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Strategic Stability:
It Takes Two to Tango?

This article focuses upon the most recent trends in nuclear deterrence and strategic stability. It addresses the contemporary developments in three interconnected domains: first-strike, crisis and arms race stability. It traces the evolution of strategic stability studies, highlights the most fundamental contribution in the three above-mentioned study areas, and attempts to explain the change in contemporary nuclear deterrence. During the Cold War the superpowers developed international practices and unwritten rules of nuclear deterrence. Political practices emerged together with extensive studies of nuclear deterrence, which were based on a rational choice approach and game modelling. Contemporary international relations (IR) faces revival of nuclear deterrence studies. While some scholars are rediscovering the Cold War IR analysis models and adapting them to contemporary realities, others are looking for new analytical possibilities. This article focuses upon interlinkages between first-strike, crisis and arms race stability, and attempts to explain how changes in strategic environment can help better understanding the contemporary nuclear deterrence. It discusses whether and under what conditions nuclear parity, first-strike stability, arms control and crisis equilibrium can guarantee the strategic stability and military balance. It also addresses the qualitative or quantitative change in the conflict or crisis perception, and its implications on contemporary deterrence.

Introduction

Change and stability are the most pivotal concepts not only for social science, but for natural and exact sciences as well. Explanation of change is usually associated with the analysis of factors affecting the stability and a system's adaptation to change. Studies of nuclear deterrence are not exceptional; they focus on the perception of change and stability, attempting to better understand the critical decision-making processes as well as factors affecting the strategic planning decisions. From the very early years of the Cold War, nuclear deterrence scholars started thinking about stabilising deterrence and preventing the nuclear exchange. The strategic stability studies evolved over

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the Cold War as nuclear deterrence research and focused on international stability and military balance.

During the first two post-Cold War decades, strategic stability studies had been almost forgotten by scholars of international relations. At that time, with a successful disarmament undertaken and diminished risks of nuclear exchange, the probability of all-out war between global powers was perceived as obsolete. Scholars and political leaders believed that nuclear weapons are losing their utility. In a more complex world, the nature of conflict has fundamentally changed and the use of nuclear weapons was perceived as barely possible. The nuclear weapon-related challenges were nuclear proliferation, non-state actors' engagement in nuclear proliferation and risks of accidental use of nuclear weapons.

Currently, International Relations (IR) is facing evident revival of the nuclear deterrence studies; some scholars are rediscovering the Cold War IR research and attempting to apply the old analysis models and perspectives to contemporary realities, while others are looking for new analytical possibilities. Since the end of Cold War, IR has significantly evolved with the development of critical security studies, constructivism and other post-positivist perspectives that are contributing to deterrence studies, both ontologically and epistemologically.

This article focuses on the contemporary nuclear deterrence and strategic stability. It addresses three areas most frequently attributed to strategic stability, namely, first-strike stability, crisis stability and arms race stability. It traces the evolution of strategic stability studies and analyses the most fundamental contribution in the three above-mentioned study areas. The article aims to find the interlinkages between first-strike stability, crisis stability and arms race stability, and explain the change in the contemporary nuclear deterrence and strategic stability.

1. Evolution of Nuclear Deterrence Studies

Deterrence studies have evolved over time. Nuclear deterrence scholars focused on political and strategic dynamics, and principles of strategic decision-making. In 1979, Robert Jervis[1] distinguished three waves of deterrence research. Later, in 2010, Jeffrey Knopf[2] suggested adding a fourth wave to Jervis'

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[1] Jervis R. (1979), "Deterrence Theory Revisited", *World Politics*, 31(2).
[2] Knopf J. W. (2010), "The Fourth Wave in Deterrence Research", *Contemporary Security Policy*, 31(1).

classification. The earliest deterrence studies observed the strategic changes in the nature of war and strategic planning, related to nuclear weapons. Bernard Brodie observed that the atomic bomb had fundamentally altered the nature of war; this strategic revolution occurred because of the possibility of total destruction inherent in the use of nuclear weapons, which meant that defeating an adversary would serve no or virtually no purpose.[3] The first wave of deterrence studies and strategic stability studies addressed nuclear weapons in a broader context of strategic balance; they observed and defined the strategic difference of nuclear weapons in comparison to conventional types of conflict. Nuclear deterrence was perceived as a means to discourage the opponent from the nuclear attack and protect urban industrial centres.

The second wave of deterrence studies highlighted rationality as the fundamental characteristic of the political actor and a pivotal principle of the decision-making process. Scholars developed game theories, based on qualitative modelling. Thomas Schelling was one of the first to classify war as a bargaining process in which opponents attempt to influence each other's expectations and intentions by means of threats, promises and action.[4] He defined strategic stability and carried out an extensive research on nuclear deterrence, conflict management, arms control and the strategic decision-making process. Those studies introduced and developed first-strike stability, crisis stability and arms race stability perceptions.

The third group emerged in the 1960s and 1970s as a criticism to dominant rational choice deterrence research. A large group of scholars questioned the rationality of decision makers in nuclear deterrence and strategic stability (see Table 1). The third wave led nuclear deterrence to extensions into cognitive psychology and behavioural studies.[5] This group of scholars argued that rationality in nuclear deterrence is impossible and the assumption that a decision-making process is rational, is relatively weak. Actors can have limited information and their decisions can be based on emotion and irrational judgement. The judgement might be based on misperception of another party's intentions. The third wave of deterrence studies not only focused on criticism of rational choice, they contributed to the study field by case studies and statistical studies. This group of scholars observed limitations to rational

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[3] Van del Putten F., Meijnders M., Rood J. (2015), "Deterrence as a Security Concept against Non-Traditional Threats", *In-depth study Clingendael Monitor*, Clingendael, p. 7.

[4] Schelling T. (1966), *Arms and Influence*, New Haven: Yale University Press.

[5] Brantly A. (2018), "The Cyber Deterrence Problem", 10th International Conference on Cyber Conflict, NATO CCD COE Publications, Tallinn, p. 33, https://ccdcoe.org/uploads/2018/10/Art-02-The-Cyber-Deterrence-Problem.pdf , 10 09 2019

choice approaches and their inabilities to explain a number of deterrence failures. Patrick Morgan highlighted that "in the crisis the actors face political and cultural barriers to empathy, plus cognitive shortcomings – various heuristics that distort perception and judgement; as a result, there are common failings in deterrence."[6]

The fourth wave emerged in a period between 1991 and 2001. Authors highlighted the diminished threat of nuclear war, emphasised the risks of non-proliferation challenges, and highlighted the significance of non-state actors such as terrorists and their possible roles and impact on asymmetric nuclear deterrence. Deterrence was perceived as a psychological relationship.[7] Those studies were less systematic; scholars were taking into account more complex implications affecting the nuclear security domain. Scholars such as Lawrence Freedman, Ted Hopf and others expanded the perception of deterrence beyond the military domain, to have it more relevant and applicable for a new security environment. They extended the scope of nuclear deterrence including additional analysis levels, new actors, and new factors and threats that might affect nuclear deterrence. The fourth wave focused on new non-military security challenges, threats of terrorism, cyber security and artificial intelligence, and addressed the issues related to new technologies, missile defence and non-proliferation.

