

A central factor making this type of weaponry much more attractive to terrorists is the hypothetical possibility of it being assembled in a major city out of unconnected parts, each of which could be obtained by differing and perfectly ordinary means, without arousing the suspicion of supervisory agencies. A book by well-known author Graham Allison entitled *Nuclear Terrorism: The Ultimate Preventable Catastrophe* describes a whole range of absolutely legal ways of sending components for nuclear devices across international borders. Among other things, this applies also to the main component, nuclear material, the prototype of which, while harmless to health, emits radiation such that it can be detected. Such a prototype was delivered unimpeded from Jakarta to the port of Los Angeles[47] inside the container of a legitimate major freight shipping company. Other components of explosive devices can, if desired, be easily ordered and obtained from official supply companies, as has been demonstrated in experiments.

47 Allison G.T. Nuclear Terrorism. The Ultimate Preventable Catastrophe. N.Y.: Times Books. Henry Holt and Company. 2004. (in Russian), P.122.

According to the well-known Italian physicist Francesco Calogero, member of the International Advisory Council of the International Luxembourg Forum on Preventing Nuclear Catastrophe, who had also recently served as Secretary General of the Pugwash Conferences on Science and World Affairs, one would need approximately 100 kg of highly enriched uranium to manufacture an effective homemade nuclear bomb. Its delivery to the location of the terrorist attack is made easier by the fact that this substance is so dense that the necessary quantity can be contained in a five-liter canister.[48]

However, despite the already existing instances of successful experiments involving the delivery of the components of a garage bomb to a target destination, and despite the existence of a substantial number of established cases of theft and attempts to sell radioactive materials, there are thus far no known cases of the actual creation of such a bomb (or there is simply no information available on this topic, which is also perfectly conceivable). Among other things, this means that thus far, the agencies that comprise the system protecting modern civilization from nuclear terrorism are operating fairly effectively. But can we rely on that being the case in the future? Can we count on this defense system not being breached again as it was in 2001?

Fifth. We should also mention here another possibility of nuclear terrorism: the theft of a nuclear warhead and its delivery to the location of a terrorist attack. The situation around the Turkish Injerlik air base, where the US nuclear bombs are storaged, after the attempt of the coup in Turkey in July 2016, once more reminded the world about such a threat. In the leading nuclear powers, a sophisticated system has been adopted, is being continually improved, and includes technical protection and specialized security measures that reduce to a minimum the probability of such a scenario occurring. Moreover, activating such a warhead, which is equipped with an effective safety system against unauthorized use, would be a virtually impossible technical feat.

48 Calogero F., Schaerf C. Nuclear Proliferation and the Problem of Terrorism (June 2, 2008). Available at: http://www.luxembourgforum.org/eng/events/addresses/text-226/ (accessed 11 February 2016).

On the other hand, specialists point out that the procedure could be simplified, if the warhead is stolen from "unacknowledged nuclear countries", for example, Pakistan or India, which do not have a technically perfected safety system to protect from this type of use.Pakistan, by virtue of its periodic political instability, might well be seen as a probable supply source for the material constituents for acts of nuclear terrorism. Possession of nuclear weapons in conjunction with the political turbulence in that country, as well as ambiguous links between government security agencies and terrorist organizations, is an extremely explosive mix.

It is probable in present conditions that extremists will come to power in one of the countries that possess nuclear weapons or nuclear energy. It also cannot be ruled out that a further degeneration of the North Korean regime will occur, having the potential to turn an entire state into an international nuclear terrorist.

Sixth. A possibility that could be used by terrorists and ISIS is the black market for nuclear technologies and materials of the type that was organized by the "father of the Pakistani nuclear bomb", Abdul Qadeer Khan. There is also evidence of voluminous supplies of nuclear components and materials from individual states as well, for example, from the already mentioned North Korea. In particular, this involves low-enriched uranium, which, after additional enrichment, can be converted into the filling for an atomic bomb.

Subjective reality: terrorism and ways of combating it: two logics which do not always intersect in space

Each terrorist attack by itself provides both graphic and tragic proof of either the complete or partial ineffectiveness of those very state agencies whose task it is to combat terrorism.

The doors to mass terrorism were, I believe, opened for the first time at the 1972 Munich Olympics. The government security agencies of one of the most developed countries of the world were unable,

even though they had taken enhanced security measures beforehand, to foresee the possibility of a specific tragic scenario occurring. Furthermore, the security agencies of even such a powerful country as Germany had turned out to be unprepared to counter the terrorists effectively.

The massive and most dramatic terrorist attack of the beginning of the twenty-first century was undoubtedly the attack on United States territory in September 2001. In this case as well, everything that happened was a complete surprise for the authorities; as was the operational plan behind what was the biggest terrorist attack in the history of mankind. Although some say that the government security agencies did have distinct information about the preparation of the attack, this got lost somewhere in the machinery of the huge and seemingly most powerful security system in the world, that of the United States.

Analysis of a significant number of past terrorist attacks shows that, as a rule, government security agencies prepare to counteract only such terrorist plots that have already been tried. This practice persists even after known attacks have already been perpetrated.

After the 2001 tragedy in the United States, monitoring of training in US flight schools was considerably strengthened. And it was only after the dual terrorist attack in the Moscow subway in March 2010, when two female suicide bombers exploded bombs which killed more than forty people, that Moscow authorities began paying the most serious attention to the problem of security in the subway.

In October 2015 a Russian airplane was blown up over the Sinai Peninsula as a consequence of diminished vigilance on the part of the airport security services, as the terrorists themselves had noticed. In November of the same year another diversionary tactic was used: Two major terrorist attacks were executed against a background of a number of minor ones. Both France and Russia by that time were actively participating in military operations against ISIS, which confirms the conclusion drawn above.

The same November in Mali, again unexpectedly, a completely different tactic was used: a luxury hotel in the center of a city was subjected to a sudden attack. Special services and professionals in security matters could not predict or were not prepared for the terrorist acts in Paris, Belgium, Istanbul and Nice in 2015-2016 and only there. In all cases, suddenness was a key factor which the government security agencies were unable to counter.

Government security agencies, like any bureaucracy, rarely demonstrate ability for creative thinking. As a result, even when they operate fairly efficiently, they are incapable of foreseeing and preventing close to 100 percent of terrorist attacks. The simple conclusion follows that there is no such thing as absolutely reliable government security agencies. This means that our security in modern civilization is at any moment in time a thoroughly relative concept. But while such a situation is tragic in the case of terrorist attacks carried out using conventional means, it would be truly catastrophic in a scenario involving nuclear terrorism, inasmuch as just one unimpeded terrorist attack could lead to a major catastrophe against which the consequences of all the previous terrorist attacks would pale into insignificance.

According to World Health Organization data, as a result of the unintentional disaster which occurred at the Chernobyl Nuclear Power Plant in 1986, a total of some 4000 people either died or may die in the future from the long-term consequences of radiation. Environmental organizations estimate that over thirty years, the socioeconomic damage from that accident will amount to an enormous sum, some 235 billion dollars.

It bears emphasis that this was an unintentional action which resulted in the destruction of only one of the nuclear power plant's reactor units. But it resulted in substantial territory being removed from the economy for many years. The territories of a number of European countries were in the zone contaminated by radiation to various degrees.

While government agencies prepare and take heightened security measures, frequently in full public view, terrorists are lurking in the shadows, quietly making observations and drawing conclusions about loopholes in security measures and creatively reworking their approaches to planning new terrorist attacks.

Having already begun use of WMDs in the form of chemical munitions, ISIS will continue to elaborate its plans along these lines. There are absolutely no guarantees that the supporters of the Islamic State will not want to acquire even more effective WMDs, namely, nuclear weapons. Therefore, it is even more important to keep this possibility in our field of vision and undertake all possible measures to prevent it from happening. However, given the current condition of government security agencies and their work, even when it is most effective, albeit still within the traditional paradigms, we are simply doomed to see repetitions of terrorist attacks and the prospect of the attacks becoming more frequent and growing in scale.The proof of this, unfortunately, may be found in quite a number of recent terrorist acts where one may see quite a variety of different terrorist's tactics.

On the one hand, even limited cooperation of states in the anti-ISIS operations in Syria inspires hope that this absolute evil can be thwarted. On the other hand, all those taking part in this operation a priori become priority targets for ISIS terrorists with all their capabilities. As the aforementioned Mr. Shea this time rightly said, "We must be on the alert, since success in these operations can never be final."[49]

The IAEA Director General Yukiya Amano has noted that "the fact that terrorist attacks using nuclear weapons or radioactive materials have not yet happened should not weaken our vigilance." In order to ensure that they really never will happen, truly strategic decisions need to be made, and a whole raft of necessary measures needs to be thought through and undertaken.

49 Kumar I. NATO: Paris Attacks Must Be a 'Spur' for Greater Intelligence Sharing. Interview with Jamie Shea.

Principles for the planning of counter-terrorism strategies

In order to plan a strategy for the prevention of possible catastrophic terrorist attacks, it might be useful to attempt to map the possible variants of terrorist activities listed above on a number of coordinate planes:

In terms of the degree of probability of attacks being carried out, they may appear as follows:

1) Radiological weapons or the use of chemical and bacteriological WMDs;
2) The capture of a nuclear power plant or the storage facilitiy of spent nuclear fuel with the threat of them being blown up (Ukraine may become one of the aims for this type of attack. Russia formerly removed spent fuel from Ukraine, but no longer does so);
3) Assembly of a garage bomb using components and materials acquired by a variety of means;
4) The capture of munitions would be the most complex method of carrying out such an attack.

