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How to beat Russia

What armed forces in NATO should learn from Ukraine's homeland defense

by Nico Lange

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CREDITS

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DATE

February 2023

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Nico Lange was Chief of Staff at the Federal Ministry of Defense of Germany from 2019 to 2022. Before being appointed to the MoD, he was Deputy General Manager of the CDU Deutschlands and Director of Strategic Planning and International Politics at CDU Headquarters.

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Nico Lange was director of the Ukraine office of Konrad-Adenauer-Stiftung in Kyiv from 2006-2012. He was awarded a Robert Bosch Fellowship in St. Petersburg, Russia from 2003-2006. Lange speaks fluent Ukrainian and Russian.

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Prof. Dr. Carlo Masala. Studied political science, German and Romance philology from 1988-1992. In 1996 he received his doctorate with a thesis on German-Italian relations in the period 1963-1969 and in December 2002 he was awarded the venia legendi for political science.

After a professorship at the Geschwister-Scholl-Institute of the Ludwig Maximilian University of Munich in the summer semester of 2003, he moved to the NATO Defense College in Rome at the beginning of 2004 where he worked in the research department, first as Research Advisor and from 2006 as Deputy Director.

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Prof. Masala is co-editor of the journal Zeitschrift für Internationale Beziehungen (ZIB) and the journal Zeitschrift für Strategische Analysen (ZfSA). He is also a member of the Scientific Advisory Board of the Federal Academy for Security Policy and a permanent expert in the Enquete Commission of the German Bundestag on the Afghanistan mission.

Since 2018, he has co-hosted the podcast Sicherheitshalber.

In 2022, his book "Weltunordnung. Global Crises and the Illusion of the West" in its 4th edition (C.H. Beck). Since the beginning of March 2022, he can be heard regularly on the stern podcast "Ukraine - die Lage".

Pavel Macko, a 3-star retired general, is a defense and security expert with 35 years of military experience. He is a graduate from the National Defense University, Washington D.C. and the Military Academy Brno, where he also gained a PhD. He has vast professional and technical knowledge, and managerial and command experience from all levels of command and control.

He held high command and staff positions at home and international headquarters. He served as the national level logistic commander, deputy commander of the Land Forces, the chief of operations at the General Staff and the Deputy CHOD. He promoted innovative training and exercising at home and internationally. He was deployed as chief of operations (CJ3 Staff) at the ISAF HQ Kabul in 2007. From 2004 to 2008, he served as the Deputy Chief of Staff Support at the Allied LCC HQ Heidelberg and for the NRF 7 & 8, he commanded the NRF Joint Logistic Support Group and led implementation of the new logistic concept for the NRF.

Pavel Macko was a highest-ranking Slovak in the NATO military structures and served as the Commander, NATO Joint Force Training Centre in Bydgoszcz, Poland. He was responsible for the preparations of the first two Slovak contributions to the EU BG, and a designated Deputy Commander of the EU OHQ. He is a frequent speaker at the international security fora.

Executive summary

Russia continues its war of aggression against Ukraine, yet its forces are already defeated. Against the resistance of Ukrainians and its allies' support, Russia has achieved almost none of its military goals. Evidently, Ukraine will prevail.

The Ukrainians have made it clear: Russian aggression is defeatable. This is due to two main reasons: the involvement of the entire Ukrainian society in homeland defence and the Ukrainian Armed Forces' excellent military and leadership skills. Extraordinary bravery, creativity, astonishing pragmatism, and improvisational skills have been at the forefront of the Ukrainian homeland defenders. Around the world, all actors can and should learn from Ukrainians about future military and civil defence.

This report identifies initial lessons for armed forces in NATO countries and politics and society from observing the course of the war and the defence of Ukrainians. Drawing lessons from Ukranian homeland defence since February 2022, the report offers possible applications to doctrine, structures, and training for the armed forces of NATO member states. Moreover, it provides political recommendations derived from Ukrainian experiences.

The report is based on open-source intelligence information and a series of 20 extensive interviews with combat-experienced Ukrainian commanders and soldiers. The observation of the war and discussions with Ukrainian forces revealed ten areas in which the Ukrainians are particularly innovative and unusual in their use of strategies and tactics, at least some of which are new to the armed forces in NATO.

This report pursues two simple questions throughout ten dimensions: What are the Ukrainians doing particularly well? And what can we in NATO, the EU, and beyond learn from them?