Table 1. **Five waves of strategic stability and nuclear deterrence studies**

Deterrence studies	Authors	Major contribution
First wave (1950s–1960s)	Bernard Brodie, Arnold Wolfers, Jacob Viner, Vannevar Bush, David Rosenberg	Definition of the study field; Definition of deterrence principles; Changing nature of war and conflict.
Second wave (1960s–1970s)	Thomas C. Schelling, Steven Brams, Mark Kilgour, Robert Powell	Rational choice approach, game modelling, strategic balancing, crisis stability, first-strike stability.
Third wave (1970s–1980s)	Richard Lebow, Janice Gross Stein, Patrick Morgan, Glenn Snyder, Robert Jervis, John Steinbruner, Graham Allison, William Wohlforth, John Gaddis, James Lebovic, Shu Guang Zhang, Frank Zagare	Case and statistics studies; Focus on cognitive psychology and behaviour studies; Questioned rationality in strategic decision-making; Criticism of rational choice inability to explain deterrence failures.

[6] Morgan P. (2003), *Deterrence Now*, Cambridge: Cambridge University Press, p.142.
[7] Kroenig M. and Pavel B. (2012), "How to Deter Terrorism", *The Washington Quarterly*, 35(2), p. 21-36.

Fourth wave (1990s–2000s)	Patrick Morgan, Thazha Paul, Marc Kilgour, Steven Brams, Lawrence Freedman, Matthew Kroenig, Colin Gray, Keith Payne, James Acton	Non-proliferation studies; Deterrence against asymmetric/non-traditional hybrid threats; Deterrence and non-state actors; Tailored deterrence; Normative approaches to deterrence.
Fifth wave (period after 2010)	Hans Kristensen, Corentin Brustlein, Andrew Futter, Amy Woolf, Brad Roberts, Aaron Brantly, David Yost, Amir Lupovici	Cold War deterrence studies principles combined with the new asymmetrical; Multidimensional deterrence; Technological impact; Role of artificial intelligence and cyber; Fusion of different waves of deterrence studies' findings.

Source: created by author, based on classifications of Robert Jervis and Jeffrey W. Knopf.

The contemporary nuclear deterrence studies are being built on the findings of the fourth wave. The contemporary research on strategic stability differs from the one that emerged right after the end of the Cold War and after the September 11 attacks, as it attempts to combine the rational choice findings with the multidimensional third and fourth wave studies, and tries to correspond with the contemporary security realities. The failing arms race stability, emerging new challenges and the growing role of new technologies are bringing back the focus on traditional state actors, but at the same time, retaining the focus on the hybrid and asymmetrical security challenges. A newly emerging strategic environment determines the changes in perception of strategic stability, which is even more complex, less symmetrical, addresses multiple complexed realities, combines positivist and post-positivist analytical approaches and looks into different analysis levels. Scholars are trying to depict systemic, regional and national effects on nuclear deterrence, and attempt to find a cohesion between traditional and revisional approaches to deterrence.

During the Cold War, the superpowers developed the particular international practices and unwritten rules in the area of nuclear deterrence. Political practices emerged together with extensive studies of nuclear deterrence, which were based on rational choice and game modelling. Currently, while some Cold War scholars of strategic stability and nuclear deterrence are re-

turning to their previous study fields,[8] a new generation of strategic studies is emerging. This article focuses on the evolution of strategic stability and depicts the contribution by the fourth and fifth waves of deterrence studies, and outlines their possible future directions. It addresses the contemporary trends in strategic stability in three interconnected domains of strategic stability: first-strike stability, crisis stability and arms race stability.

2. Concept of Strategic Stability

A concept of strategic stability was introduced by Thomas C. Schelling[9] and Morton Halperin in their 1961 book *Strategy and Arms Control*. They defined strategic stability as "a situation where the risks of war are low because neither side has an incentive to strike first and this calculation is reasonably secure against shocks, alarms and perturbations."[10] During the Cold War, the strategic stability was aimed at balancing strategic, military imbalances and ensuring the credible nuclear deterrence, discouraging the opponent from nuclear attack. American nuclear strategists believed that development of nuclear forces in both the United States and the Soviet Union could lead to broader international stability due to the symmetrical balance of terror between the superpowers.[11] The perception of strategic stability evolved over time and finally became very complex and sophisticated.

Strategic stability contains a lot of confusion stemming from the complexity and fluidity of the concept. It involves complex political and military domains, such as the decision-making process, negotiation, military doctrines, conflict studies, defence and military planning, force postures and nuclear technologies. David Yost noticed that "while force postures may play a critical role in deterrence, crisis management, and operations, strategic stability depends fundamentally on political factors, including the objectives and decision-making dynamics of the potential adversaries".[12] Strategic stability also reveals a very close connection between strategic military planning and political negotiation processes, which cannot be addressed separately.

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[8] For instance Patrick Morgan, David Yost, Lawrence Rubin, Adam Stulberg, Frank Harvey.

[9] In 2005 Thomas Schelling received a Memorial Nobel Prize for game modelling in strategic and conflict studies.

[10] Koblentz G. (2014), "Strategic Stability in the Second Nuclear Age", *Council Special Report No. 71*, New York: Council on Foreign Relations, p.19.

[11] Kroenig M. (2018), *The Logic of American Nuclear Strategy: Why Strategic Superiority Matters*, Oxford: Oxford University Press, p.128-129.

[12] Yost D. (2013), "Strategic Stability in Europe", *The Non-Proliferation Review*, 20(2), p. 208.

The term strategic stability was developed by rational choice approaches. Later, it was challenged by the third wave deterrence studies criticising the rationality of decision-making processes and highlighting failures of deterrence. Notwithstanding this, the concept finds its way into the research of contemporary deterrence and reveals the attempts to connect the findings of the Cold War studies on nuclear deterrence with the contemporary research. For scholars of the fourth and fifth waves of deterrence studies, this concept became even more enigmatic, complex and fluid. The fourth wave deterrence studies have expanded the perception of strategic stability, introducing additional elements to the concept. It focuses on the changing nature of armed conflict, the role of non-state actors, proliferation risks and asymmetrical security challenges that might alter principles of deterrence such as cyber, technology development and artificial intelligence. The fourth wave scholars have also highlighted the challenges and risks that are intentionally or unintentionally ignored, unanticipated and excluded from the deterrence strategies.