In terms of consequences, the probability picture of catastrophic terrorism scenarios looks somewhat different:

1) The explosion of a manufactured munition;
2) A "garage bomb" (or a ship in port with a nuclear device on board) could be very powerful and devastating;
3) The capture and undermining of a nuclear power plant or major nuclear infrastructure facility;
4) The use of radiological or chemical and bacteriological weapons.

It follows from juxtaposing the two systems of coordinates that the most dangerous scenarios (the explosion of a munition or of the the garage bomb) are the least likely, whereas those that are easier and simpler to stage are less dangerous. This means that, for security purposes, priority attention must be paid to those threats where there is an

highest combination of probability of occurrence and gravity of consequences. It is precisely these two factors that are inherent in the probability of the scenarios — the capture of a nuclear power plant or a major nuclear infrastructure facility.

Of course, thorough attention by the leading states should be paid to the means which can be easily acquired and to facilities located in countries (or zones) where there is a heightened politico-military and terrorist risk.

In the older member countries of the nuclear club, the physical protection of nuclear infrastructure facilities has been developed and improved for a long time.

The key elements of these strategies must be:

- Attention to and monitoring of these issues by international organizations;
- An advanced state of national legislation and necessary regulations, a high degree of detail with regard to the provision of physical protection in various scenarios and a high degree of responsibility at national and local levels for the physical protection of nuclear infrastructure facilities;
- A high level of cooperation between interested countries at all levels, ranging from the drafting of appropriate legislation and the optimization and improvement of the physical protection infrastructure to the exchange of data between government security agencies;
- The active exchange of experience and mutual assistance in physical protection arrangements and the exchange of best practices in this field.

For these scenarios to be realized, it is necessary to overcome the profound crisis in political relations between Russia and the West and return to cooperation. It is essential to enhance the level of trust between the sides. This will make it possible to reach the level of active cooperation between the leading powers with a view to cutting off opportunities for catastrophic terrorism.

8. RUSSIAN-US COOPERATION IN PREVENTING NUCLEAR TERRORISM

Anatoliy Diakov[50]

In Russia, as in so many countries, it is understood that nuclear weapons proliferation and nuclear terrorism presents a real threat to national and international security. In that context, one of the most alarming developments of late has been the incursion and rise of the Islamic State in the Middle East, declared by Russia to be a terrorist organization — something which was confirmed by the recent terrorist acts which cost over 500 lives in Ankara, Paris, and even aboard the Russian A321 airliner in Egypt for which ISIS claimed responsibility confirming this.

Terrorist structures aim to expand their destructive capabilities and are constantly trying to get access to nuclear weapons. They realize perfectly well that if an act of terrorism can be carried out using a nuclear explosive device, the consequences will be global. Taking into account a well known fact that in making the nuclear bomb about 80 — 90 percent of efforts were devoted to producing the nuclear material,

50 Anatoliy Diakov — Researcher (former Director) of the Center for Arms Control, Energy and Environmental Studies, Ph.D. (Russia).

it becomes clear that the realization of nuclear terrorist act depends on terrorist capability to acquire the key material necessary for making nuclear weapons — plutonium and highly enriched uranium. Consequently, if we can prevent terrorist from obtaining nuclear materials we will succeed in preventing nuclear terrorist attack.

According to estimates at the end of 2014, the five acknowledge nuclear weapon states had military stocks totaling about 238 tons of weapon grade plutonium and 1,330 tons of HEU, mostly weapon-grade uranium. 95% of the plutonium and HEU of this quantity belong only two countries — Russia and the United States. Estimates by non-governmental analysts, which are uncertain, suggest that as of end 2014 Russia had something in the range of 700 tons of highly enriched uranium (HEU) and over 120 tons of weapons-grade plutonium. Russia also has more than 50 tons of separated civilian plutonium. The US has about 95 tons of WGPu and about 544 tons of HEU. Most of this material is the legacy of the Cold War when the Soviet Union and the United States each created nuclear industries capable of supporting arsenals of tens of thousands of nuclear weapons. These figures make clear that both Russia and the US bear a special responsibility for security of these stockpiles.

In the United States are quite common publications which express concerns about the security and reliability of physical protection of storage of nuclear materials and facilities in Russia. Congressman Tom Marino recently came out with a fairly typical comment in that sense, saying, "Russia has so much nuclear material missing, they just don't pay attention to it. I don't know if they don't care or if it is just that they are so disorganized over there."[51] Other, more knowledgeable experts like Stanford University's Siegfried Hecker or Harvard's Matthew Bunn, who do have a fairly complete knowledge of the real state of affairs in Russia on this matter, have also voiced apprehension over Russia's vulnerable materials' protection systems.[52]

51 See Oswald R. Chill with Russia Brings Nuclear Insecurity. Available at: http://pulitzercenter.org/reporting/chill-rusia-brings-nucler-insecurity (accessed 20 November 2015).

52 Hecker S.C., Davis P.E. Why the US Should Keep Cooperation with Russia on Nuclear Security. Bulletin of the Atomic Scientists. Available at: http://hebulletin.org/why-us-should-keep-

Therefore, it is expedient to acquaint the reader with the situation regarding the accounting, control and physical protection of nuclear materials (NM) and radioactive sources in Russia.

The Russian government contends that a global nuclear security regime can only be effective if every country has its own proper and effective national safety and security system for NM. That is, essentially, the key principle behind Russian policies aimed at resolving problems in this field.

It is well known that during beginning of 1990s the nuclear material security within the Russian nuclear weapons complex did give rise to concern, primarily due to a deteriorating economic situation and weakening of government controls. The threat of nuclear materials theft was a reality —there were several cases of stealing nuclear materials by insiders. The Russian top leadership realized the responsibility they bore for their nuclear arsenal's security and safekeeping and took decisive measures to tighten NM security on their territory to prevent diversion of NM into terrorist hands.

Those measures included:

- drafting and adopting the legislative and regulatory frameworks for handling fissile and radioactive materials;
- updating the national control and accounting systems of NM;
- implementing modern physical protection measures for NM;
- developing and carrying out programs to consolidate nuclear warheads and nuclear materials;
- implementing into practice of training and certification of nuclear industry personnel working in accounting and physical protection special training centers, providing them the possibility to learn about modern methods and improve their practical skills;

cooperating-russia-nuclear-security7207 (accessed 29 May 2014); Bunn M. Nuclear Security in Russia and Current State of Cooperation. Harvard Kennedy School Meeting on U.S.-Russian Nuclear Security Cooperation. U.S. Institute of Peace. Available at: http://belfercenter.org/mta (accessed 26 September 2014); Roth N. A Response to Critics of U.S.-Russian Nuclear Security Cooperation. Belfer Center for Science and International Affairs. Available at: http://nuclearsecuritymatters.belfercenter.org/blog/response-critics-us-russian-nuclear-security-coooperation (accessed 21 October 2014).

- updating nuclear industry and customs checkpoints with equipment for automatic control of the movement of radioactive substances and fissile materials.

As a result of implementation of those measures, an appropriate legislative framework was created to deal with the modern reality. Systems for accounting, control, and physical protection of nuclear and radioactive materials were placed on an up-to-date technological basis, making it possible to track all changes in real time. Over the period of 1993—2013, physical protection at all plants and in all buildings with nuclear materials was substantially modernized. Technical systems were put in place at customs and nuclear site checkpoints to detect fissile and radioactive materials.[53] It should be noted that the successful implementation of these measures in a relatively short period of time, given the scale of the Russian nuclear complex, was made possible by international cooperation, particularly through the Russian-US collaboration under the Cooperative Threat Reduction (CTR) program.

To prevent the threat of terrorists employing radioactive materials for radioactive contamination of whole territories (the "dirty bomb"), the production, use, and disposal of radioactive sources have to be more strictly controlled. National standards and rules governing how radioactive sources are handled in Russia have undergone radical improvement. The entire s life cycle of radioactive sources, from production to final disposal, is subjected to constant government accounting controls. Under the instituted requirements, any organization utilizing

53 The "*Yantar*" ("Amber") stationary radiation monitoring systems, devised and manufactured in Russia, are designed to take constant automatic readings at nuclear cycle facilities' access points, and at road and rail customs border crossings as well as on personnel at nuclear enterprises, and passengers and luggage at various checkpoints to detect the presence of radioactive and nuclear materials. They have met test standards under the ITRAP Illicit Trafficking Radiation Assessment Program, applied at the Austrian test center in Seibersdorf in cooperation with IAEA, the World Customs Organization, and Interpol. The system was tested at Los Alamos and awarded the center's certificate of excellence. Overall, there are now more than 6,000 Yantar systems, of various models, installed. How much these technical systems do to make nuclear and radioactive material protection effective is borne out by the following figures: 95% of all illicit transfers of sensitive materials was detected by dedicated equipment, as opposed to the mere 5% with operational intelligence and analysis of accompanying documents. See: (See Yantar at Work. Available at: http://aspect.dubna.ru/new/page.php?page=327 (accessed 20 March 2016).

sources is legally bound to report regularly (twice a year) to the common state accounting system on source holdings and their condition. No organization is cleared to work with sources unless they have a special license, which is only granted when a member of staff stands personally responsible for compliance with all the standards and rules governing work with sources.

