EUROPEAN LEADERSHIP NETWORK

Building better security for wider Europe

New technologies, complexity, nuclear decision making and arms control

Workshop summary report

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The European Leadership Network (ELN) is an independent, non-partisan, pan-European network of nearly 300 past, present and future European leaders working to provide practical real-world solutions to political and security challenges.

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On March 22-23, 2021, the European Leadership Network (ELN), in partnership with and funding from the German Federal Foreign Office, hosted a workshop on 'New Technologies, Complexity Nuclear Decision Making and Arms Control'. The workshop aimed to raise and discuss questions concerning the nexus between new technologies and nuclear decision-making and arms control throughout four panels.

The workshop hosted 78 experts, researchers, and practitioners from all around the world on day one and 69 on day two.

This summary report, prepared by the ELN, offers a project overview and the rationale behind the project, highlights some of the major themes of discussion and provides policy take-aways.

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Background

The decision on the use of nuclear weapons may be the most significant a decision-maker may need to make. Today, decision-makers encounter an avalanche of information, reduced timelines, and a greater move towards autonomous decisions. They may struggle to distinguish facts from the information presented and mistakes and miscalculations may quickly multiply. A gulf is growing between the pace of evolution of new technologies and the understanding of these technologies by the decision-makers. Asymmetric development of new technologies may even undermine strategic stability.

Removing technologies, or their impact, from nuclear decision-making, is nearly impossible. As a result, the key questions become how best to mitigate their risk, how to manage their spread, and how can their employment be controlled? Paradoxically, the technologies themselves may offer novel and innovative solutions to safer decision making, more effective verification, and increased strategic stability.

Workshop rationale and objectives

1	2	3	4
To establish an understanding of the impact of new technologies on nuclear weapons decision making & explore the challenges & opportunities they pose.	To identify key lesons from non-military users of aggregate developing technologies, their experience of employment and risk mitigation.	To raise understanding of new technologies by governmental and military participants.	To explore opportunities of emerging technologies and identify proposals for future work on the application of individual and multiple emerging technologies.

The objective of this workshop has been to further explore the complex interaction of new technologies on the nuclear decision-making process and move towards concrete policy proposals for risk mitigation and arms control. Some of the specific guiding deliverables of the workshop were:

1. Seeking to establish a baseline understanding of the impact (risk) of selected and illustrative new technologies on nuclear weapons decision making, exploring the challenges and opportunities they pose to existing arms control and investigate alternate solutions for future study.

2. Identifying key lessons from non-military users of aggregate developing technologies their experience of employment and risk mitigation. Consider which lessons and best practice may apply to reducing risk in nuclear decision-making.

3. To raise understanding of new technologies by governmental and military participants.

4. Exploring opportunities of emerging technologies and identifying proposals for future work on the application of individual and multiple emerging technologies to arms control, verification, and risk mitigation.

New technologies and nuclear systems: challenges for arms control

Workshop participants discussed the stasis and the lack of adaptation in the nuclear policy field. The 21st century is marked by great power competition, new and emerging technologies, waning arms control, and the primacy of the private sector spearheading innovation. Today is distinctly different from the Cold War era, and participants warned that a Cold War mindset to address 21st-century problems will be problematic.

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- **Hypersonic systems inject ambiguities, uncertainties and shorten decision-making timelines.** Some participants argued that there is a clear military imperative for high-speed weapons. Due to their speed, technologies like hypersonic and boost-glide systems are expected to affect decision-making timelines. Participants noted that in comparison to the inter-continental ballistic missiles (ICBMs) to date, hypersonic systems do not get to the target quickly but rather inject ambiguities and uncertainties (especially when dual-capable). For example, it might become challenging to tell whether a hypersonic system carries a nuclear or a conventional payload in a crisis. Payload ambiguity matters when you shoot 'at' or 'near' to another nuclear-armed state or close ally. Participants pointed out that countries might be tempted to expect the worst-case scenario, putting escalatory pressures to use-it or lose-it.

- The workshop experts raised the question of the need for arms control for new technology systems and, in particular, whether countries should seek a **prohibition on boost-glide hypersonic systems**. Workshop participants agreed that the US and Russia might not agree to determine limits on technology as it is still evolving. Additionally, Russia sees hypersonic platforms as a defence against missile defences in Europe. Participants noted that China has embarked on a massive investment and mobilisation in defence and aerospace and has been expanding and modernising from tactical to strategic systems.