1. Ukraine is engaging its entire society in total defence.

The recommendations to the armed forces in NATO are to:

- Provide basic military training and basic medical training to large parts of society
- Develop strategies for the military reserve capitalizing on civil life qualifications
- Hold regular simulations and exercises at local and regional levels
- Build communities for homeland defence
- Train mayors, governors, and decision-makers, by making crisis and defence training a prerequisite for holding office
- Build infrastructures to collect and use data provided by civil society

2. The fight is data-based in the newest of ways.

The recommendations include to:

- Introduce full and continuous data connectivity on the battlefield
- Collect all data on all levels of command and innovate on data analysis
- Setup low orbit satellite constellations as strategic enablers
- Build an embedded "data force"
- Improve operational speed, especially on time-sensitive targeting
- Radically speed up innovation and procurement cycles
- Open up to civic innovation and ease access for new companies and start-ups

3. Ukrainian forces often operate as decentralized networks with much command-and-control responsibility at lower and intermediate levels.

The recommendations include to:

- Have agile staff and more troops focused on speed and adaptability
- Avoid highly detailed military planning and too rigid command and control
- Rely more on oral agreements and verbal decision making
- Promote thinking and acting in network and matrix structures, breaking out of rigid formal corsets
- Transfer more responsibility to non-commissioned officers
- Investigate further if fundamentally different modes of operation require different sets of forces to be successful

4. Ukraine is shaping the battlefield through a consistent focus on attacks on logistics, command and control, and communications.

The recommendations include to:

- Improve military mobility
- Further emphasize medium and light forces
- Increase speed and precision to beat superiority in mass
- Train and exercise "shaping operations" as a special, resource-efficient form of attack

5. Ukrainian soldiers are using drones ubiquitously and en masse for many operational purposes.

The recommendations include to:

- Introduce drones en masse into all branches of the armed forces
- Utilize inexpensive commercial drones for military purposes in addition to specially-developed military drones
- Quickly develop and deploy new and simple, cost-efficient drone solutions
- Reduce dependencies on the Chinese commercial drone production
- Introduce and train military competence in the operation of drones in all branches and at all levels
- Procure cost-efficient anti-drone systems

6. The Armed Forces of Ukraine have achieved successes with minimal units in an astonishing revival of Jagdkampf

The recommendations include to:

- Reintroduce light infantry battalions or companies with capabilities for asymmetrical, highly mobile combat
- Retrain infantry units in commando operations and urban warfare tactics
- Increase equipment, stocks, and production capacities of mobile anti-tank, anti-aircraft, and anti-drone weapons
- Strengthen granular logistics and prepositioning, also using standard containers and drones
- Establish a system of constant, high-intensity training and exercise for dismounted infantry

7. Ukraine is leading the renaissance of artillery but in an expanded, advanced form.

The recommendations include to:

- Redeploy significantly larger wheeled and tracked, towed and self-propelled artillery forces
- Increase production capacity for artillery pieces and ammunition

- Research and evaluate the knowledge gathered in Ukraine on different guns and ammunition
- Transform artillery into software and an AI-driven system
- Integrate drones for target acquisition and fire control
- Improve counter-battery capabilities
- Equip, train, and exercise toward high-speed kill chain, high mobility, and maximum precision
- Build more ammunition storage and improve standardized, fast ammunition logistics

8. Complex logistics, especially on rails, form a stable backbone for the fighting forces.

The recommendations include to:

- Create considerable redundancies and crisis capabilities in commercial transport
- Develop and stack deep reserves of equipment, trained personnel, capabilities for emergency repairs, and stocks of spare parts, if necessary, fully financed by government crisis provision funds
- Provide the legal framework and financing for the extensive use of civilian infrastructures for defence logistics
- Intensively practice night-time logistic operations under realistic conditions

9. High operational security, tight secrecy, and successful deception make decisive differences.

The recommendations include to:

- Exercise regularly and intensively under entirely realistic conditions of operational security
- Keep closely up-to-date with the opponents' sensor capabilities
- Include more in-depth language skills, regional knowledge, and cultural knowledge
- Review internal bureaucratic procedures and increase an institutional culture of broad participation and CC culture from a strict operational security perspective
- Address the balance between tight operational security and civil or parliamentary oversight

10. The best stories win the strategic information war.

The recommendations include to:

- Radically transform structure and content production of strategic communications in armed forces in NATO countries
- Establish more media production capabilities and more extensive communication capabilities
- Produce much more quality output across many different channels
- Reform toward rapid decision-making procedures and ample freedom for communicators
- Embed creative partners and creative professionals
- Anchor strategic communications structurally on the highest political level

This report aims to be accessible to a broader audience beyond the narrow circle of pronounced military experts. We urgently need broad debates involving the military and experts to strengthen defence capabilities and resilience in our states. Above all else, we need the participation of political leaders, the media, and citizens at large.

Armed forces in NATO countries, the EU, and beyond should learn essential lessons from the course of this war. The analysis and study of this war will undoubtedly continue - this report is meant as the start of a necessary debate.