The most recent studies of strategic stability are focused on multiple levels of analysis – global/systemic, national, but in particular on the regional level of deterrence dynamics, which makes nuclear deterrence and perception of military calculus even more complex and challenging. Some scholars are addressing regional strategic stabilities in South Asia, the South Pacific, Europe, South Asia or the Middle East. As Frank P. Harvey observes, "if deterrence is primarily about 'relationships', as old threats diminish, as new threats emerge, and as bipolarity collapses under the weight of multipolar pressures, a complex mix of strategies will be needed to address new and evolving relationships."[13]

As Stephen Cimbala observed, "the concept of stability in nuclear deterrence divides itself into at least three aspects: first-strike stability; crisis stability, and arms race stability."[14] Those three elements (or research directions) of strategic stability are closely interlinked and cannot be addressed in isolation; they reveal how strategic doctrinal elements, defence planning and military balance contribute to a broader perception of the international/global system's stability. Studies of strategic stability reveal the principles and trends in strategic military balance.

James Acton combines Cimbala's three distinguished aspects of strategic stability and attempts to connect the Cold War perception of strategic stability with new strategic dynamics in the post-Cold War world. He defines strategic

[13] Harvey F. (2003), "The Future of Strategic Stability and Nuclear Deterrence", *International Journal*, 58(2), p. 321.
[14] Cimbala S. (2006), "Parity in Peril? The Continuing Vitality of Russian-US Strategic Nuclear Deterrence", *Contemporary Security Policy*, 27(3), p. 418.

stability as "an absence of incentives to use nuclear weapons first (crisis stability), the absence of incentives to build up a nuclear force (arms race stability) and more broadly, it describes the absence of armed conflict between nuclear-armed states."[15] Firstly, Acton's definition refers to a narrow perception of military parity and military calculus and secondly, it depicts a broader nexus of political, diplomatic and defence decision-making processes, including doctrinal aspects of nuclear balancing. Actually, this definition also reveals that nuclear balancing is a hypothetical and cognitive process.

The integrated studies of strategic stability combine perceptions of the equilibrium of nuclear deterrence (not necessarily numerical parity) and major principles that are necessary to better understand complexity of strategic studies. To better understand the interrelation between strategic stability and nuclear deterrence, this article will focus on three major perceptions of strategic stability, namely, first-strike stability, crisis stability and arms race stability, and how those three areas of strategic stability have evolved over time.

3. Strategic Stability: First-strike, Crisis and Arms Race Stability

3.1. First-strike Stability and the Contemporary International System

During the Cold War, it was broadly agreed that nuclear stability is achieved and risks of nuclear exchange are lowered when two nuclear parties obtain a second-strike capability. This principle is known as "a first-strike stability"; it refers to a situation where both nuclear powers are cognisant that after the first nuclear strike, the attacked state will have an opportunity to retaliate. The first-strike stability refers to military balance as a retaliatory nuclear strike capability. Studies of first-strike stability usually explore military strategies and mathematical models that explain *the role of first-strike equilibrium*.

Thomas C. Schelling outlined, "it is not the 'balance' – the sheer equality or symmetry of the situation – that constitutes mutual deterrence; it is the stability of the balance. The balance is stable only when neither, in striking first, can destroy the other's ability to strike back."[16] This principle might be called

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[15] Acton J. (2013), "Reclaiming Strategic Stability" in Colby E., Gerson M, eds., *Strategic Stability: Contending Interpretations*, Carlisle, PA: US Army War College Press, p. 117.
[16] Schelling T. (1958), *Surprise Attack and Disarmament*, Santa Monica, CA: Rand, p. 4.

deterrence by punishment; nuclear power is deterred from the nuclear attack by calculus that any attempt to strike first will not give it any strategic superiority, and other side's retaliation might be disadvantageous. The first-strike stability comes with a certain sense of equilibrium, but it has to be mutually accepted and commonly perceived. The second wave of deterrence studies prioritised first-strike stability studies. During the Cold War, tremendous efforts were put into the development of mathematical models simulating the first-strike stability. The aim was to quantify the incentives to strike first by modelling a nuclear exchange and using the results to determine whether either side was best served by waiting or attacking.[17]

Usually the first-strike stability is explored through a perspective of second-strike capability. *The second-strike* principle is nested in the perception of arms racing[18] to ensure the possibility of retaliatory second strike. It also refers to the mutually assured destruction (MAD) principle and unacceptable damage on an enemy. A principle of the second-strike nuclear deterrence means that after the nuclear strike, the attacked state has sufficient capabilities and ability to strike back and win the nuclear exchange/war, whereas the first-strike stability principle refers to the balance, which comes from the ambiguity that any party can use the nuclear strike first. As David Yost argues, "the dominant prescription was to seek 'first-strike stability' by acquiring highly survivable second-strike forces suited to attacking the other side's population while eschewing capabilities that might limit damage to one's own society."[19]

Scholars disagreed over which strategy of defence – by preparation for the first strike or giving the other side the chance to strike first – is more advantageous. Barry Buzan and Eric Herring notice that "since uncertainty is easy to create when possible costs are very high, the required conditions for effective nuclear deterrence are not difficult to meet, but only as long as the opponent is not desperate, fanatical or irrational."[20] The perception and the level of unacceptable damage for different nuclear parties might be different, which also might affect the nuclear calculus and strategic instability. Stephen Cimbala summarises the two major approaches that dominated during the Cold War:

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[17] Acton J. (2013), Op. cit. p. 122.
[18] MccGwire M. (2006), "Nuclear Deterrence", *International Affairs*, 82(4), p. 776.
[19] Yost D. (2011), "Strategic Stability in the Cold War: Lessons for Continuing Challenges", *Proliferation Paper 36*, Paris: IFRI, p. 17.
[20] Buzan B., Herring E. (1998), *The Arms Dynamic in World Politics*, Boulder, CO: Lynne Rienner Publishers, p. 171-172.

Cold War deterrence logic assumed that first strikers would seek to destroy the opponent's retaliatory forces, in order to minimise the amount of damage caused by the defender to the attacker's society. This assumption of a counterforce first strike followed by a countervalue retaliation drove most US analysis. Some strategists and policy-makers favoured a counterforce second-strike capability in addition to countervalue attacks: only by putting at risk the enemy's remaining deterrent force as well as his cities could leaders impose de-escalation and war termination on favourable terms.[21]

Nuclear deterrence theorists argue about nuclear stability in relation to deterrence stability; they highlight that "nuclear balance of power is the most stable when both states possess a secure, second-strike capability and rough nuclear parity."[22] Steven Brams and Marc Kilgour observe that nuclear deterrence between the superpowers, as long as it is assured by a second-strike capability, would appear to provide the necessary insurance.[23] Matthew Kroenig adds that "the most stable nuclear balance of power would be one in which both states possess survivable arsenals of roughly equal size."[24] Those principles might be relevant under the perfectly predictable security environment, and having absolutely rational actors. However, the reality is more complex and highly unpredictable, so the nuclear parity does not necessarily guarantee the strategic stability. This brings up the argument that the factors of quantity of nuclear weapons cannot significantly change the calculation of risks. That is why the greater precision, mobility and risks of surprise attacks were becoming more significant for nuclear powers during the second half of the Cold War.