- **The issue of meaningful human control** generated a rich discussion on how nuclear-armed states carried responsibilities towards ensuring meaningful human control on all decision-making processes. Participants agreed that as automation becomes a reality in all the process steps, there needs to be a steady and stable human-machine team-up with the integration of capabilities, constant learning and modernisation.

- Discussion on **artificial intelligence and offensive and defensive cyber-attacks** led participants to point out that 'defending forward' (2018 US Cyber Defense Strategy) can be utilised for both offensive and defensive purposes. Participants agreed that there is an urgent need to secure countries' critical national infrastructure. With an increasing number of cases of offensive cyber-attacks and capabilities, participants underscored that there is a need for opponents to come to a shared understanding of cyber non-use to interfere with nuclear command and control. As cyber weapons have low entry barriers, data access/ breach in the wrong hands can disrupt strategic stability. Participants pointed to the United Nations' Open-Ended Working Group (OEWG) on 'Developments in the field of Information and Telecommunications in the Context of International Security', where an ongoing discussion in Geneva on what constitutes responsible behaviour in cyberspace, and its potential impact on the nuclear field, takes place.

- Participants agreed that whilst the nuclear arms control landscape might look more stable today, due to the recent five-year extension of the New START Treaty, the **US and Russia need to continue strategic stability talks, possibly agree on further cuts and consider understanding missile defence implications better.**

Aggregate complexity of new technologies & nuclear issues – which wolf is at the door?

Participants discussed that under the shadow of multi-tech "complexity", the speed at which technologies by themselves, or in combination, can manage, assimilate, and process data can simply overwhelm nuclear weapons decision-makers and abet risks of automation biases. As the number of emerging technologies and their potential integration with strategic weapons is growing, it will shorten decision-making times. Additionally, participants added that the lack of routine understanding of adversaries' intent, redlines, and the lack of trust in machines are compounding uncertainties and can impact strategic stability and crisis escalation dynamics. The need for secure and authenticated lines of communications was also underscored. Participants highlighted that it would be important to identify the role of technology and how we might pursue them at a tactical and an operational level for off-ramps and de-escalation strategies.

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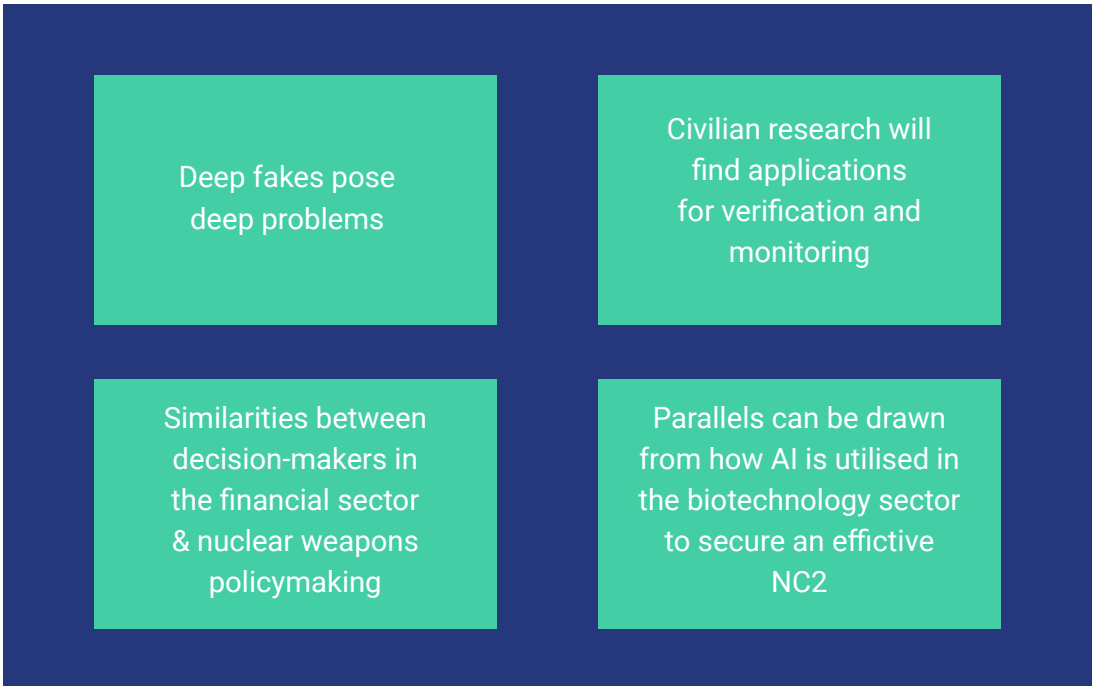
- **Need for mitigation measures and systemic innovations.** With the rapid pace of tech development and the existence of such vast quantities of data today, it increasingly seems that human beings cannot and will not cope with the information flow to determine what to believe and whether to trust machines. As a result, they may suffer from decision-paralysis and biased decision-making. Therefore, policymakers and technologists will need to think about mitigation measures and begin to predict where the innovations can come from – for instance, red-teaming and wargames. Participants agreed that by simulating a few extreme scenarios and decision-makers rehearsing, one can build resilience.