Introduction

"Do you know why we are winning the war?" Out of the blue, one of the interviewees for this report poses a question to me after he patiently answered my many queries. He is a Ukrainian artilleryman, currently in a hospital, his thoughts always with his comrades at the front in the Donbass. He will be with them again shortly. At the end of our long conversation about reconnaissance data, the prioritization of targets (aided by artificial intelligence), Ukrainian and Western guns, different types of ammunition, and the impressive tablet app of the Ukrainian artillery forces, he tells me a short story: an 11-year-old girl from Lviv together with her friends and relatives collected money for winter clothes and sent them to the frontlines. My interlocutor and his comrades now have warm jackets. These are dark blue as for the Navy, but they also protect artillerymen from the cold. The girl from Lviv embroidered a heart on each jacket – the upper half as blue as the sky, the lower half golden yellow like a cornfield (the colors of the flag of Ukraine). ***"We got warm jackets with Ukrainian hearts on them from this little Ukrainian girl. That's why we're going to win."***

> ***Ukrainians have revealed an undeniable truth: Russian aggression is beatable***

There are an infinite number of similar stories. They underscore that the entire Ukrainian society is resisting Russia's war of aggression and assisting the armed forces in the total defense of the country. Ukraine is indeed countering Russia's belligerency considerably more successfully than expected by all military experts. These valiant efforts have brought the attacks to a halt and enabled Ukraine to recapture occupied territories.

Ukrainians have revealed an undeniable truth: Russian aggression is beatable. This outcome has been made possible by the involvement of the entire Ukrainian society into the country's homeland defense and due to excellent military and leadership skills of the Armed Forces of Ukraine. These homeland defenders have demonstrated extraordinary bravery, ingenuity, and astonishing pragmatism and improvisational skills. All of us in the member states of NATO, the EU and beyond can and should learn from Ukraine for future military and civil defense.

Assessing the course of the war and the formidable Ukrainian defense of their country, this report identifies initial lessons for the armed forces, policies, and societies of NATO countries. While this study does not provide a comprehensive or conclusive analysis of Russia's war of aggression against Ukraine or analyze Russian missteps and vulnerabilities, these types of assessments can be found in other research and will be analyzed in depth in numerous more studies to come.

This report rather draws lessons from the Ukrainian homeland defense (February 2022 onward) and suggests possible applications to the doctrine, structures, and training for the armed forces of NATO member states. It also gives political recommendations for action derived from Ukraine's experiences. The findings are based on open-source intelligence information and a series of 20 extensive interviews conducted with combat-experienced Ukrainian commanders and soldiers. Their identities are kept anonymous since they are still engaged in combat. This report refrains from specifying any operational information or information subject to confidentiality or secrecy in Ukraine or any NATO countries.

The assessment of the war and discussions with Ukrainian forces revealed ten areas where Ukrainians have proven particularly innovative, creative, and distinctive in their use of strategies and tactics - at least some of which are new to us in NATO. Through success in these ten areas, among

others, Ukraine provides possible answers to the guiding question of this paper: How can Russia be defeated?

Ukraine is engaging its entire society in total defense (1). The fight is data-based in new ways (2). Ukrainian forces often operate through decentralized networks with considerable command-and-control responsibility at lower and intermediate levels (3). Ukraine, furthermore, is shaping the battlefield through a consistent focus on attacks on logistics, command and control, and communications (4). Ukrainian soldiers have deployed drones ubiquitously and en masse for an enormous number of operational purposes (5) and they have achieved success by mobilizing very small units in an astonishing revival of Jagdkampf (6). We are witnessing a renaissance of artillery but in an expanded, advanced form (7). Complex logistics, especially on rails, form a stable backbone for the fighting forces (8). Very high operational security, tight secrecy, and successful deception are also making a decisive difference (9) and effective stories are winning the strategic information war (10). In each of these ten dimensions, this report pursues two simple questions: What are Ukrainians doing particularly well? What can we in NATO, the EU and beyond learn from them?

This report aims to be accessible to a broader audience beyond a narrow circle of distinguished military experts. To strengthen the defense capabilities and resilience in our states, we urgently need broader debates involving not only the military and experts but also political leaders, the media, and the citizenry.

The idea for this study arose from a meeting with Robert Vass in Bratislava just after the 2022 GLOBSEC conference, when we were talking about how much respect we have for the Armed Forces of Ukraine and how little we understand the many in our countries who believed they had to give the Ukrainians advice and instructions constantly and often even from above. We agreed that we in NATO can and must learn more from Ukraine's homeland defenders. I thank Robert Vass for his trust and support and Alena Kudzko and everyone at GLOBSEC for their endless patience and tremendous cooperation. I am very grateful to Lieutenant General ret. Pavel Macko for his professional military advice on this study and to Professor Carlo Masala for his invaluable scientific support. My special thanks go to the leadership of the Armed Forces of Ukraine and especially to all Ukrainian servicemen and women for their willingness to talk to me. I think of you often and wish you soldier's fortune, may God bless and protect you.