Scholars disagree about strategic value, advantages and disadvantages of first-strike stability and the second-strike principle of nuclear deterrence. They provide different arguments on conditions required for the first-strike stability to be achieved. Some believe that parity of nuclear weapons might guarantee strategic stability, while others take into account the broader war fighting strategies and highlight the significant role of conventional capabilities. The third group of experts emphasises the risks of pre-emptive strikes, which might bypass the principles of first-strike stability and avoid escalation that the first-strike stability is preventing. Finally, irrational factors of decision-making processes and risks of miscalculation can affect the first-strike stability concept. They also highlight the risks of escalation to the conventional conflict, as Brams and Kilgour observe: "What worries the political leaders of each superpower considerably more than a 'bolt from the blue' by the other

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[21] Cimbala S. (2006), Op. cit. p. 420.
[22] Kroenig M. (2018), Op. cit. p. 127.
[23] Brams S., Kilgour M. (1987), "Threat Escalation and Crisis Stability: A Game-theoretic Analysis", *The American Political Science Review,* 81(3), p. 833.
[24] Kroenig M. (2018), Op. cit. p.130.

superpower is the possible escalation of a conventional conflict, such as might occur in the Middle East or Western Europe, into a crisis that involves serious threats to their allies or event their own security."[25]

The third and fourth wave scholars reiterate the risks of irrational decision-making processes, increased risks of miscalculation, unpredictability, challenges of proliferation, technology transfer as well as cyber risks. Technological developments, higher precision, greater mobility of launchers and multiple warheads are making the strategic stability process and nuclear deterrence more nuanced and complex. In addition, the first-strike stability perspective does not address the entire strategic/doctrinal perception of crisis and disregards risks of regional-level crisis escalation.

The perception of first strike is relational. Its major weakness is that it excludes the option that parties might not necessarily use the first-strike stability as a strategic advantage – rather a disadvantage – so parties might aim for more room for manoeuvre and strategic flexibility; they might intend to bypass first-strike balance and calculus. So, the first-strike balance or the second-strike capability does not necessarily prevent conflict from happening and limited/regional war from escalating. On the other hand, with the limited nuclear war perception, pre-emptive strike and concept of extended deterrence, the second strike possibility becomes rather ambiguous. Limited strike option does not necessarily preclude escalation to the strategic level. As Richard Lebow and Janice Gross Stein observe, "the problems are particularly acute in the testing of theories of deterrence because of the difficulties inherent in identifying deterrence successes, which leave few if any behavioural traces, and of inferring the intentions of would-be challengers."[26]

Mutual awareness of second-strike capability might not necessarily exist. The existing perception imbalance might produce more room for manoeuvre, but at the same time increase the risk of miscalculation, encourage nuclear powers not to give up the first-strike strategic possibility and develop the alternatives on how to bypass possible strategic [massive] escalation and retain the ambiguity under which conditions the first strike would be possible. Besides, bearing in mind the reflexivity and imitation of the possible actions or deflection from the real intentions of other nuclear power might negatively affect the escalation control and crisis stability, which are closely linked with the first-strike stability.

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[25] Brams S., Kilgour M. (1987), Op. cit. p. 833.
[26] Lebow R., Stein J. (1990), "The Elusive Dependent Variable", *World Politics*, 42(3), p. 336.

3.2. Crisis Stability and Escalation Control

Crisis stability is the most developed and the most sophisticated analytical approach to strategic stability if compared with studies on first-strike stability and arms race stability. These studies have developed game modelling methodologies and substantially contributed to nuclear deterrence, escalation control and crisis stability research. In crisis stability studies carried out by a number of second and third deterrence wave scholars, for instance, Schelling, Kilgour, Morgan, Brams, Harvey, Jervis, Powel, O'Neill, Leah and Lowher, most of them focused on the decision-making process, which is perceived to be rational and actors are supposed to make the most advantageous and rational decisions.

Crisis stability can be defined as "a structural feature of conflict, that even after they have escalated to crisis proportions, permits decision makers to prevent crisis from exploding."[27] It is perceived as depending on "the force structures, and doctrines of both sides and on each side's perception of the other."[28] Whereas, first-strike stability is usually based on strategic decision-making processes, strategic calculus and decisions taken by leaders, crisis stability is a broader concept related to military strategy and doctrine and conflict perception, as well as nuclear declaratory policy. Crisis stability provides a broader perspective of nuclear deterrence and decision-making processes in case the crisis escalates. It addresses the steps to be taken or crisis calculus if deterrence fails, and studies the possibilities of stabilisation. It also touches upon "the psychological stress, ambiguous or incorrect information, erroneous assessments of enemy interest, miscalculation and misinterpretations, so first-strike instability is only one component of crisis instability."[29]

Studies of crisis stability focus on crisis escalation analysis. As Patrick Morgan observes, "escalation was generally analysed under the heading of the stability problem in mutual deterrence.[30]" Steven Brams and Marc Kilgour, by focusing upon the decision-making process, designed a theoretical model (that can be attributed to one of rational choice models) explaining the threat escalation and stability in superpower crises. They focused on a decision calculus for optimal threats by applying a model of retaliation and proposed a more

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[27] Brams S., Kilgour M. (1987), Op. cit. p. 833.

[28] Office of Technical Assessment (1986), *Strategic Defences: Two Reports by the Office of Technology Assessment*, Princeton, NJ: Princeton University Press, p. 78.

[29] Kent G., Thaler D. (1990), *First-Strike Stability and Strategic Defences*, Rand, p. 3.

[30] Morgan P. (2005), "Deterrence, Escalation, and Negotiation" in Zartman W., Faure G.O., eds., *Escalation and Negotiation in International Conflicts*, Cambridge: Cambridge University Press, p. 56.

specialised treatment of crisis de-escalation,[31] highlighting that "crisis stability might encourage provocative behaviour, whereas an inability to stabilise crises may induce more cautious choices."[32]

Brams and Kilgour's conclusions correspond with major first-strike stability critique, and highlight that nuclear parity and first-strike stability reasoning does not necessarily prevent a crisis from happening. In sum, the nuclear (numerical) parity and crisis equilibrium are not the pivotal factors ensuring strategic stability. Moreover, Brams and Kilgour's findings lead to the assumption that higher levels of crisis instability and unpredictability lead to greater strategic stability. To the contrary intentions to stabilise a crisis might lead to crisis escalation in some cases, where one highly competitive party aggressively escalates but not matching the opponent's escalation is disadvantageous, so the "consequence of escalation is more escalation."[33]

Pursuing the analysis of stability, escalation and the possibility of equilibrium, Kilgour observed that "escalation may sometimes be a beneficial bargaining tactic, but only if the opponent does not reciprocate."[34] Sometimes to ensure some room for manoeuvre and greater flexibility, nuclear power might act in an escalatory manner with the aim to prevent crisis from real escalation into nuclear exchange.

The fear of a surprise attack is central in making the strategic calculus and development of nuclear doctrines. It is linked to the principle of escalation dominance in case the deterrence fails. Escalation dominance is defined by Barry Buzan, who underscores that the principles of nuclear deterrence leads to attempts "to find another way around the military paralysis of nuclear deterrence."[35] The crisis stability and nuclear deterrence is much more complicated than simple rational choice calculus. It is relational, based on expectation, fear and irrationality of the decision-making process.