It should be pointed out that work to enhance nuclear security in Russia continues, even though Cooperative Threat Reduction collaboration has ended. The present focus is on further improvements to the existing infrastructure, drawing on experience gained in Russia and other countries as well as on IAEA recommendations, while heeding new threats. The regulations on accounting and physical protection of nuclear and other radioactive materials are continually updated and improved. For example, a revised version of the federal "Basic Nuclear Material Accounting and Control Regulations" was adopted in 2012.

The governmental agencies in charge on security and regulatory of nuclear energy are constantly monitoring all NM stocktaking and accounting procedures as well as the effectiveness of NM physical protection. In this connection Rosatom has adopted programs to upgrade physical protection systems at sites in the nuclear sector that to be completed by 2020. Improvements are continually being introduced in physical protection equipment at NM sites and storage facilities. In addition, all such programs undergo constant revision in keeping with interdepartmental inspection findings and the results of exercises conducted by Rosatom together with the FSB (Federal Security Service), the Ministry of the Interior, and the Ministry for Emergency Response.[54]

Methods for countering nuclear terrorism are also being strengthened. The September 2012 "*Strazh* (*Sentinel*) —2012" anti-terrorism exercise was run in the Moscow region (oblast) as part of the Global Initiative to Combat Nuclear Terrorism. In the presence of delegates

54 State Atomic Energy Corporation "Rosatom" Safety Report. Moscow. 2014.

from 58 countries and observers from IAEA, Interpol, and UNODC, the exercise demonstrated the latest technical advances by the Ministry of Defense and Rosatom State Corporation in detecting nuclear materials and radioactive substances, and the work of FSB special units and Rosatom emergency technical squads in countering nuclear terrorism and eliminating its consequences.

Work is being undertaken to minimize the stocks of weapons nuclear materials and their use. In November, 2015 a total of 560 billion rubles were approved to finance a new special purpose federal program (SFP) on "Nuclear and Radiological Security for 2016—2020 and through to 2030". In addition, another 394 billion rubles may be earmarked within the budget for a follow-up SFP-2.

Russia is in complete compliance with its international commitments to ensure and maintain NM physical protection, as party to all the existing multilateral conventions: the Convention on the Physical Protection of Nuclear Material and the 2005 Amendment to the Convention, as well as the International Convention for the Suppression of Acts of Nuclear Terrorism.

The implementation of all these measures on strengthening nuclear material security gave Russian officials sufficient reasons to claim at the 2014 Nuclear Security Summit that levels of physical protection for nuclear materials and facilities in Russia gave no cause for concern.[55] Protection of all nuclear materials, storage facilities, and transport is assured through measures that, at the very least, meet IAEA recommended requirements (INFCIRC/225/Rev.5).

Even American experts including the above-mentioned Siegfried Hecker and Matthew Bunn acknowledge the dramatic improvements to nuclear and radioactive material physical protection in Russia accomplished over the last twenty years. Nonetheless, they continue to believe that the risk of diversion of nuclear materials is still considera-

55 Memorandum of Russian Federation at the 2014 Nuclear Security Summit. The Hague, Netherlands (24—25 March 2014).

ble.[56] That view is founded on the premise that although work has as yet to be completed on reinforcing nuclear and radioactive materials physical protection, and all the vulnerabilities in NM physical protection have as yet to be overcome, Russians are no longer treating the issue as important. In this regard, the United States calls for the continuation of cooperation between the US and Russia in this area, which, after completion of the CTR program has virtually ceased in 2013.[57]

With regard to the continuation of cooperation between Russia and the United States on nuclear security issues it is necessary to mention two points.

The first has to do with the format of twenty years cooperation under the CTR program from 1993 to 2013. While noting the unique and effective experience gained in CTR cooperation between Russia and the USA, one must also concede that this cooperation was not based on the principal of real partnership. Funding for the projects of the CTR program is almost entirely carried out by the United States, although Russia also has spent on their implementation heavily. US financial assistance was linked with granting by Russia to American side the right to inspect Russian nuclear facilities where specific projects were being carried out. That gave Americans opportunity to visit Russian nuclear installations and thereby keep their "finger on the pulse" of the Russian nuclear complex. The above statement by Congressman Marino can be explained likely by not concerns about the status of accounting, control and physical protection of nuclear materials in Russia, but rather the annoyance of some US circles due to of the impossibility of continuing control over Russian nuclear complex once Russia had pulled out of further CTR cooperation. It should also be noted that the provision of access to American inspectors to nuclear facilities in Russia, falling

56 Bunn M. Nuclear Security in Russia and Current State of Cooperation. Harvard Kennedy School Meeting on U.S.-Russian Nuclear Security Cooperation. U.S. Institute of Peace. Available at: http://belfercenter.org/mta (accessed 26 September 2014).

57 Nunn S., Lugar R., Browne D. The Greatest Terrorist Threat. How to Stop Nuclear Material from Falling into the Wrong Hands. Politico Magazine. Available at: http://www.politico.com/magazine/story/2015/11/the-greatest-terrorist-threat-213370 (accessed 17 November 2015).

within the scope of its national security, and the lack of similar opportunities for the Russian side, always caused irritation in Russia. Some Russian experts on the CTR program feel that the joint projects served more as a cover for Americans to gather intelligence.[58] This gained further resonance in a recent comment by the Russian Deputy Prime Minister Dmitri Rogozin.[59]

At the same time, discussing the issue of Russian-American cooperation in this area should take into account the following circumstance. These days, nuclear terrorism is the most dangerous type of use of force. In terms of the potential destructive power and number of casualties that a nuclear terrorist act would unleash, there is no equivalent among recent terrorist attacks. It can confidently be said that its implementation will have a global impact. For this reason the world community is entitled to have not only assurances that any country with nuclear weapons or nuclear materials and associated facilities, for the safety of which they bear primary responsibility, has a physical protection system, but it is also important to have convincing proof that nuclear security is really exists. As the US and Russia possess between them 94% of the worlds weapons-usable nuclear materials and bear particular responsibility for their integrity and security, it is of paramount importance to have the certainty that the two countries are doing everything necessary to prevent nuclear materials from falling into the hands of terrorist organizations.

Obtaining such certainty is impossible without cooperation among two countries on nuclear security issues. It should be noted that the understanding of this necessity of this was quite clearly expressed by

58 Overcoming Impediments to U.S.-Russian Cooperation on Nuclear Non-Proliferation. Report of the Joint Workshop, National Research Council of the National Academies. The National Academy Press. Washington, D.C. 2004.

59 Speaking to journalists in Vladivostok, Dmitri Rogozin announced that, "US proposals to extend the program were no longer consistent with Moscow's understanding of how such cooperation should be arranged ...We want to ascertain just what the real financial bonus to us would be and what the setbacks to our own defense capabilities would be from having technical monitoring of our production", see Russia Will Estimates Damage to Its Defense capabilities From the Nunn-Lugar Program. Available at: http://ria.ru/politics/20151218/1344333736.html#ixzz3ufKS2GBq (accessed 18 December 2015).

Russian and American experts during the Review Conference held in Moscow in early June 2013 on the results and experience of joint work on the various projects carried out within the frame of the 20th anniversary of the CTR program. Russian and American scientific and technical experts who have directed the joint projects drew up a concluding conference decision[60] in which they noted their urgent and shared need to continue mutually beneficial cooperation, inter alia, in:

- accounting, control, and protection of nuclear materials;
- global nuclear non-proliferation and the elimination of global threats, including non-proliferation of nuclear technology;
- scientific and technical aspects of nuclear anti-terrorism;
- fundamental and applied scientific research in areas of mutual benefit;
- transfer of expertise acquired through cooperation to a new generation of academics and directors of RF institutes and US national labs;
- extending the experience to cooperation with third countries for global security and nuclear non-proliferation.

In the conference decision it was further noted that cooperation should be carried out in the new format which is based on a symmetrical and mutually beneficial approach, that takes into account of changes in the world over the last twenty years.

An unfortunate consequence of the crisis in the Ukraine has been that collaboration between Russia and the United States has nearly ground to a halt, not only for NM accounting and physical protection, but also in other nuclear matters. In March 2014, the US suspended cooperation in the bilateral Russian-American Presidential Commission's (Poneman-Kirienko) working group overseeing the nuclear security programs. Then in May 2014, again at the US's instigation, work was suspended under the 16 September 2013 inter-governmental Agreement on Cooperation in Nuclear- and Energy-Related Scientific Research

60 Decision of the conference on Russian-American nuclear cooperation: achievements and future prospects. Moscow (3 — 5 June 2013).

and Development. Thus, it was only to be expected that the Russian side would respond by suspending cooperation under the inter-governmental protocol to the Framework Agreement on a Multilateral Nuclear Environmental Program in the Russian Federation, the protocol that specified the areas of cooperation, which included accounting, control, and physical protection for nuclear materials.[61]

Certainly it would be unrealistic to expect that the relationship between Russia and the United States, today characterized by hostile elements because of the events in Ukraine, will not have a negative impact on their relationship in matters of nuclear security. However, even during the Cold War, the Soviet Union and the United States supported some forms of nuclear cooperation, because both countries were aware that it was in both their interest, and that to forego it could lead to unacceptable risks. Therefore, despite all the current differences between the US and Russia the resumption of cooperation between them on matters of nuclear security is necessary and corresponds with their common interests.

Not that one should forget what invaluable experience Russia and the United States accumulated through international cooperation on nuclear threat reduction. That applies not only to government departments and organizations, but also to the Russian and American scientists and experts who established personal contacts with one another.