Nico Lange
February 2023

Total Defense

Chernihiv, about 140 km from Kyiv and 50 km from the Belarusian border, March 2022, a dark, cold, very early morning: Suddenly there is a loud bang and hiss on the street in a residential neighborhood not far from the city center. Immediately, everyone is on their feet. Have the Russian besiegers fired artillery or the devastating Grad multiple rocket launchers into the city again? Have Russians entered the inner city? The Russian incursion into Ukraine had already been ongoing since February 24th. And Chernihiv, right on the border with Belarus with direct road and rail links to Kyiv, is one of the Kremlin's first targets. But the Russians are unable to take Chernihiv, with fierce fighting raging. News finally emerges about the morning commotion: it turns out it is the city garbage collection. Even under attack and siege, basic municipal services continue to work stoically. The mayor and the governor report to their workplaces, checking in daily via video on Telegram channels. The city administration is also active, with most people

electing to stay despite Russia's launch of hostilities. Though officials are shocked and appalled, certainly full of fear, they are there all the same. They all form part of the total defense of the city and country.

The expression "total defense" sounds brutal. And yet it is apt. The Russian invasion of Ukraine failed because of Ukraine's total defense efforts within the first decisive 72 hours of battle. The major Ukrainian cities directly on the borders withstood attack after attack. Chernihiv, Sumy, and Kharkiv, importantly, prevented the rapid advance of Russian forces on Kyiv, stopped the attacks, and thwarted Moscow's attempts to turn them into logistical hubs to bolster further military advances. The populations of these cities quickly flipped a switch from leading their normal lives to putting up a stiff resistance. This transition to a robust partisan mentality within hours was fostered by two factors. First, political decentralization in Ukraine since 2014 has provided separate powers and decision-making autonomy for governors and mayors and fostered a sense among local leaders that they are able to decide their own matters instead of asking for direction from Kyiv. Second, since the experience of the 2014 war and especially beginning in 2021, Ukrainian administrations and political leaders had repeatedly practiced, trained, and acquired knowledge of what to do in the event of war.

The resistance of major Ukrainian cities and urban populations illustrates the essence of total defense: it entails that an aggressor is not only confronted by the defender's military forces but faces an entire society standing completely against them. This approach has enabled Ukraine to prove itself resilient across the board, witness the ability of Ukrainians to quickly recover from Russian strikes on critical infrastructure, including railroad, highways, and energy infrastructure. This success, in turn, has enabled the country to provide continuous support to its civilian population and substantial support to the military, be it delivery and distribution of foreign military equipment and aid or logistical support for combat troops.

> ***The analysis of Ukrainian defense once again makes it crystal clear: Armed forces within NATO need better strategies for reserves.***

The Russian invasion of Ukraine saw a new element, unprecedented in this form, added within the first hour of the war. The civilian population provided millions of additional pairs of eyes and ears for the army and security forces. As early as February 24th, the Armed Forces of Ukraine and the Ukrainian intelligence service SBU set up Telegram channels and publicized instructions for reporting data and information. With cell phones ubiquitous, Ukrainians photographed and filmed columns of vehicles, Russian positions, military bases, troop movements, license plates, insignia of units, and the faces of commanders and soldiers. The armed forces and SBU were able to swiftly record the data, process it, and use it for intelligence and situational awareness. They also made it operational for prioritizing and engaging targets. These efforts were supplemented by the analysis of social media networks, the interception of attackers' cell phones, and the tapping of data through usual means of reconnaissance. Most importantly, aided by the cooperation of society, Ukrainian security forces were able to quickly and reliably generate situational awareness far superior to that of the attackers and effectively engage targets based on accurate information.

At the same time, Ukraine's politicians, administration, and military established trustworthy sources immediately from the outset of the war – these outlets constantly provide society with information in the other direction. Consistent, fast, and continuous information, especially on Telegram channels, contributes to a shared perception of the situation by civilians and ensures that unity is the foundation for total defense. The generation of reliable information has since been amplified at real-time speed, with the entire society an invaluable resource for adding to this data.

Ukrainian society has also become an important resource for the further mobilization of the Ukrainian

armed forces since the beginning of the war. Pictures of long lines of Ukrainians at recruitment offices beginning February 24th, 2022, quickly went viral throughout the world. Large numbers of very well trained and qualified personnel volunteered immediately to join the armed forces: doctors, medical personnel, engineers, technical specialists, IT specialists, and mechanics. The procedures for processing the legions of volunteers was remarkable in one respect in particular. The Ukrainian military and supporting civil society networks quickly recorded detailed information about the relevant skills of volunteers into compatible and contemporary IT systems. A reliable database outlining the skills and locations of volunteers, consequently, grew with astounding speed. Since then, the Ukrainian Armed Forces has gradually accessed personnel reserves on the basis of this information and assigned them tasks commensurate with their qualifications. Data collection and data inventory form the foundation of the military personnel reserve.