Recently, scholars of the fourth and fifth waves of deterrence studies have observed the probabilities of horizontal escalation,[36] which is harder to control and manage, and which might have lower thresholds, greater ambi-

[31] Patrick J, Harvey F. (1989), "Threat Escalation and Crisis Stability: Superpower Cases, 1948–1979", *Canadian Journal of Political Science*, 22(3), p. 523.

[32] Brams S., Kilgour M. (1987), p. 834.

[33] Kilgour M. (2005), "Escalation in Negotiation: Analysis of Some Simple Game Models" in Zartman W., Faure G.O., eds., *Escalation and Negotiation in International Conflicts*, Cambridge: Cambridge University Press, p. 247.

[34] Ibidem, p. 249.

[35] Buzan B., Hansen L. (2009), *The Evolution of International Security Studies*, Cambridge: Cambridge University Press, p. 81.

[36] Rubin L., Stulberg A. (2018), *The End of Strategic Stability? Nuclear Weapons and the Challenge of Regional Rivalries*, Washington DC: Georgetown University Press, p. 32.

guities and a higher probability of miscalculation. Horizontal escalation refers to non-state actors, asymmetrical security threats and the changing nature of conflict, and involving unintended, uncontrolled and unpredictable risks. Horizontal escalation challenges the earlier (vertical) escalation studies with higher levels of unpredictability and complicated escalation control. Corentin Brustlein underscores that "progress in conventional long-range strike, electronic warfare and anti-access/area denial (A2/AD) capabilities are likely to modify crisis and escalation dynamics",[37] and cyber security factors might also have some impact on crisis stability change. Other scholars observe that the principles of nuclear deterrence remain the same, and crisis stability does not eliminate the probability of crisis and conflict[38] as such.

Andrew Futter distinguished three types of escalation: (1) a deliberate decision taken to use nuclear weapons pre-emptively – either as a means of signalling intent or as a disarming first strike; (2) a nuclear device being accidentally or without authorisation detonated in the middle of the crisis; (3) as a result of miscalculation arising either from the misperception of enemy intentions of faulty intelligence.[39] All three above-mentioned types of escalation indicate the qualitative change in the conflict or crisis perception. Studies on crisis stability aim at explaining and understanding the escalatory actions and possibly the implications for the outcomes of the conflict as well as possibilities for stabilising the escalation.

A group of RAND scholars, who can be attributed to the fifth wave of deterrence studies, highlighted the following escalation mechanisms: deliberate, inadvertent and accidental.[40] Their analysis focused upon "understanding the nature of escalation thresholds and the mechanisms through which escalation manifests, and then crafting strategies to manipulate those mechanisms to keep the intensity and scope of conflict from exceeding thresholds that would be excessively costly."[41] RAND scholars observe that crisis stability can be achieved through the *balance of interests*; they underscore that a "state's critical escalation thresholds are those most closely tied to its survival and related

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[37] Brustlein C. (2018), "The Erosion of Strategic Stability and the Future of Arms Control in Europe", *Proliferation Paper 60*, Paris: IFRI, p.14.

[38] Yost D. (2011), "Strategic Stability in the Cold War. Lessons for Continuing Challenges", *Proliferation paper 36*, Paris: IFRI.

[39] Futter A. (2015), *The Politics of Nuclear Weapons*. New Delhi: Sage, p.82 citation of Gray C. (1999), *The Second Nuclear Age*, Boulder CO: Lynne Rienner Publishers, p. 81.

[40] Morgan F., Orletsky D., Henry R., Molander R., Ratner E., Reardon R., Peterson H., Dogo H., Hart J., Saum-Manning L. (2015), *Managing Escalation in Crisis and War. Confronting Emergent Nuclear-Armed Regional Adversaries. Prospects for Neutralization, Strategies for Escalation Management*, research report, Santa Monica CA: Rand Corporation, p. 29.

[41] Ibidem

core interests; crossing those thresholds would almost certainly prompt opposing leaders to escalate the fight."[42] That argument is similar to the "existential threat" concept as introduced by Ole Wæver, which refers to the existential interests of the state and national interest to prevent existential threats from occurring. States most likely will take the decision to escalate in the case of an existential threat, which is perceived as the escalation threshold.

As Jervis observed, "a first step is to grasp the other side's values, beliefs and perceptions and to understand the motivated and unmotivated biases that influence information processing and decision-making."[43] As James Acton highlights the following factors relevant to crisis stability, namely, "emotion, pressure, bad advice, miscalculation, misperception or poor communication,"[44] they hardly can be quantified, but affect crisis stability. Another factor that affects the crisis stability and risks of escalation is ambiguity that might affect the decision-making process and escalation control. David Johnson observes that "operationally, all of Russia's precision-strike weapons are dual-capable or have a nuclear analogue; and the activities of precision-strike platforms would be freighted with nuclear ambiguity during an escalating crisis even prior to the beginning of the kinetic phase of conflict".[45]

It is natural that contemporary crisis stability and some of its principles have changed in comparison with the Cold War crisis stability, but major elements and principles are still relevant and applicable, the major insights and principles of crisis escalation and strategic stability as depicted by Kilgour and Brams are still applicable Escalation management is usually perceived through the threshold management perspective, focused on the escalation change in relation to actors' decisions to raise or lower the thresholds, in an action–reaction cycle.

3.3. Arms Race Stability and Arms Control

The third element and direction of strategic stability studies involves political negotiation and diplomatic agreements, as attempts for dialogue and development of regulatory mechanisms. Arms control arrangements introduce

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[42] Ibidem

[43] James P., Harvey F. (1989), Op. cit. p. 545.

[44] Acton J. (2013), Op. cit. p. p.122.

[45] Johnson D. (2018), "Russia's Conventional Precision Strike Capabilities, Regional Crises, and Nuclear Thresholds", Livemore Papers on Global Security, No. 3, p.73, https://cgsr.llnl.gov/content/assets/docs/ Precision-Strike-Capabilities-report-v3-7.pdf , 12 09 2019.

certain sets of principles and norms that are being developed during the negotiations or ewolved out of practical implementation of the agreements. Arms race stability is based on the principles of deterrence and mutually agreed limitations for certain weapon systems to be incorporated into the defence strategies. It refers to there are restrictions for acquiring, testing, or deploying certain weapon systems or categories.

Nuclear arms control has multiple purposes, but the most pivotal is the balancing of arms races and creating a certain level of trust and predictability between nuclear powers. As Buzan highlights, "arms control could include arms reductions or even eliminations, and thus incorporate parts of the disarmament agenda, but it might also point to increases of some types of weapons thought of as stabilising."[46] The aim is equilibrium and predictability, as well as diplomatic processes per se. The political process contributes to strategic stability in the way that it highlights the importance of the issue and handles the strategic balance decisions to the highest authorities of the state. Arms race stability is presumably based on a certain level of nuclear parity. The very logic, relevance and validity of nuclear parity and its contribution to strategic stability remains debatable.