61 Under the bilateral protocol the Parties agreed to cooperate in the following areas:
a) nuclear material physical protection, control, and accounting;
b) security management relating to nuclear material physical protection, control, and accounting;
c) customs control of nuclear and other radioactive material;
d) identification, recovery, storage, securing, and disposal of high-risk radioactive sources;
e) consolidation of nuclear material, including irradiated and non-irradiated uranium enriched to 20% or more of the U-235 isotope (HEU), and conversion of excess HEU to low enriched uranium (LEU);
f) conversion of Russian Federation HEU-fueled research reactors to operate with LEU fuel, and development of new LEU fuel technologies to enable future HEU to LEU research reactor conversions;
g) dismantlement, transportation, fuel removal and safe storage of nuclear submarines, including transportation and safe storage of reactor compartments and associated materials, aimed at ensuring the security of highly enriched spent nuclear fuel.
Protocol between the Government of the United States of America and the Government of the Russian Federation to the Framework Agreement on a Multilateral Nuclear Environmental Program in the Russian Federation on May 21, 2003, signed on June 14, 2013.

The experience accumulated by the two countries in strengthening the non-proliferation regime and preventing the nuclear threat is not something one would wish to lose over differences in the approach to events in the Ukraine.

Experience shows that to suspend cooperation is easy, but to restore it will be very hard. What is crucial for that to happen is to keep a dialogue going between the parties to identify nuclear security issues of common interest. That dialogue would obviously have to be between absolutely equal partners. The organization and holding of joint seminars to exchange experience in such areas as physical protection, accounting and control of nuclear materials and radioactive sources in the civil nuclear industry enterprises would also contribute to maintaining contacts.

It seems would be reasonable to consider extending the experience that Russia and the United States have gained in the operation of nuclear installations and in the handling of nuclear materials, including for nuclear physical security, to cooperation with third countries in order to enhance global security and nuclear non-proliferation.

Sooner or later, Russian and American leaders will come to appreciate the need to meet again on nuclear security issues. At this point, it is desirable to have already concrete proposals for cooperation between organizations and the national nuclear laboratories in Russia and the United States in the field of fundamental and applied researches. Obviously the resumption of dialogue, joint seminars and joint cooperation with third countries will contribute to this.

9. PREVENTING CATASTROPHIC BIOLOGICAL TERRORISM

Andy Weber and Christine Parthemore[62]

Introduction

Biological weapons are considered by many to play a central role in the most likely and most daunting scenarios of terrorists or rogue individuals using weapons of mass destruction. Factors driving this threat perception include the ubiquitousness of the knowledge and technologies required, the frequency of public statements of intent by terrorist groups, and the historical public record of terrorist organizations attempting to develop and deploy biological weapons.

Due to the confluence of these characteristics of biological threats and the growing resources and influence of terrorist organizations globally, improving the ability of countries to prevent catastrophic bioterrorism requires two complementary approaches: building a strong foundation of basic capacities, and creating systems that keep pace with threats as they evolve and account for unknowns and extremes. This chapter will first describe the general landscape of modern biological threats, then describe how these two approaches combine to reduce the risks of biological terrorism.

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The biological terrorism threat

In 2007, the US Congress commissioned a report to assess the prospects of terrorists using weapons of mass destruction and offer recommendations on how the country could improve its efforts to prevent such attacks. The following year, the Commission on the Prevention of Weapons of Mass Destruction Proliferation and Terrorism conveyed a stark warning in its World at Risk report: "terrorists are more likely to be able to obtain and use a biological weapon than a nuclear weapon. The Commission believes that the US government needs to move more aggressively to limit the proliferation of biological weapons and reduce the prospect of a bioterror attack."[63]

Understanding how to confront this challenge begins with examining how biological weapons threats have evolved to where they stand today, and why terrorist use of weapons of mass destruction has been elevated to a top security concern.

Biological weapons, which date back to ancient times, were completely banned after President Richard Nixon outlawed the U.S. offensive program in 1969, and negotiated the landmark 1972 Biological and Toxin Weapons Convention (BWC) which entered into force in 1975. In 1979, an accidental leak of anthrax from an illegal Soviet biological weapons factory in Sverdlovsk (now Ekaterinburg) killed about one hundred innocent people who inhaled the deadly spores downwind. After this, the Soviet Union greatly expanded its investment in biological weapons, and built a massive anthrax weapons factory in isolated Stepnogorsk, Kazakhstan. Later and at the request of President of Kazakhstan Nursultan Nazarbayev, the factory, with its proven capacity to produce 300 tons of anthrax weapon during a wartime mobilization period of eight months, was safely eliminated through the U.S. Department of Defense Nunn-Lugar Cooperative Threat Reduction Program. Green grass now grows on the Kazakh steppe where it once stood.

63 Graham B. World at Risk: The Report of the Commission on the Prevention of WMD Proliferation and Terrorism (Vintage Books, 2008). P. XV.

In April 1992, Russian Federation President Boris Yeltsin officially acknowledged the existence of an offensive biological weapons program and ordered the end to all activities that violated the BWC.[64] Suspicions remain, however, as Soviet-era military biological weapons facilities in the Russian Federation remain active but off limits to international visitors.[65] Another large state bioweapons program built in Saddam Hussein's Iraq was successfully eliminated after the first Gulf War in the 1990's under the able leadership of Ambassador Rolf Ekeus and the UN Special Commission on Iraq.

While more than 150 countries have signed and ratified the BWC as of this writing, the threat of state-based biological weapons threats remain with us today, albeit at a reduced scale. For example, North Korea is widely believed to possess biological weapons despite its accession to the BWC and the lack of specific information regarding its program and potential stockpiles.[66]

As the number and scale of state-based programs seems to have significantly waned since the Cold War, the world has witnessed the steady emergence of terrorist organizations and other non-state actors showcasing their intent to acquire and use biological weapons. Several prominent cases in the late 20th and early 21st centuries have contributed to the concern that a biological attack is the most likely means by which terrorists may use weapons of mass destruction.

Among the most widely discussed examples of a non-state organization working toward biological terrorism are the attempts by the Japanese cult Aum Shinrikyo in the 1990s. Members of Aum Shinrikyo put significant effort into weaponizing and conducting attacks using both botulinum toxin and bacillus anthracis. Both lines of effort

64 2005 Adherence to and Compliance with Arms Control, Nonproliferation, and Disarmament Agreements and Commitments. US Department of State. Available at: http://www.state.gov/t/avc/rls/rpt/51977.htm (accessed 5 January 2005).

65 Tucker J., Vogel K. Preventing the Proliferation of Chemical and Biological Weapon Materials and Know-how. The Nonproliferation Review (Spring 2000).

66 Bennett B.W. The Challenge of North Korean Biological Weapons. Testimony presented before the House Armed Services Subcommittee on Intelligence, Emerging Threats and Capabilities. Washington, D.C. (October 11, 2013).

eventually failed, and while insufficient skills and techniques seem likely to have contributed to their failure, in both cases the group was hindered by using strains that were less likely to be effective in causing human sickness or death.[67]

Al Qaeda stands as a unique example among non-state groups with a demonstrated intent to acquire or develop biological weapons, both for its proven ability to conduct extraordinary acts of terrorism, and for the fact that the interest in these weapons was shared broadly across many of its adherents and endured for many years. Where other groups like Aum Shinrikyo may have hampered their own ability to succeed by maintaining tight secrecy and limiting involvement to a very small number of people, Al Qaeda leaders were open regarding their intentions of developing biological weapons and involved a wider range of their supporters. Osama bin Laden provided his own declarations of interest in and rationale for biological attacks, but key leaders and operatives such as Ayman al-Zawahiri and Anwar al-Awlaki shared his interest and overt support, helped orchestrate Al Qaeda's bioweapons attempts, and helped to articulate the public case for pursuing these weapons to Al Qaeda's followers. The organization's leaders proved willing to trust many of the organization's members at lower ranks with pursuing biological weapons, recruited (at least temporarily) several individuals with potentially-relevant training in biological and veterinary sciences, and even collaborated with other terrorist organizations.[68]

Concern is mounting with the emergence of the Islamic State as a dominant organization among those conducting terrorist attacks due to its ability and will to carry out spectacular acts of violence, the scale of its financial resources, and its proven ability to control territory in which materials and personnel critical to a biological attack may reside.

67 Danzig R., et al. Aum Shinrikyo: Insights Into How Terrorists Develop Biological and Chemical Weapons. Center for a New American Security. Washington, DC. 2012. PP. 18—28.

68 See, for example, Mowatt-Larssen R. Al Qaeda Weapons of Mass Destruction Threat: Hype or Reality? Belfer Center for Science and International Affairs (January 2010); Kreider R., Ross B. Al Qaeda Cleric's Call from Grave: Attack with Bio Weapons. ABC News (May 3, 2012).

Past cases show the need for continued vigilance that the Islamic State or other terrorist organizations may pay, recruit, or compel skilled scientists and technicians in order to acquire the skills needed to carry out biological attacks as their intentions expand.