The equipping and training of the countless volunteers in the first days and weeks was undoubtedly chaotic but saw remarkable improvement over a short span. The initiatives took only a few months to go from ***"it's a disaster"*** and ***"we have nothing"*** to ***"we have too much food, stop bringing it to us."*** This was made possible by the decentralized support provided to Ukrainian troops by civil society networks and the respective local populations in places of deployment. From rations prepared daily in localities to helmets, protective vests, clothing, drones and vehicles, everything has been and continues to be collected by the civilian population and delivered to the military. These efforts have offset the limitations and resource shortages of the Ukrainian armed forces. This decentralized supply, furthermore, has proven infinitely faster and more efficient than centralized attempts. It has also contributed to unbreakable emotional bonds and support and engaged civilians and communities in meaningful activities. Ordinary people can contribute to the success of their armed forces.

It is notable that these activities have been feasible in Ukraine because of its special history. Horizontal social networks already began to crop up following the Orange Revolution in 2004 and accelerated again during the Euromaidan starting in 2013. Following the annexation of Crimea and the Russian intervention in the Donbass, these networks contributed decisively to the reconstruction and equipping of the Ukrainian armed forces. In Ukraine, existing and robust civil society network structures were successfully transferred to the armed forces and used for their benefit.

There is, additionally, robust emotional support for society from within. For example, the video of the well-known artist Andriy Khlyvnyuk of the group BoomBox, who volunteered in the first days of the war and sang the Ukrainian folk song ***"Chervona Kalyna"*** on Sofia Square in the center of Kyiv, rapidly spread on Telegram channels and has since entered the collective motivation for defense in countless versions. So too did the gloomy, grim electro sound of ***"Dobroho Vechera my s Ukrainy"*** ("Good evening, we are from Ukraine") or the songs "Bayrakhtar" (about the Turkish drone) and ***"Orka tilo ljashe v grunt, dopomoshe VSU"*** ("The bodies of Orcs go into the ground, Armed Forces of Ukraine are helping) which were written, produced, and published during the war. Through music, culture, and humor, Ukrainian society is strengthening its cohesion, consoling itself over difficult situations, and bolstering its military motivation. This factor cannot be overestimated for total defense.

It was precisely these cultural factors and opportunities for civil society to participate in defense through the provision of equipment, information, and/or data analysis that has seen Ukraine manage to form a global community of support and leverage it as a resource. This global backing has contributed significantly to Ukrainian military successes to this day.

But did total defense arise only by necessity to compensate for military weaknesses? Can we disregard these observations from Ukraine because we are much stronger militarily in NATO and could also defend ourselves against Russia in this way? This approach towards looking at the situation is legitimate. And it is certainly true that

the total defense of Ukraine is also a product of the historical, cultural, and social peculiarities of Ukraine. Nevertheless, some important and noteworthy points for NATO should be drawn from the analysis of Ukrainian experiences with total defense.

National defense, notably, is more successful when a greater share of the population has basic military training and proficiency in first aid and medical survival assistance. While this may sound banal at first glance, it poses a significant challenge in view of modern European and Western societies. Systematic strategies and offers for training - also regarding self-organization and the independent ability to act - are necessary, especially because extremely high expectations of the state and an associated lack of independence have demonstrably grown a great deal in Western countries in recent decades.

The survivability of citizens is higher and total defense succeeds better, if the handling of geography, maps, and coordinates is mastered and widely understood across society. This awareness extends to knowledge and skills practice concerning central military and defense concepts, basic rules of behavior when under attack, search of cover, and movement in dangerous situations. It is already helpful if a person was already forced to deal with such situations mentally previously even once in their life. NATO countries should think about this once again and examine possible options therein. There is also much to learn from the future new NATO member Finland in this respect.

The analysis of Ukrainian defense once again makes it crystal clear: Armed forces within NATO need better strategies for reserves. At the core of this strategy must be the systematic collection and mapping of the capabilities of reservists from civilian life who are needed for defense and can be put to good use. In addition, there is a need for regular military exercises under real conditions, as close to home as possible and in cooperation with civilian administrations.

The civilian administrations themselves must regularly simulate crises and defense scenarios and act them out under conditions that are as real as possible. Recurring exercises at the local and regional level involving civilian administrations, the military, and local or regional media are absolutely necessary.

Building communities for the defense of society as a whole is a task in its own right and it must be mapped out, with its own dedicated positions in local and regional level administrations. Special personnel for it must be identified and trained.