Arms race stability has a meaningful role in connecting political (diplomatic), defence (defence planning), military (military deployments, training, modernisation, etc.) elements. It is focused on the adjustment of a strategic calculus and the creation of military balance; for instance, the US deployment of Pershing II missiles in Europe in the 1980s, as a reaction to the Soviet Union's deployment of SS-20 (modernised missiles). The Soviet Union perceived the US action as a dangerous escalation because it could cut down the warning time to the minimum (as the SS-20 did for Western Europe). So, those strategic decisions finally led to a successful completion of the negotiation over the Intermediate-Range Nuclear Forces Treaty (INF)[47] that eliminated the entire class of intermediate and shorter range ballistic and cruise missiles.

Despite the fact that uncertainty does not affect escalation, as observed by Kilgour,[48] the arms race stability and dialogue among nuclear powers might be a useful tool for maintaining equilibrium and ensuring strategic stability. Arms race stability is closely connected to two other areas of strategic stability: first-strike stability and crisis stability, and tied to security dilemma, as well as the concept of mutually assured destruction. This is credible "not only

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[46] Buzan B., Hansen L. (2009), Op. cit. p. 111.

[47] Full title: Treaty between the United States of America and the Union of Soviet Socialist Republics on the Elimination of Their Intermediate-Range and Shorter-Range Missiles

[48] Kilgour M. (2005), Op. cit. p. 248.

because no one wants it, but also because it creates no misperception of the other's intentions, and the two parties expect to be treated according to the same pattern."[49]
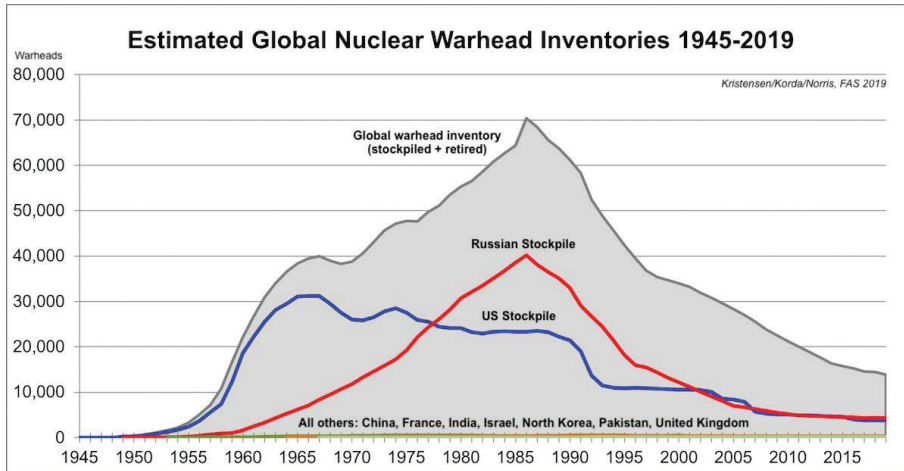

Estimated Global Nuclear Warhead Inventories 1945-2019

Figure 1. **Global Nuclear Warhead Inventories 1945–2018**

Source: Hans Kristensen, Robert Norris, 2018. Status of World Nuclear Forces, Federation of American Scientists https://fas.org/issues/nuclear-weapons/status-world-nuclear-forces/

A first-strike stability can only be achieved together with arms race stability, namely, parties are developing the strategic-doctrinal nuclear balancing efforts that increase predictability and ensure the continuity of the status quo. Parties see merit in starting the negotiation over the arms race stability – in other words, the doctrinal balance leads to political steps towards the material balance. It is believed that the arms race stability in the end of the Cold War was achieved by agreeing on and implementing the arms control treaties (with verification mechanisms), which facilitated the process of arms race stability. However, Avis Bohlen underlines that Cold War's achievements in arms control "were modest; it's easier to say what it did not achieve than what it did. It did not end or even slow the arms race, either quantitatively or qualitatively; numbers continued to rise. Neither side gave up a single weapon system that it really wanted. It did not reduce defence spending."[50]

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[49] Liru C. (1991), "The Problem of the Nuclear First-Use Option" in Carlton D., Schaerf C. eds., *The Arms Race in Era of Negotiation*, London: Macmillan, p. 20-25.
[50] Bohlen A. (2009), *Arms Control in the Cold War*, Foreign Policy Research Institute, https://www.fpri.org/article/2009/05/arms-control-in-the-cold-war/ , 02 02 2019

Arms race stability is usually analysed together with the focus on nuclear deterrence in relation to crisis stability. As Patrick Morgan observed, "arms control thinking reinforced the emphasis in the theory on avoiding moves and conditions that could undermine crisis stability."[51] The diplomatic and political means proved to be able to contribute to crisis stability and prevent the uncontrolled escalation. However, the arguments about uncontrolled nuclear incidents or accidents that could lead to unexpected crises have been retained among deterrence scholars and nuclear decision makers. For instance, "during the missile crisis Soviet generals in Cuba shot down a U-2 without permission; the head of SAC ordered US forces to go to DEFCON II in the clear – without permission – and some air force units went to a higher level of alert than authorised; Castro used troops to surround missile batteries to try to keep the Soviet Union from removing them."[52]

Arms race stability contributed to crisis stability studies and provided a political perspective to crisis stabilisation and escalation control. As Patrick Morgan highlighted, deterrence theory and nuclear deterrence gradually extended into arms control, which was primarily associated with general deterrence: avoiding destabilising weapons and deployments, containing arms race costs, curbing proliferation."[53] Arms race stability perspective touches on the action–reaction chain that countries are becoming involved in as they are increasing their nuclear arsenals, developing new armament technologies with the aim to obtain strategic superiority.

[51] Morgan P. (2003), *Deterrence Now*, Cambridge: Cambridge University Press, p. 33.
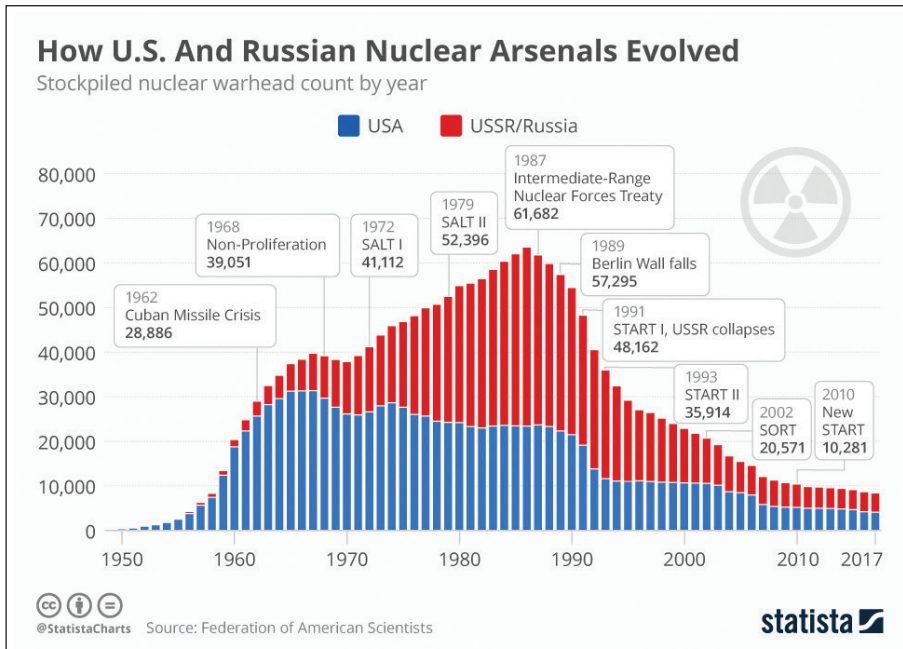[52] Ibidem
[53] Ibidem, p. 85.