Lone actors have become another key feature of modern biological threats, with the 2001 anthrax attacks in the United States highlighting how terrorizing and complex even relatively small-scale attacks can become. The so-called Amerithrax attacks killed five and sickened seventeen Americans, yet took nine years, dozens of personnel, more than 10,000 interviews and thousands of environmental samples to conclude that a sole individual was responsible.[69] The Amerithrax case has served to fuel concerns that even if the vast majority of its practitioners are no threat, a lone individual or chain of seemingly-unaffiliated individuals practicing bio-hacking or "DIY bio" could apply their skills in ways that seem nearly impossible to predict, detect, or prevent.[70]

Finally, while biological terrorism threats remain a high security concern, the public and political leaders have increasingly focused on building resilience to health risks of all kinds rather than those posed by specific cases of deliberate attack or naturally occurring diseases. When we view bioterrorism as a common challenge alongside other risks to human health, the combination of trends in globalization, rapid urbanization, the changing climate, and the rise of rogue actors with malicious intentions all show the stark need to improve global capabilities for countering biological threats of all kinds.

Addressing the threats

While there are countless combinations of actions and investments that can contribute to preventing catastrophic biological attacks, we advocate for placing the preponderance of effort on establishing

69 Amerithrax or Anthrax Investigation. US Federal Bureau of Investigation. Available at: https://www.fbi.gov/about-us/history/famous-cases/anthrax-amerithrax (accessed 20 March 2016).

70 An often-cited, if extreme, example was described by Hessel A., Goodman M., Kotler S. Hacking the President's DNA. The Atlantic (November 2012).

strong foundational capabilities that are necessary for handling a wide range of deliberate biological attacks and naturally-occurring public health threats; while protecting niche lines of investment and investigation that help hedge against unexpected biological threats emerging and hold the potential for dramatic gains. All of the recommendations outlined in this chapter contribute to preventing biological threats, but are likewise important to effectively predicting, characterizing, and responding to biological crises.

Building a strong foundation

Luckily, most countries do not require differentiated responses to all unique biological threats. Core capacities that are commonly needed across a range of circumstances can position the world better for the majority of the biological threat spectrum.[71] Moreover, many of the tools and technologies needed to grow these core capacities are already available today, and merely require us to prioritize deploying them and become more innovative, agile, and proactive in using them. For most countries and regions, the foremost tasks in reducing the prospects of catastrophic bioterrorism and emerging public health threats are therefore to identify what core capacities are missing, and determine how to efficiently and effectively build them.

In some cases capacity-building may stem from crisis response, in particular in countries lacking strong public health systems backed by trained disease detectives and diagnostic laboratories. When Ebola started spreading in Guinea, Sierra Leone, and Liberia in the winter of 2013—2014, although there was some deliberate covering up of information, these three countries had such weak public health systems that it was many months before they fully understood the toll Ebola

71 While we use the term "core capacities" generically in this chapter, our recommendations are consistent with the core capacities advocated by the World Health Organization's 2005 update of the International Health Regulations and other widely-accepted global standards. However, our recommendations reflect our prioritization of steps of greatest importance to preventing and preparing for biological terrorism.

was taking within their borders. International actors quickly began to fill capacity gaps in each country with investments that will continue to improve their ability to counter biological threats of all kinds, from training personnel and supplying equipment to building laboratories and developing information sharing systems.

In other cases -- for example, in areas that house a number of geographically small countries or neighboring countries with high volumes of cross-border traffic -- regional collaboration across countries can be both cost-effective and reduce transboundary biological risks. In order to strengthen public and animal health monitoring capacity in Central Asia and the Caucasus, the US Department of Defense built the Richard Lugar National Center for Disease Control in Tbilisi, Georgia. A similar Central Asian Center for Disease Control will be opened in Almaty, Kazakhstan. Through President Obama's Global Health Security Agenda, similar public health capacity building efforts are being accelerated in sixty countries around the world.

Most of the steps highlighted below contribute to the full range of capacities needed for effectively countering biological threats: deterring and preventing biological attacks, detecting and characterizing events as quickly as possible if they occur, monitoring situations as they unfold, and responding to and recovering from biological events.

Reducing Access to Dangerous Biological Materials

Discussion of reducing the risks of biological terrorism frequently focus on access to knowledge. Though the vast majority of biological research is used for positive gains, many lines of research and applications will always be inherently dual use, capable of being used for good or for harm. Debates over dual use research of concern, and in particular gain of function research on pathogens likely to pose dangers to the human population, have grown more heated in recent years.[72] While these

72 See, for example, Paul W., et al. Gain-of-function Experiments: Time for a Real Debate. Nature Reviews Microbiology. No. 13. 2015. PP. 58—64; Casadevall A., Imperiale M.J. Risks and Benefits of

efforts to focus on the knowledge base are important in building global norms against nefarious use, the knowledge required to carry out a deliberate biological attack is globally available and relatively easy to access. Put simply, it is impossible to control. Our approaches to improving biosecurity must account for that.

Luckily, the materials needed to develop and build biological weapons can be restricted significantly compared to what we see today. Minimizing stocks of dangerous pathogens provides one of the most straightforward opportunities for reducing the ability of nefarious actors to access and employ biological weapons.

The early 21st Century witnessed a quick expansion of the highest biosafety-level laboratories (designated as BSL-3 and BSL-4 labs). This trend was not limited to the United States, but extended to countries at all levels of development and with great variation in the training, regulatory, and legal regimes that help ensure the materials in these laboratories remain safe and secure.[73] Even under normally-stringent controls and oversight, there are no full guarantees that potentially-dangerous biological agents will be handled appropriately and will not be diverted for nefarious use. Between 2014 and 2015, for example, US defense and civilian agencies were found to have inappropriately stored, ineffectively deactivated, and otherwise mishandled both anthrax and the smallpox variola virus.[74] These trends and incidents led the US Centers for Disease Control and Prevention Director, Dr. Tom Frieden, to articulate the need for reducing access to the most dangerous biological materials:

> "...one of the things that we want to do is reduce the number of laboratories that work with dangerous agents to the absolute minimum necessary. Reduce the number of people who have access to those laboratories to the absolute minimum necessary. Reduce the number of dangerous pathogens we work with in those laboratories."[75]

gain-of-function Experiments with Pathogens of Pandemic Potential, Such as Influenza Virus: a Call for a Science-based Discussion. No. 5(4). 2014.

73 Begley S., Steenhuysen J. How Secure Are Labs Handling World's Deadliest Pathogens? Reuters (February 16, 2012).

74 CDC Media Statement on Newly Discovered Smallpox Specimens. U.S. Centers for Disease Control and Prevention (July 8, 2014); Laboratory Review. U.S. Department of Defense. Available at: http://www.defense.gov/News/Special-Reports/DoD-Laboratory-Review (accessed 20 March 2016).

The medical community has seen significant advances in tools that can help achieve these goals, such as diagnostics that do not require culturing of viruses or bacteria and thereby help minimize the need for laboratories to hold them in stock. These safe, precise, and rapid technologies and techniques need to be fostered and expanded. Great gains in preventing biological terrorism can be made by providing advanced diagnostics and other tools to countries and communities that house or are proximate to terrorist organizations, have laboratories that today hold samples of the biological agents of greatest concern, or exhibit other indicators of high bioterror risk. Many countries are starting to take this approach, consolidating dangerous pathogen collections from many locations into one safe, well protected modern laboratory. The Lugar Center in Tbilisi and a Central Reference Laboratory in Almaty, Kazakhstan are strong examples.[76]

Practicing Cross-Sectoral Response

Continuing to integrate across the various communities of interest is another basic, practical improvement that could foster important gains in preventing and preparing for biological threats. In many countries, coordination among health, security, law enforcement, environmental, agricultural, veterinary, insurance, and other sectors is improving. This cross-sectoral coordination can improve prevention rates and response times, minimize casualties and costs, and ensure that law enforcement and security officials preserve the evidence required to

75 Frieden T. CDC Press Conference on Laboratory Quality and Safety after Recent Lab Incidents (July 11, 2014).

76 Keenan J. New High-Tech Laboratory in Kazakhstan to Fight Plague Outbreaks: $102 Million Biosecurity Facility Will Open in 2015. National Geographic (September 23, 2013).

find and stop malicious actors who may be behind planned or executed biological attacks.

In a March 2015 op-ed, Bill Gates helped to highlight the need to practice multi-sectoral response to biological events, comparing the dearth of health response exercises to NATO's regular conduct of "joint exercises where they work out logistics like how troops will get food and what language they will use to communicate."[77] The governments of the United States and Republic of Korea have for several years conducted this kind of exercise, focusing on biological attacks on the Korean Peninsula. This exercise series, called Able Response, was designed to continually improve how medical, defense, law enforcement, and political officials share information, coordinate responses, and communicate during biological events. Held annually since 2011, the Able Response exercises have simulated crises from terrorist attacks using anthrax, botulinum toxin, smallpox, and other sources.

The exercises deliberately included complex scenarios in which multiple threats (biological and otherwise) emerged simultaneously. They were also designed to mimic the public confusion that can easily emerge during health crises, in particular when symptoms take several days to emerge and especially in cases of highly transmissible diseases. As both countries found lessons to improve their cross-sector coordination capabilities over the years, the United States and Republic of Korea also grew more comfortable in their bilateral coordination in the event of a bioterrorism attack.[78] One critical lesson that has emerged from this bioterrorism exercise series is the need for surveillance and information sharing tools that can be easily accessed and are likely to be useful to decision makers and responders across a range of sectors and institutions.

The need for improved cross-sectoral collaboration extends to relationships among governments, private companies, and non-

77 Gates B. How to Fight the Next Epidemic: The Ebola Crisis Was Terrible. But Next Time Could Be Much Worse. The New York Times (March 18, 2015).