Mayors, governors, or heads of local authorities, politically responsible persons in decision-making positions, also individually need special personal training and regular practice for defense situations. This should be made a mandatory requirement for holding certain offices and functions.

The armed forces of NATO countries and the intelligence services must build technological structures with new resources to systematically collect, integrate, and fuse together, with other data, the information provided by civil society. Data from the open-source intelligence community must be incorporated into the work of the armed forces and intelligence agencies in real time. Easy access and incentives should be created for civil society to contribute to national defense by providing information. Possible conflicts between these recommendations for action and the protection of data and privacy must be widely discussed and decided politically.

Total Defense: Recommendations to armed forces in NATO

- Provide basic military training and basic medical training to large parts of society
- Develop strategies for the military reserves to capitalize on civilian life qualifications
- Hold regular simulations and exercises at local and regional level
- Build communities for homeland defense
- Train mayors, governors, and decision makers and make crisis and defense training a prerequisite for holding office
- Build infrastructure to collect and use data provided by civil society

Data driven battle

Nettles are plants that protect themselves from being eaten by large animals with their stinging sap. At the same time, nettles also serve as medicinal plants. Perhaps these two attributes played a role in the decision to use the name ***"Kropyva"*** (stinging nettles) for the tablet app programmed by volunteers of the ***"Armija SOS"*** initiative in support of the Armed Forces of Ukraine. The name is part of a tradition where, for example, artillery weapons are named after flowers and missile systems after weather phenomena. Software is now apparently named after plants that know how to defend themselves. In any case, it is indisputable that nearly all Ukrainian soldiers say that without the ***"software weapon system"***, Kropyva, it is unlikely they would be alive.

> ***It is particularly striking that the Armed Forces of Ukraine systematically involves the open-source intelligence community in their data work. An entire global scene is collaborating in support of Ukraine.***

The app "Kropyva", which is installed on Android tablets and gives Ukrainian troops an up-to-date picture of the situation, is symbolic of the data-driven battle in Ukraine. Nothing runs without up-to-date data or data transfer and nothing happens without the data being immediately transferred back into the system. The app, like other significant software, artificial neural networks, and machine learning systems used by the Armed Forces of Ukraine, was developed, tested, and deployed at breakneck speed after the invasion started. In short innovation cycles, specialists embedded in the field are constantly developing the apps and AI systems during ongoing battles and always oriented towards solving practical problems that arise in war. Artificial neural networks identify patterns in data sets while machine learning goes on and on based on the ever-growing data set. Though systems, like "Kropyva", were already effective when they were first introduced, they continue developing, with new features being added all the time.

The data for the Ukrainian software solutions comes from military intelligence gathering and intelligence agencies but also from physical reconnaissance operations, military and commercial satellite imagery, drone flights, cell phone photos and cell phone videos, and open-source intelligence. Incorporating all available disparate sources and fusing the data gives Ukrainian forces an edge in situational awareness, improves decision-making for military leaders, and enables high mobility and high precision simultaneously. Ukrainian combat, tactics, and strategy are driven by data and data analytics. The potential near real-time view of the situation provides a higher level of detail, reliability, and speed than any traditional military reporting system.

Data-driven combat is made possible by permanent connectivity on the battlefield. To this end, the Armed Forces of Ukraine use Starlink, a commercial low-orbit satellite constellation. But mobile Internet is also used in cooperation with Ukrainian operators. Mobile Internet towers are even taken along on Ukrainian advances. During the offensive operation in the direction of Kherson, many residents in the Kherson area suddenly received mobile Internet again at the start of the operation, probably also to enable them to transmit information about Russian forces in the area to Ukrainian troops. More recently, Ukrainian forces were supplied by a number of military SATCOMs. Those can be seen as a secure military channel, though they cannot be a substitute for commercial networks and bandwidth that see massive use.

It is particularly striking that the Armed Forces of Ukraine systematically involves the open-source intelligence community in their data work. An entire global scene is collaborating in support of Ukraine.

The armed forces and intelligence services have created interfaces for this purpose and meet the activists with openness, team spirit, and acceptance.

Artificial neural networks for rapid pattern recognition in complex data and machine learning have become a permanent and integral part of warfare. This applies to situation analysis, the identification of vehicles, people and targets, the prioritization of targets, and innovative methods of target identification. Vehicle types are automatically identified down to every last source of differentiation and their path tracked in an automated way - they are prioritized based on their manufacturing value or other criteria to ensure that particularly expensive or especially relevant Russian systems are targeted first.

Ever-new solutions to military problems are made possible by constant learning during the ongoing war. For example, after taking out Russian ammunition depots and railroad bridgeheads, Ukraine used satellite imagery to determine transportation routes for ammunition trucks by comparing specific tire tracks. The analysis of these records on commercial satellite imagery from successive days enabled AI to determine the coordinates of newly created intermediate depots that could be used operationally for artillery and rocket artillery targeting and successfully engaged. This example underlines the considerable potential of data-driven combat.