Figure 2. **US and Russian Stockpiled Nuclear Arsenals, 1950–2017**

Source: Federation of American Scientists

The Cold War arms control negotiations have been criticised for their ineffectiveness, futility and limitations by numerous nuclear deterrence scholars. For instance, Thomas Schelling (in 1975) observed that "an enormous amount of arms control negotiation as posturing has discredited arms control all over."[54] David Yost observes that arms race stability theories "that had led the United States to propose SALT 1 agreements, including the ABM Treaty, failed to account for Soviet behaviour,"[55] which entailed the broader strategic calculation. James Acton observes that "the development and procurement of survivable nuclear forces – unilateral decisions originally taken outside of an arms control framework – did more than anything else to ensure mutual vulnerability and hence crisis stability during the Cold War."[56]

Yost expresses scepticism regarding the action–reaction chain in arms races. He provides the Cold War example and quotes US Defence Secretary Harold Brown, who in congressional testimony highlighted, "when we build,

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[54] Schelling T. (1975), "The Importance of Agreements" in Carlton D., Schaerf C., eds., *The Dynamics of the Arms Race*, London: Croon Helm, p. 65-77.

[55] Yost D. (2007), "Analysing International Nuclear Order", *International Affairs*, 83(3), p.55.

[56] Acton J. (2013), Op. cit. p.138.

they build. When we stop, they build."[57] David Yost shares the observation on Soviet attitude and behaviour, stating "Soviet behaviour did not conform to US 'arms race stability' theories according to which minimising strategic missile defences through the ABM Treaty would remove incentives to build offensive strike forces and to invest in non-ABM forms of strategic defence.[58] James Acton adds his voice to this debate arguing that "it is doubtful that arms control could succeed too well and produce arrangements that would drive the danger of undesired escalation close to zero."[59] Over the course of the 1970s the Soviets dramatically out-invested the United States in such capabilities."[60]
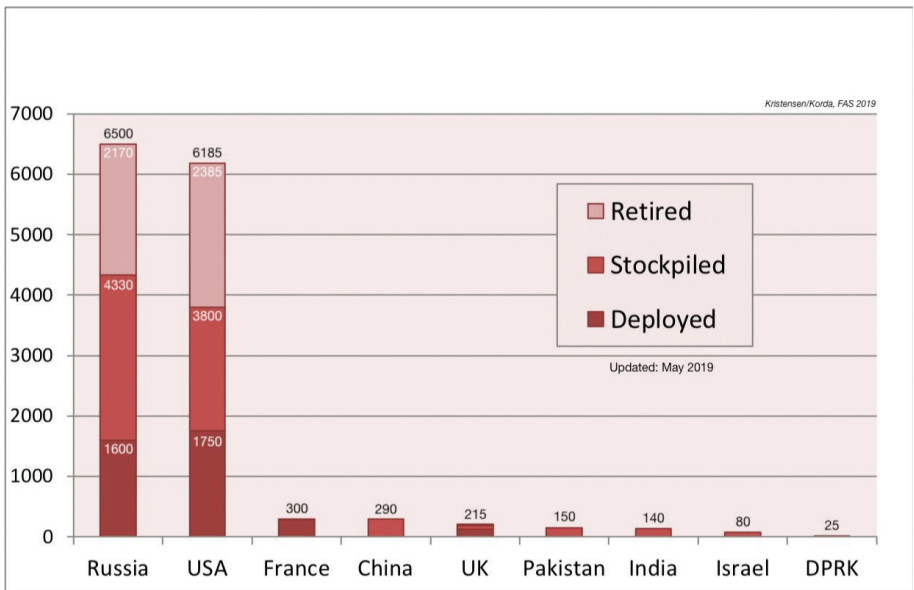

Figure 3. **Estimated Global Nuclear Warhead Inventories, 2019**

Source: Hans Kristensen, Robert Norris, 2018. Status of World Nuclear Forces, Federation of American Scientists, https://fas.org/issues/nuclear-weapons/status-world-nuclear-forces/

Evidently, arms race stability is more irrational and complex than it might seem at first sight. Arms race stability is relational and evolves together with perceptions of the other parties' intentions and strategic thinking. It is a significant element while taking decisions on building certain capabilities to

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[57] Yost D. (2007), Op. cit. p.554.

[58] Ibidem

[59] Acton J. (2013), Op. cit. p.134,

[60] Yost D. (2007), Op. cit. p.554.

outmatch and prevail over the other nuclear powers. These agreements led to significant decreases in nuclear stockpiles, as nuclear powers were obliged by the treaties to limit their nuclear stockpiles and capabilities.[61] Despite the fact that almost all Cold War or post-Cold War nuclear arms control arrangements faced numerous challenges, some successful examples indicate a more optimistic side of arms race stability. The New START Treaty can serve as an example of relatively successful arms race stability instruments. It set the requirement to cut the numbers of deployed nuclear warheads to 1,500 per party by 2021; parties have not indicated major compliance concerns over the implementation of this treaty.

Presently, with the decreased numbers of nuclear stockpiles (see Figure 2) and limited nuclear capabilities, nuclear powers are starting to return to strategic calculus similar to that during the Cold War with the aim to gain and retain strategic dominance, but under a different complexity of the current international system. Some arms control agreements are still functioning, but the majority of them are crumbling. For instance, in in August 2019 the INF Treaty collapsed because of Russia's non-compliance. Russia has developed and deployed a missile system with an intermediate (500-5500 km) range, which was eliminated by the INF Treaty. The demise of the INF leads to increased unpredictability and distrust between two major nuclear powers.

3.4. Risks to Contemporary Strategic Stability: The Nexus of First-strike Stability, Crisis Stability and Arms Race Stability

The contemporary strategic stability differs from the one that existed during the Cold War; the numbers of nuclear arsenals are significantly lower, states have experience in the practicing of arms race stability, new modern technologies and capabilities are developed. As Harvey notes, "perceptions of change depend on whether one focuses on numbers or on relationships."[62] In a post-Cold War system, strategic stability is going beyond the significance of numbers of warheads, because of relative parity in nuclear warheads and capabilities.