78 See, for example, Kim S.S. et al. Introduction of the Republic of Korea — the United States of America's Joint Exercise against Biothreats in 2013: Able Response 13. Osong Public Health and Research Perspectives 4.5 (2013). PP. 285 — 290.

governmental organizations. One notable effort to advance this capacity is emerging through the more than 50 countries and international organizations that form the Global Health Security Agenda (GHSA) partnership. With input from dozens of countries, INTERPOL, the World Health Organization, the World Organisation for Animal Health, and others, GHSA members are setting targets for multi-sectoral response to biological events and establishing mechanisms and metrics that countries can adopt to help ensure health, security, and law enforcement agencies will respond collaboratively in the event of an attack or naturally-emerging epidemic.[79]

Forced by dire circumstances, each of the three West African countries most affected by Ebola established inter-agency and international Ebola Response Centers to facilitate effective command, control, and communications. These Centers facilitated coordination among the many civilian, military, local, African Union, and international government, non-governmental, and private sector responders. Some of the most important contributions to the successful Ebola intervention, involving more than seventy countries, were from private philanthropic and technical organizations such as Doctors Without Borders and the Paul Allen, Bill and Melinda Gates, and Facebook Foundations. We can expect that such public private partnerships will be the key to preventing, detecting, and responding to similar health emergencies in the future — whether they occur naturally or are the result of deliberate attacks.

Deploying Key Technologies

The key to saving lives is prevention, rapid detection, and fast, effective response to biological events. Strong information technology systems that facilitate real-time collection, sharing, and analysis of

79 Linking Public Health with Law and Multisectoral Rapid Response Action Package: GHSA Action Package Respond-2. Global Health Security Agenda. Available at: https://ghsagenda.org/packages/r2-linking-public-health-law-rapid-respone.html (accessed 20 March 2016).

epidemiological, genomic, and clinical data are vital. Unfortunately, the public health and academic sectors can be slow to adopt cutting edge technology. This is one reason why ending dangerous taboos against health data sharing and academic traditions of withholding data prior to publication are essential. The ongoing revolution in diagnostic and information technologies make the goal of real-time global disease surveillance achievable.[80]

In 2015, we wrote that improving the rapid employment of relevant and available technologies could have improved the US response to the Ebola outbreak in West Africa. The response effort included several relative successes in deploying mobile laboratories to key locations and using improved diagnostic tools, however:

> "Lack of innovation on the information technology and biosurveillance front...impeded an effective response. Although the Pentagon had developed a suite of advanced biosurveillance systems through activities such as the Able Response bioterrorism exercise series with South Korea, bureaucratic hurdles hampered the U.S. government's ability to share them with West African governments, international nongovernmental organizations, and other key players on the ground. Now that the scale of the Ebola crisis has waned, private partners such as the Paul G. Allen Family Foundation, Facebook, and NetHope are fostering data system innovation to prepare for future pandemics, but such tools were not applied rapidly enough to meet their full potential in countering Ebola's spread."[81]

The lack of licensed, stockpiled drugs and vaccines for rare emerging and re-emerging infectious diseases is also a major obstacle to

80 Moon S., et al. Will Ebola Change the Game? Ten Essential Reforms before the Next Pandemic. The report of the Harvard-LSHTM Independent Panel on the Global Response to Ebola. The Lancet. Vol. 386. Issue 10009 (November 2015).

81 Weber A., Parthemore C. Innovation in Countering Weapons of Mass Destruction. Arms Control Today (July/August 2015).

mounting effective responses to Ebola and other deadly epidemics. Three major pharmaceutical companies did accelerate production and testing of an Ebola vaccine, but unfortunately much too late to save the many brave health care workers who perished during the Ebola crisis. Biodefense research and development programs in the United States, Canada, and elsewhere were the source of the only Ebola vaccines, therapeutics, and diagnostics in the pipeline when the crises emerged. More government support to such programs is needed to offset the lack of commercial incentives and markets for such products.

While the Ebola outbreak was a naturally-occurring public health crisis, in many ways it mirrored the ways in which countries and the world may respond during a deliberate biological attack. Early confusion regarding the scale of potential damage, public misunderstanding and distrust, and an absence of key tools and technologies would all hinder effective response in the event of a terrorist-originated biological attack just as they did during the early months of the Ebola response.

Addressing the Unknowns and Extremes

Many key characteristics of modern biological threats are known today, including the actors most likely to employ them, the ways by which they may seek to obtain them, and the foundational capabilities most important to preventing and responding if they succeed. Yet the biological sciences are evolving more rapidly and more profoundly than perhaps ever before, reshaping biological threats in new ways. Our world is now characterized by an ever-expanding availability and affordability of key tools and great leaps forward in the realm of science and technology. The 2009 U.S. *National Strategy for Countering Biological Threats* describes it as a tripartite challenge: "(1) the risk is evolving in unpredictable ways; (2) advances in the enabling technologies will continue to be globally available; and (3) the ability to exploit such advances will become increasingly accessible to those

with ill intent as the barriers of technical expertise and monetary costs decline."[82]

These characteristics will allow great advances in medicine and other fields, but could provide new opportunities to nefarious actors as well. This could form an especially potent combination if the weapons of mass destruction intentions and resources of terrorist groups continue to expand. Whereas the transition from the Cold War to post-Cold War era saw the actors and scale of biological weapons threats change over multiple decades, we now face game-changers in the technologies, methods, and the rapidity of advances that could be used by potential perpetrators.

It is important to note that the need to focus investments in the foundational capabilities outlined above holds true in the face of this new reality. As we face biological terrorism threats that today seem extreme and nearly impossible to predict or prevent, policies and investments must still recognize that these threats are inherently about protecting human health. However, the modern era of biological threats requires a few new balancing acts: building core capacities while preserving unique investments that may hold the keys to navigating unexpected crises; and maintaining focus on preventing the most likely scenarios while remaining flexible and open-minded enough to ensure failure of imagination does not lead us to lose vigilance in watching for the low-probability but catastrophic events.

Protect unique investments

Many entities already invest in understanding, preventing, and responding to biological threats that seem unique to their communities but may pose broader challenges when they are employed by bad actors or emerge naturally. Defense organizations are particularly strong in this category. The emergence of Ebola in West Africa showed how

82 National Strategy for Countering Biological Threats. The White House. Washington, D.C. 2009. P. 2.

these unique investments can have unexpected utility when new crises emerge.

Private companies often have little or no financial incentive to work on uncommon bacteriological and viral threats such as Ebola if the market for vaccines or therapeutics is small or does not yet exist. However, rare diseases can pose unique manmade or natural threats to defense and civilian personnel who live and operate globally. For terrorists seeking to employ biological weapons, highly transmissible diseases for which there are no known cures or preventive medications may be particularly attractive. Due to this combination of factors, the US Department of Defense was one of the few entities that had invested in finding appropriate medical countermeasures when the West African Ebola crisis emerged.[83] Though these kinds of niche investments may seem unlikely to pay off and face intense scrutiny, they are worth carefully protecting as a hedge against low-probability but high impact biological threats.

Understand the trends

Those tasked with preventing and responding to biological terrorism must maintain an understanding of trends in biological sciences broadly, not just the bioterror intentions of nefarious actors. For one worrisome example, biosecurity expert Gigi Kwik Gronvall explains the potential security implications of advances in synthetic biology:

> "...it is no longer necessary to isolate a pathogen either from nature or a sick patient before developing it as a weapon. The ability to recreate a pathogen from scratch allows eradicated or difficult-to-access pathogens—including smallpox, which has been eradicated from nature although its genetic sequence is freely available online—to be used as weapons. Even viruses that are not eradicated

83 Noack R. Why Ebola Worries the Defense Department. The Washington Post (August 5, 2014).

and could theoretically be isolated from the environment...A skilled actor could use synthetic biology to develop novel pathogens (e.g., a variant of influenza). Finally, synthetic biology could also allow pathogens to be modified so that stockpiled medical countermeasures, diagnostic tests, or detectors are rendered ineffective, leading to delays in diagnosis and public health interventions."[84]

Growing concerns about synthetic biology, gain of function experiments, and other trends show the need for vigilance by decision makers and senior leaders. Understanding trends that may facilitate biological terrorism, however, does not necessarily require advanced degrees or laboratory skills. Governments in particular can work toward this objective by ensuring their staffs have support in accessing both the noticeable trends and potentially game-changing possibilities that most commonly originate from the private sector and academia. This can be as simple as supporting continuing education, rewarding attendance at conferences and meetings that shed light on new bioterrorism possibilities, and other means of incentivizing regular and broad-based interaction among governmental and non-governmental players.

Importantly, this mandate is not limited to new or advanced technologies. Reducing the risk of biological terrorism also requires creative thinking of how would-be perpetrators may use basic, common tools as simple as commercial spraying devices and home brewing equipment, and tailoring preventive measures accordingly.

Leadership

Perhaps the biggest challenge is sustained political leadership and advocacy to improve our abilities to prevent, prepare, exercise, and respond to rare catastrophic bioterrorism and pandemic events. Leaders

84 Gronvall G.K. Mitigating the Risks of Synthetic Biology. New York. Council on Foreign Relations (February 2015). PP. 4—5.

don't get credit for preventing a disaster, but the public can quickly lose confidence in government leaders when catastrophe strikes. One applicable model for cultivating leadership in preventing biological terrorism is the series of Nuclear Security Summits held across the Obama administration's time in office. These high-level international summits have generated enormous political will for coordinated approaches to preventing nuclear terrorism. This degree of leadership engagement and action must be matched through efforts like the Global Health Security Agenda if we are to effectively prevent and prepare for biological nightmares.