- **Technology cannot be un-invented and should not be stigmatised.** Keeping humans in the loop will be problematic because it will be hard to keep up with the flow of information. The growing power of sub-state actors, empowered by disruptive technologies, can lead to a chaotic situation. Additionally, bio-threats will grow, and small-scale actors with the threat of bioweapons can have a global impact.

What can we learn from commercial users of multiple new technologies?



This session brought together policy and industry experts to discuss how the strategic nuclear policy community can apply some of the lessons learned from the commercial users of multiple new technologies. Participants agreed that information overload is creating more and not less stress for decision-makers. However, policymakers cannot be absolved from the high stakes of risk attached with decision-making on nuclear issues. Therefore, societies will need to design and improve accountability of actions undertaken by the decision-makers to the public. Participants also discussed the importance of training decision-makers and that decision-makers need clarity of objectives, norms, values, and responsibilities.

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- **Deep problems posed by deep fakes.** Despite technologies like image analysis, voice recognition, and pattern analysis which can distinguish an original video from a fake one, the challenge of deep fakes and their misutilisation (by influencing political narratives through propaganda) can pose severe problems for decision-makers during a crisis. Participants agreed that decision-makers would need to dedicate special attention to the detection and circulation of deep fakes. Further, participants pointed out that the recent decision of US President Joe Biden's administration to review and upgrade critical infrastructure and supply chain security is a step in the right direction.

- **Civilian research will find applications for verification and monitoring.** Several participants discussed that various new technologies and their dual-use applications could prove helpful for decision-makers with geospatial investigations, verification and monitoring of suspicious military activities.

- **There are interesting similarities between decision-makers in the financial sector and nuclear weapons policymaking.** Financial leaders make life and death decisions on the welfare of their companies and face information overload. They have to cope with risks emanating from many similar technologies to ensure the financial viability of their companies or institutions. There are valuable lessons learned for the nuclear weapons sector.

- **Parallels can be drawn between how AI is utilised in the biotechnology sector and its related challenges to securing an effective nuclear command and control.** The biotechnology sector is turning to AI for computational modelling and automation to enhance the quality and quantity of products. High-value assembly lines must be protected against intrusion and sabotage in much the same way as command and control systems and other digital systems related to nuclear weapons.

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New technologies – an opportunity as well as a threat for arms control?

An annotated bibliography recently published by Lawrence Livermore National Laboratory visualised that the expert community predominantly focuses on the dark side of new technologies, leaving tech for good largely unnoticed. We thus need to investigate and invest in opportunities offered by new technologies to assist risk mitigation, arms control and verification.

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- There is space for rapid, tamper-proof data sharing between states, especially in asymmetrical situations where it can lower tensions. Harnessing open-source information and making data sharable between adversaries and allies without revealing sources and intelligence gathering methods is a way of building trust and confidence. **Crowd-sourcing problems** allow for diversity, making analysis better and creating a more even playing field (e.g. Datayo, CATALINK). This approach should be seen as complementary to traditional sources.