> ***Ukraine developed powerful systems for datadriven combat with AI support over a matter of weeks and months and deployed them directly into its armed forces. Most NATO countries might need around 10 years to forge similar progress at ten times the price and with less functionality and userfriendliness.***

The fusion of data from all available sources and AI-assisted analysis of the data, in other words, generates an output stream for its own situation picture and a direct output stream for target assignment of weapon systems of different ranges reported into the system. This, in turn, enables Ukrainians to achieve speed and precision that NATO has not yet achieved.

That said, many of the Ukrainian systems in use do not meet military standards of operational security. They are dependent on commercial constellations, such as Starlink, that are susceptible to the targeted feeding of false information and often operated on relatively insecure commercially available equipment. Yet comparatively cheap technologies and ease of use simultaneously ensure very rapid deployment and use. In Ukraine's view, the risks of operational security are less significant if you only rely on access to just enough data and can make sense of that data quickly using AI to ensure significantly faster speed than the adversary in recognizing the situation and having a military impact.

Although the basic principles and potential of data-driven combat have been recognized in NATO countries for some time, the innovations in Ukraine should open our eyes once again and, above all, act as a catalyst. Speed makes all the difference. Data-driven combat works better when it is rolled out quickly through many unified, easy-to-understand, and easy-to-use systems throughout the armed forces. The systems must be modular and at the same time have a parsimonious frontend limited to a few clear functions.

NATO's armed forces should swiftly introduce full and continuous data connectivity for all friendly forces and extensive sensor technology for all elements on the battlefield. The complete digitization of the battlefield must take place now, not in 10-20 years with then supposedly mature systems. From now on, NATO forces should always, constantly, and everywhere collect data on their own exercises and combat missions and, based on

the data, develop ever-new methods for evaluating and using it.

A fundamental strategic enabler of data-driven warfare pertains to low orbit satellite constellations. NATO and the EU urgently need their own constellations up and running as soon as possible. In view of Ukraine's defense, the launch of satellites for this purpose should have taken place long ago. The need for action is more than urgent.

It seems evident that a "data force" embedded in NATO's armed forces is badly needed. IT, data specialists, and AI specialists need to work constantly and directly on exercises and combat to improve systems. Data collection and data analysis at all levels of command should become part of NATO's concept of warfare. The days of developing software solutions driven by theoretical requirements in laboratories far removed from real military action and subsequently only introducing them into the armed forces over many years must be put to a halt.

Any trade-offs between operational security and usability must be tilted more in favor of speed. Those with the advantage of speed, in fact, can compromise on operational security. Special focus, in this regard, should be assigned to the type of time sensitive targeting that has proven to be decisive for the success of some operations in very dynamic maneuver warfare.

Ukraine developed powerful systems for data-driven combat with AI support over a matter of weeks and months and deployed them directly into its armed forces. Most NATO countries might need around 10 years to forge similar progress at ten times the price and with less functionality and user-friendliness. Innovation cycles, development, and test periods in NATO countries, to this point, need to be radically accelerated compared to today's cumbersome defense procurement processes. A real paradigm shift is needed here – it could involve including completely new personnel, ensuring easier access for new companies and start-ups to procurement procedures, and fostering new ideas in the defense sector.

Driven by data collection and data analysis, there are now fundamentally novel ideas for solving military problems but they go in a completely different direction than those focused on the constant further development of existing platforms and processes. Those who are open to disruption and know how to use these innovations will enjoy a military advantage in the future.

Data driven battle: Recommendations to armed forces in NATO

- Introduce complete and continuous data connectivity on the battlefield
- Collect all data at all levels of command and innovate on data analysis
- Set up low orbit satellite constellations as strategic enablers
- Build an embedded "data force"
- Improve operational speed, especially on time sensitive targeting
- Radically accelerate innovation and procurement cycles
- Open up to civic innovation and ease access for new companies and start-ups

Decentralized networks and responsible leadership

"The reason we are good at defending ourselves against the Russians is that it's basically like fighting ourselves from 10-15 years ago. We know well the problems of rigid hierarchies and the inability to make your own decisions and improvise, but we have become completely different on these issues since 2014." This statement from an experienced mid-level commander describes a crucial element of the Armed Forces of Ukraine. In many respects, Ukraine's military is now characterized by networks rather than a classic rigid hierarchy.

Starting with the Commander-In-Chief, superiors not only expect military leaders and non-commissioned officers, who play an important role, to make many independent decisions and assume responsibility, they even aggressively demand it. This emphasis on independent action and network-like structures of cooperation in the armed forces goes far beyond the military understanding of commissioned tactics.