[61] Bohlen A. (2009), Op. cit.
[62] Harvey F. (2003), Op. cit. p. 323.

Table 2. **Major functions of first-strike stability, crisis stability and arms race stability**

Element of strategic stability	Balancing function
First- strike stability	Doctrinal balancing Balancing expectations for nuclear exchange
Crisis stability	Balancing the risks of escalation control Limiting strategic superiority
Arms race stability	Limiting strategic superiority Aimed at nuclear weapons and weapons systems parity

Source: created by author

Yost's observation includes elements of anxiety, credibility, distrust and intentions to mislead; this observation shows that a lot of challenges are related to relational perception of strategic stability and different sorts of expectations. This type of strategic thinking adds another layer of complexity. The strategic thinking and the grey zone of raising, shortening the alert time and changes in targeting strategies are reflecting the changes in crisis stability and first-strike stability calculus, whereas the arms race stability is challenged by the demise of some strategic treaties such as the INF. All these challenges depicted by Yost indicate the interplay of changes in the post-Cold War strategic stability, as well as the remaining strong overlaps and interlinkages between the first-strike stability, crisis stability and arms control stability (stability of arms race) (see Table 2).

Recently, the fifth- and fourth-wave nuclear deterrence experts have been debating the impact and role of missile defence, hypersonic glide vehicles, technologies, artificial intelligence and cyber threats. Some deterrence experts are highlighting that those capabilities and technological challenges cannot significantly change the strategic calculus, that the doctrine and crisis stability elements the most significant, remain. As Andrew Futter highlights, "the result, especially given the current climate of political distrust, is that neither party is likely to take any moves – such as de-alerting or reducing nuclear forces – that might potentially make them more vulnerable or susceptible to cyberattacks, or attacks that include a cyber-component, aimed at compromising their vital nuclear command and control systems."[63]

Notably, all three elements of strategic stability are strongly affected by

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[63] Futter A. (2016), "War Games Redux? Cyber threats, US-Russian Strategic Stability and New Challenges for Nuclear Security and Arms Control", *European Security*, 25(2), p. 169.

relational, subjective and cognitive factors. Moreover, the perception of trust can help to explain the continuity and balancing of strategic stability. Trust is perceived as evolving between the nuclear powers – it might have the most significant stabilising role and ensure the credibility of strategic stability. As Cui Liru observes, calculus of deterrence is related to "perception and assessments of adversaries about one another, perception and assessments are subject to the influence of strategy, political intention, international events, ideology, historical legacy and established structures."[64]

Table 3. **Major Contemporary Challenges to Strategic Stability**

	Major challenges	Drivers of change	Post-Cold War factors
First-strike stability	Risks of first strike Pre-emptive strike Irrational decision-making Ambiguity of retaliation	Defence strategy and military planning	Development of technologies Cyber security Artificial intelligence
Crisis stability	Launch-on-warning strategy Risks of limited nuclear war High alert Miscalculation, ambiguity Irrational decision-making	Defence strategy and military planning	Higher levels of ambiguity Risks of miscalculation Cyber threats/ challenges Complexed inter-domain and inter-theatre escalation New technologies
Arms race stability	Strategic imbalance Non-compliance Cheating Irrational decision-making	Diplomacy, political decisions	Distrust in arms race stability system Lower numbers of nuclear warheads Development of technologies and cyber challenges

Source: created by author

The fourth and fifth waves of deterrence studies focused on numerous technological, cyber and artificial intelligence challenges, which supposedly are changing the principles of deterrence and stability, and paving the way for the in-depth reassessment of strategic stability and nuclear deterrence.

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[64] Liru C. (1991), Op. cit. p. 20-25.

Together with new actors and additional levels of analysis, technological developments, higher precision, greater mobility of launchers and diminished reaction times, multiple warheads are making strategic stability and nuclear deterrence even more complicated and perplexing. Strategic stability is increasingly affected by irrational decision-making processes, increased risks of miscalculation, unpredictability, challenges of proliferation, technology development, artificial intelligence and cyber risks, which are paving the way for newly emerging deterrence studies.

Conclusions

Despite the fact that the most fundamental principles of first-strike stability crisis stability and arms race stability are remaining, the new technologies, and doctrinal novelties and adjustments are generating changes in strategic calculus. Notably, contemporary strategic stability is more complex and asymmetrical, reflecting multiple multifaceted political and military realities so nuclear powers are adapting their doctrines and policies to meet the major strategic changes.

Evidently, the first-strike balance or the second-strike capability does not necessarily prevent conflict from happening and conventional regional war from escalating. It leads to an argument that factors of the quantity of nuclear weapons is not a significant factor to change the risk calculus. Against this backdrop, higher precision of weapons, greater mobility, shortened warning times and risks of surprise attacks might be even more significant for nuclear powers than during the second half of the Cold War.

The first-strike stability comes with a certain sense of equilibrium, but it has to be mutually accepted and commonly perceived. The belief that parity of nuclear weapons can ensure strategic stability does not fully reflect the complexity of nuclear deterrence. The first-strike stability should be viewed in a broader perspective, taking into account different war fighting strategies and highlighting the significant role of conventional capabilities, evaluating risks of pre-emptive strikes, as well as irrational factors of decision-making processes, ambiguities and risks of miscalculation. The fifth wave of nuclear deterrence studies highlights the need for more nuanced, multifaceted and more complicated and relational perception of first-strike stability. Its major weakness is that it excludes the option that parties might not necessarily perceive the first-strike stability as strategic advantage – rather as a disadvantage, so parties might aim for more room to manoeuvre and strategic flexibility, so

they might intend to bypass first-strike balance and in this way change the strategic calculus.

Steven Brams' and Marc Kilgour's findings correspond with major first-strike stability critiques, highlighting that nuclear parity and first-strike stability reasoning does not necessarily prevent crisis from happening. Moreover, their findings lead to the assumption that higher levels of crisis instability and unpredictability lead to greater strategic stability. In sum, the nuclear (numerical) parity and crisis equilibrium are not the pivotal factors ensuring strategic stability. At the same time, ontological and psychological aspects need to be taken into account while addressing crisis stability, escalation control and threshold management such as principles, norms and values, as well as perception of vulnerabilities that the national regimes might be facing. The perception of crisis escalation might be expanded to include elements of trust, pressure, irrationality, misperceptions, ambiguities, unpredictability, relational assumptions and an action–reaction chain that might lead to highly unpredictable decisions, especially in the case of limited nuclear war.

Arms race stability is connecting political and military elements of nuclear deterrence, and interlinks three different domains of strategic stability. In other words, the doctrinal balance leads to political steps towards material balance. The logic and validity of the nuclear parity principle has been questioned by first-strike stability authors, crisis escalation scholars as well as by arms race stability experts. Arms race stability is more irrational and complex than it might seem at first sight. Currently, it is focusing on development of certain capabilities to outmatch and prevail over the other nuclear powers or to isolate/discourage the other party from taking certain nuclear deterrence related decisions.

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