Conclusion

Biological threats will continue to evolve, just as the scale of the Ebola crisis seemed to take the entire world by surprise. Terrorism will likewise persist in the years and perhaps decades ahead, with few boundaries to the geographic scope or scale of potential atrocities. All of the actions outlined in this chapter can help prevent and prepare for whatever is next as these trends combine. Leaders in each country must find their best balance of developing a solid foundation of core capacities and investing in countering dangerous, unique threats that may emerge. Working across borders, collaborating among all communities of actors and responders, directly reducing the availability of dangerous materials, and creatively applying relevant technologies are all required to prevent catastrophic biological threats.

10. RECOMMENDATIONS ON CERTAIN IMPORTANT ISSUES DISCUSSED AT THE CONFERENCE

10.1 On WMD security

Resume cooperation on WMD security, including nuclear material security, to prevent the threat of catastrophic terrorism. In particular, emphasis should be given to improving security of radiological materials to counter the growing danger of terrorist acts with the use of a "dirty bomb."

Russia and the United States bear a special responsibility to cooperate on WMD security. They are the world's largest nuclear powers, collectively possessing over 90% of the world's nuclear weapons and nuclear materials. For over twenty years, Moscow and Washington successfully worked together to reduce nuclear dangers and mitigate serious risks to our common security. That cooperation, however, has largely come to a standstill as a result of the recent downturn in bilateral relations.

Russia and the United States should seek to resume WMD security cooperation as soon as possible. These matters are too important and too consequential for politics to interfere. Terrorist organizations, particularly the Islamic State (IS), have announced their intentions to seek weapons of mass destruction. Illicit networks have been caught smuggling radiological materials that could be used for "dirty bomb" attacks. Both countries face the pressures of balancing effective security with shrinking federal budgets.

Firstly, Russia and the United States should resume cooperation on nuclear materials security. A new approach to cooperation should be developed based on the principles of mutual benefit and equal partnership. While the focus of previous cooperation had been on technical assistance, the focus of future cooperation should be on sustainability, continuous improvement, and countering nuclear terrorism. Particular attention should be placed on developing channels of communication to share intelligence and critical information pertaining to non-state threats to nuclear facilities. Furthermore, both countries should expand nuclear security cooperation in third countries and continue the successful program of HEU repatriation.

Secondly, Russia and the United States should cooperate on radiological security. Radiological terrorism is an increasing threat and the international community should do more to secure these dangerous materials and keep them out of the hands of terrorists. A "dirty bomb" detonated in a major metropolitan area could result in economic losses in the billions of dollars as a result of evacuations, relocations, cleanup, and lost wages. Potential bilateral cooperation in this area include technical exchanges, best practice workshops, joint removal projects in third countries, and information sharing.

Lastly, Russia and the United States should revive cooperation on biological and chemical weapons threats. Terrorist organizations have previously used such weapons in attacks against civilians. More work should be done to increase awareness of the chemical and biological threat — and to improve security of facilities with chemical and biological agents which could be used in an improvised weapon. Confidence-building measures should also be developed to enhance international assurance surrounding the security of biological and chemical agents.

10.2. On Nuclear Disarmament Verification

Work together on verification research associated with technical issues on nuclear arms reduction, including through the International Partnership on Nuclear Disarmament Verification.

Verification measures are implemented around the world every day for commitments related to nuclear and chemical weapons, nuclear material, and other military activities. Inspectors use an extensive toolkit of instruments, techniques, and methods—including data exchanges, on-site inspections, tags and seals, containment and surveillance equipment, and environmental sampling—to verify compliance with a range of bilateral and multilateral agreements.

Such verification systems and methods are crucial to managing risks and mitigating threats, but gaps remain. Going forward states will need the ability to monitor and detect smaller items and quantities of nuclear material. While important contributions have already been made to address these challenges, the development and application of new technologies and concepts will be essential.

The US government is leading an International Partnership for Nuclear Disarmament Verification in cooperation with NTI. The International Partnership is designed to build capacity among both states with and without nuclear weapons, and develop technical solutions for monitoring and verification challenges across the nuclear weapons lifecycle. Twenty six countries are participating in the Partnership's work.

The Partnership is a sustained, multi-year effort that consists of both technical working groups that take on specific projects, tasks, and collaborative research and development activities, and holds up to two plenary meetings each year. These plenary meetings, comprised of senior officials and technical experts, monitor the progress of the working groups, discuss common themes and challenges, and increase the understanding of other relevant research that may inform the work of the Partnership. Two plenaries have been held already, in Washington DC and Oslo in 2015, and a third will be held in Tokyo

in June 2016. Three working groups have been established for the first phase of work: Monitoring and Verification Objectives; On-Site Inspections; and Technical Challenges and Solutions. They will be meeting in Geneva in February 2016.

10.3. On Cyber Security

Cyber security threats and strategies need close cooperation between Russia and the US.

Cyber attacks are increasingly one of the major threats facing all countries. Key infrastructure, including that important for securing nuclear materials and weapons, is not immune to cyber attacks. For example, experts have highlighted the potential vulnerability of nuclear power plant control systems, the risk posed by malevolent insiders to nuclear material accounting systems, and the potential for compromise of access control systems. These vulnerabilities could lead to a cyber-mediated theft of nuclear materials or catastrophic radiation releases and should receive high-level attention.

Of even greater concern, due to the inherent vulnerability of digital systems, the United States and Russia cannot be fully confident that even their nuclear command, control, and communication (NC3) systems will operate as planned if attacked by a sophisticated cyber opponent. Cyber attacks on NC3 systems could convey false information of an attack, jeopardize the confidence of government officials or even potentially allow an adversary to take positive control of a nuclear weapons system.

As a result, US and Russian experts need to jointly consider the implications and challenges posed by the cyber threat to current nuclear force postures and policies and identify means to minimize the risk. Key questions that must be addressed include: How does the cyber threat affect the risks of unintended launch? How would uncertainty about command and control vulnerabilities affect crisis decision making and strategic stability? What must be done to ensure that the cyber threat does not increase strategic risks?

10.4. On the Implementation of the NPT Provisions

A new start should be given to the implementation of the NPT provisions. The central role here should be played by Russia and the US.

There is an obvious and strong necessity to renew joint efforts towards activization of implementation of the Non-Proliferation Treaty' provisions, including the agreed outcomes of the 1995, 2000 and 2010 Review Conferences.

Russia and the US should undertake all possible efforts to resume the nuclear arms control negotiations following the provisions of the Article VI of the NPT Treaty which urges the 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, and on a treaty on general and complete disarmament under strict and effective international control". The mutual activity on the way to the implementation of this important obligation is considered by other states as the strong stimulus in strengthening the non-proliferation regime.

The implementation of provisions of the NPT Treaty has continuing importance. Participants to the regular Review Conferences constantly emphasize that in accordance with NPT the ultimate objective of the efforts of states in the disarmament process is general and complete disarmament under effective international control.

It is also important to underline that recalling the NPT commitment mentioned above China, France and UK should include themselves into the process of reduction of stockpiles of nuclear weapons which will give a positive sign for other countries.

The conditions should be created for non-member parties to accede to the NPT Treaty. This presupposes the efforts to be taken by Russia and the US to strengthen international and regional security.

Russia and the US should also do everything in their power in cooperation with other P5 states to insist on strict implementation of all provisions of the NPT Treaty.

The NPT Review Conferences strongly deplore the nuclear activity and the nuclear tests conducted by the Democratic People's Republic of Korea. As it is emphasized in the documents of the Conferences, in accordance with the Treaty, DPRK cannot have the status of a nuclear-weapon state.

Following the provisions of the Treaty special attention should be rendered by all P5 states to the commitment not to transfer to any recipient nuclear weapons or other nuclear explosive devices, or control equipment and not to assist, encourage or induce any non-nuclear-weapon state to manufacture or otherwise acquire nuclear weapons.

At the same time, the documents of the NPT Review Conferences once more pay attention to the universal right of the states in the development of peaceful uses of nuclear power. This presupposes, in line with Article IV, efforts on the part of the P5 states to render assistance to the development and growth of civil nuclear power to other countries. At the same time the P5 states should undertake all measures possible to ensure that their nuclear-related exports in no way may support the development of nuclear weapons. All possible concerns with the cases of non-compliance should be pursued by diplomatic means.

The practice should be welcomed of creation of a reserve of low-enriched uranium (LEU) in the Russian Federation for use by IAEA member states as well as the establishment of an IAEA owned and operated LEU Fuel Bank to be hosted by Kazakhstan.

The recent dangerous accidents with nuclear power stations raise once more the issue of nuclear safety and security. These dangers though being under the national legislation demand persistent attention and may be most effectively prevented and overcome under the broad international cooperation and exchange of experience between the P5 states. Amendment to the Convention on Physical Protection of Nuclear Material should be ratified as soon as possible to allow this document to enter into force.

A central role in developing comprehensive nuclear security guidance documents is played by the IAEA. The role of the IAEA should be

reaffirmed and more support rendered to its activity. A set of special measures in this connection should be elaborated.