- **Distributed ledger technology** (DLT), known more widely as blockchain, can improve safeguard efficiencies (e.g. SLAFKA). Nuclear fuel repositories, nuclear security, transport security and export control are domains where DLT can be applied. For example, it can be used for data integrity to ensure that data reflects sealed sources stored underground. It can support declaration information sharing and authentication between Euratom and a facility. In addition, DLT can handle safeguards transactions.

- For analysts working on monitoring and verification, **AI** has arrived in the government and private sector. For example, reverse image search software allows recognising missile transports or suspicious military activity. AI information processing will enable us to understand hidden relationships, especially in high noise, low signal information environments. In the past, the best data was secret. Today, the challenge is less to find the needle in a haystack but that you have an entire haystack of needles, and you have to structure that data to figure out what you want to find out. While the computer will take the burden off the human, it will be the human that asks the right questions or curates the data.

- **Challenges** that the non-governmental sector faces when exploring the application of new technologies are costs of procuring data, human capacity limits (e.g. introducing technological vocabulary and methods into educational curricula, including ethical training on technology and methodology) and lack – and limited diversity – of participants in crowd-sourcing problem-solving. There is also a need to build an understanding of the potential of new technologies and the legal limitations that technology could solve. Finally, from the governmental perspective, challenges include cost and practicality to assist people who work in this space.

- In terms of **prioritising the use of new technologies for better risk reduction**, participants mentioned deep tech penetration of adversaries to avoid or win wars, new sensors and sensing capabilities (incl. nonvisible spectrums of light, hyperspectral data), assisting verification officers to be more productive and effective, and supporting records management to free up verification capacities.

Policy takeaways for the way forward

1. **Regularise, reframe and strengthen strategic stability dialogue** between the US and Russia. There is also a need for strategic stability dialogue between the US and China, and participants noted that the P5 process in the NPT framework could be strengthened. Due to several recent developments and ahead of the NPT Review Conference, P5 countries should pursue dialogue and discussion on nuclear postures. The nuclear-weapon states in particular need to undertake efforts to ensure that how AI and emerging technologies are integrated into militaries does not endanger strategic stability, but contributes to and enhances it.

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2. **Human control in decisions must be maintained:** Participants unanimously agreed that the loss of human control in nuclear decision-making could prove disastrous. Several experts noted that keeping humans in the decision-making loop is essential. At the same time, there is the worry that it may not be possible in the future as it would be hard for human beings to keep up with the fast pace of the flow of information. There need to be better linkages between nuclear decision-makers and technology designers and enhanced and continuous training and practice for leaders to keep them abreast of new technologies and challenges. Some argued that it must be in the interest of nuclear weapon states to foster agreements to shield the nuclear decision-making process from AI.

3. **Broader arms control efforts should include new technologies:** Participants agreed that P5, nuclear-armed countries, and like-minded partners – under the rubrics of broader, verifiable arms control – need to pursue discussions on specific emerging technologies to prevent both their proliferation and from falling into the wrong hands. This will not be possible without close cooperation between governments and the private sector. As new and emerging technologies are widely available, organised crime and terror networks might have free and easy access to these technologies. Moreover, non-state actors using emerging technologies can disrupt peace and stability, which may have significant implications for strategic stability and balance.

4. **Norms, non-attack, and responsible behaviour:** Transparency, confidence-building measures, off-ramps from a crisis, and responsible conduct in cyber and outer space are some of the key issues that nuclear-armed countries need to engage with urgently. Participants underscored that governments need to avoid, to the extent possible, entanglement between nuclear and conventional systems. Additionally, in the absence of clearly established and universal norms on cyber, countries should agree to not execute massive cyber-attacks on opponents' nuclear and conventional command and control.

5. **Public awareness and education:** Political decision-makers need to be better informed. Experts discussed the lack of understanding of both shared nuclear risks and the effects of these emerging technologies. It was highlighted that in the case of a massively disruptive nuclear weapons-related event, prompt decision-making by political leaders could not be taken for granted. Moreover, several policymakers don't have a common understanding of the effects of nuclear weapons.

6. **Fight against the failure of imagination regarding solutions:** While bilateral and multilateral relations among peer competitors are tense, there is a need to rebuild trust at both the political and governmental levels. Participants underscored the need to begin a political process aimed at actionable solutions. These cannot be only technological – they must be political and technological too.

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