The Additional Protocol plays an important role in supporting the non-proliferation regime. At the same time its conclusion is a sovereign decision of any country, but once in force this document becomes a legal obligation to the state.

The catastrophic humanitarian consequences of any use of nuclear weapons should be constantly emphasized. This is especially important due to the fact that a new generation of political elite, not always being aware of the global disastrous consequences of even "limited" usage of nuclear weapons, has come to power in the states which play important role in the non-proliferation process. This raises the importance of the activity of the knowledgeable expert community in its dialogue with the national authorities.

Further support should be rendered to the creation of new nuclear-weapon-free zones. A sizeable stimulus for this may be provided by strengthening international and regional security which may be done most effectively with the active support of Russia and the US. It is important that the nuclear-weapon states should bring into effect the security assurances provided by the nuclear-weapon-free zone treaties and their protocols.

11. JOINT STATEMENT OF THE LUXEMBOURG FORUM AND THE NUCLEAR THREAT INITIATIVE (NTI) ON PREVENTING NUCLEAR CATASTROPHE

INTERNATIONAL LUXEMBOURG FORUM ON PREVENTING NUCLEAR CATASTROPHE
www.luxembourgforum.org

NTI
BUILDING A SAFER WORLD

Preventing the Crisis of Nuclear Arms Control and Catastrophic Terrorism

December 2, 2015, Washington D.C.

Recognizing that the interests, perspectives, and actions of the West and Russia diverge in Ukraine and Syria, it should be emphasized that the US and Russia continue to share interests in reducing the risks of nuclear war, terrorism and proliferation. Indeed, as the possessors of the world's largest nuclear arsenals and longstanding leaders of the nuclear nonproliferation regime, the US and Russia have special responsibilities to cooperate on nuclear matters even when they clash on other matters.

As a matter of highest priority, there is an urgent and immediate requirement to rebuild US-Russian relations. Because of the nuclear dangers that haunt their relationship, this reconstruction should include a new declaration reconfirming their common view of nuclear war — that it cannot be won and must never be fought. The US and Russia should revive and strengthen all channels of communication. Dialogue can no longer be treated as a bargaining chip. Continuous

dialogue is essential between political, military and intelligence leaders through direct bilateral channels and the NATO-Russia Council.

Tensions between the United States/NATO and Russia are exacerbating an already profound crisis of nuclear arms control, disarmament, and non-proliferation. Despite a few important examples of cooperation such as the 2010 New START Treaty and the Joint Comprehensive Plan of Action on the Iranian nuclear program, the state of affairs on nuclear issues remains bleak. US-Russian dialogue across a range of security threats and arms control issues has broken down, multilateral cooperation for nuclear arms control and disarmament has been impaired, and existing arms control measures are jeopardized.

Today there is no agreed process or agenda for next steps on nuclear disarmament and risk reduction between Russia and the United States, who between them still possess over 90% of the world's nuclear weapons. While nuclear arms control is dormant, international crises put serious pressures on US-Russian relations and raise concerns about nuclear risk. Dangerous military incidents have occurred and official statements emphasizing nuclear capabilities have implied the possibility that nuclear weapons might be used, reviving fears of possible military conflict that could potentially lead to nuclear escalation between Russia and the US.

Stepping back from this dangerous ledge will require the urgent joint effort of the leaderships of the two biggest nuclear powers and their allies. They should recall the wisdom of former Soviet and US leaders who, during the Cold War, managed to cooperate to prevent nuclear catastrophe even during profound crises in relations. Starting in 1963, they reached a number of agreements that led to joint statements articulating the belief that "a nuclear war cannot be won and must never be fought." In the ensuing fifty years these agreements laid the groundwork for significant success in nuclear arms control.

Today, the leaders of Russia, the United States, and their European allies should draw on that history and work to avoid the catastrophe of global nuclear war, which could be triggered even by limited and

selective use of nuclear weapons. These threats are all growing, as is the threat of nuclear terrorism by groups such as ISIS.

An important and necessary step in addressing nuclear dangers is discussion on the dangerous "prompt-launch" or "hair-trigger" status of strategic missiles — a perilous posture inherited from the Cold War. In addition, it is imperative to avoid the possibility of launch by accident, miscalculation or sabotage. Reducing nuclear risks should be at the top of the agenda — even as the crises over Ukraine, Syria and the flow of refugees to Europe demand serious attention.

Leaders should recall that, in the past, each time a new US-Soviet or US-Russian nuclear arms control agreement was signed, the parties immediately started negotiations for the next one. Presently, five years after approval of the 2010 New START Treaty, there are no negotiations underway or expected. At the same time, the Comprehensive Test Ban Treaty has not entered into force, the Intermediate-range Nuclear Forces Treaty is under threat, and the Conventional Forces in Europe Treaty is not being implemented. Important negotiations are deadlocked and cooperative steps that would improve the security of all parties are on hold. At a moment of friction and conflict when restraint is needed, arms control is failing; trust is being eroded precisely when it is most needed.

Consequently, we urge Presidents Putin and Obama, hopefully joined by their principal allies, to do the following:

Without further delay resume the process of negotiations for follow-on reductions of strategic arms.

Undertake measures to exclude the risk of accidental or mistaken launch of missiles and extend the time available to national command authorities for decision-making on the launch of strategic missiles.

Resume cooperation on WMD security, including nuclear material security, to prevent the threat of catastrophic terrorism. In particular,

emphasis should be given to improving security of radiological materials to counter the growing danger of terrorist acts with the use of "dirty bomb".

Renew diplomatic efforts on the issues of U.S./NATO ballistic missile defense and strategic precision-guided conventional weapon systems to resolve existing controversies and reach agreements ensuring that those weapon systems will not undermine stability in the future.

Initiate talks on the limitation, reduction and confidence-building measures related to sub-strategic nuclear weapons.

Initiate a dialogue on cybersecurity focused on developing shared approaches to combating cyberthreats, in particular those that may threaten nuclear command-control and early-warning assets as well as other critical facilities and sites.

Work together on verification research associated with technical issues on nuclear arms reduction, including through the International Partnership on Nuclear Disarmament Verification.

Renew joint efforts to strengthen the implementation of the nuclear Non-Proliferation Treaty, including the agreed outcomes of the 1995, 2000 and 2010 Review Conferences.

Today we find ourselves in a race between cooperation and catastrophe. Consequently, leaders must begin this work immediately. Because of growing tensions across the globe, renewed and enhanced dialogue is essential. No security architecture, no set of rules, no efforts to negotiate or implement agreements can succeed without leaders who are committed to addressing core issues and who are willing to cooperate. It is their obligation as leaders to work together to build a safer world for all our citizens.

12. LIST OF PARTICIPANTS

Joint Conference of the Luxembourg Forum and the Nuclear Threat Initiative on Preventing Nuclear Catastrophe

Washington D.C., December 1—2, 2015

INTERNATIONAL LUXEMBOURG FORUM ON PREVENTING NUCLEAR CATASTROPHE
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24. **Sergey OZNOBISHCHEV** — Deputy Chairman of the Organizing Committee, International Luxembourg Forum; Head of the Section of the Primakov Institute of World Economy and International Relations (IMEMO), RAS; Director of the Institute for Strategic Assessments; Professor of the MGIMO (University), Ministry of Foreign Affairs of Russia; (former Chief of the Organizational Analytic Division, RAS); Ph.D. (Russia).

25. **George PERKOVICH** — Vice President for Studies — Global Security and Economic Development and Director of the Non-proliferation Program at the Carnegie Endowment for International Peace, Ph.D. (USA).

26. **William PERRY** — Professor, Stanford University; Member of the Supervisory Board of the International Luxembourg Forum; (former Secretary of the US Department of Defense); Ph.D. (USA).

27. **Samantha PITTS-KIEFER** — Senior Program Officer for Scientific and Technical Affairs, Nuclear Threat Initiative (USA).

28. **William POTTER** — Director James Martin Center for Non-proliferation Studies and Professor of Non-proliferation Studies, Monterey Institute of International Studies, Ph.D. (USA).

29. **Leon RATZ** — Program Officer for Material Security and Minimization, Nuclear Threat Initiative (USA).

30. **Tariq RAUF** — Director, Disarmament, Arms Control and Non-Proliferation at the Stockholm International Peace Research Institute; (former — Head, Verification and Security Policy Cooperation at the IAEA, Coordinator, Multilateral Approaches to the Nuclear Fuel Cycle, IAEA); Ph.D. (Canada).

31. **Joan ROHLFING** — President and Chief Operating Officer, Nuclear Threat Initiative; Member of the U.S. Department of Defense Threat Reduction Advisory Committee; Member of the Council on Foreign Relations; (former Senior Advisor for National Security to the US Secretary of Energy) (USA).

32.	**Roald SAGDEEV**	Distinguished University Professor, Department of Physics at the University of Maryland; Director Emeritus of the Russian Space Research Institute; Member of the Supervisory Council of the International Luxembourg Forum; Academician, RAS (Russia/USA).
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34.	**Ellen TAUSCHER**	Member of the Board of Directors, Nuclear Threat Initiative; (former Congresswoman, Under Secretary of State for Arms Control and International Security Affairs) (USA).
35.	**Andrew WEBER**	Member of the Council on Foreign Relations; (former Assistant Secretary of Defense for Nuclear, Chemical and Biological Defense Programs) (USA).
36.	**Isabelle WILLIAMS**	Senior Advisor of the Nuclear Security Project, Nuclear Threat Initiative (USA/United Kingdom).