The Armed Forces of Ukraine of 2022 and 2023 are broadly shaped by their experiences at warfare since 2014. Many very well-qualified and highly-motivated men and women with robust prior experiences in civilian life joined the military voluntarily following Russia's first military intervention in 2014. To a large extent, the very active and powerful horizontal structures of Ukrainian civil society spilled over into the armed forces. There, they accelerated a cultural shift towards ownership, network structures, and task completion in fluent-matrix structures that come together for special military tasks and then disband again.

Ukrainians largely liberated staff structures and bureaucracies from the Soviet legacy and keep them comparatively lean. Military leaders emphasize fewer rigid processes. At the same time, low- and mid-level leaders are just now assertively demanding the transfer of personal responsibility to them. Reports passed upward are often made to inform higher-ups about their own decisions rather than to pass responsibility up the chain of command.

Non-commissioned officers have a special role and responsibility to play in these processes. Pressing for more responsibility, they are willing to take risks in the process, make decisions, and adapt their actions to the realities of the battlefield without constant questioning about approval and cover from above.

Military leaders in today's Ukrainian armed forces often gain the necessary leadership organically through competence and experience, especially based on personal war experience in the Donbass since 2014. They often exercise leadership and responsibility that stands apart from formal hierarchy and rank - this is allowed and even encouraged.

> ***Reports passed upward are often made to inform higher-ups about their own decisions rather than to pass responsibility up the chain of command.***

Mid-level military leaders (but actually nearly all Ukrainian troops), in particular, communicate very intensively in all situations and very often horizontally to complement hierarchical communications for reporting and issuing orders. Higher levels of command and staff often deliberately move into a role of coordination and support, avoiding attempts at granular top-down control. The commander-in-chief, General Zaluzhny,

lives this leadership culture himself and demands it within his forces.

It is remarkable in this context that to a surprisingly high degree the situation analysis, decision planning, decision-making, the issuing of orders, and feedback on execution are exclusively verbal.

The decentralized and sometimes almost anarchic networks within the Armed Forces of Ukraine are the result of extensive efforts to modernize the system. These efforts started from the top and mark a generational leap - even the current Commander-in-Chief of the Armed Forces, a four-star general, is not yet 50 years old. They come from immense pressure for change from within, especially since 2014. In the defense of Ukraine, these network structures and independent decision-making processes have demonstrated tremendous advantages of speed, continuous very good adaptability to new situations, and extremely high responsiveness. They also have displayed a record of creating enormous problems for their adversary in comprehending the situational picture and war events.

As the war progresses, however, weaknesses in these structures and in the internal culture of the Ukrainian armed forces are becoming clear. Operational command and control at the brigade level or higher is difficult and poorly executed. Units and leaders that operate largely independently have discernible difficulty reintegrating into bigger formations for major attacks. Ukrainians have not yet sufficiently achieved the ability to shift from a decentralized mode of defense to systematic and disciplined mode of attack to produce the greater effects that come from larger formations.

These shortcomings are certainly not easy to resolve. Nevertheless, some particularly important lessons can be gleaned for NATO forces. Speed, adaptability, and significantly the ability to surprise the enemy require, in simple terms, agile staff and more troops. Overly detailed military planning, rigid command and control, granular control ideas from the top, and bureaucratic internal operations must be combated and avoided at all costs to successfully defend against large-scale Russian attacks. It is particularly worthwhile to compare the lean procedures of Ukrainian defenders with those of the large military bureaucracies of many NATO forces and to use successful innovations by Ukraine to dismantle some long-established structures within NATO.

The constant adaptation of operational command at higher levels to decisions made by responsible leaders at mid-levels, with many degrees of freedom, improves the striking power of the armed forces.

Networks and matrix structures place very high and new demands on personnel selection as well as training and exercises. Personnel selection targeted towards assuming responsibility, creativity, and agility is reaching its limits in many countries in view of the competitive situation of armed forces in the labor market. However, training concepts that promote independence, creativity, thinking, and acting in networks and matrix structures and approaches that consciously break out of the rigid structure of situation briefings and formal decision-making procedures are necessary for future officer and general staff training.

Not everything obviously has to be recorded in writing nor does it need to be written down again following a decision meeting in largely incomprehensible bureaucratic language. The verbal issuing of orders encourages and demands personal responsibility. Whether this might create tensions with the principle of parliamentary control of the armed forces would need to be examined but it is certainly worth consideration.

Promoting leadership through competence and experience and fostering a culture of respect for competence and experience, even in parallel with formal hierarchies, is an ongoing and worthwhile task in light of Ukraine's experience.

Nothing is more successful than success. If the experiences from the Ukrainian defense against Russia's full-out attack and the success factors of network structures, responsible leadership,

and the internal culture of Armed Forces of Ukraine are all heeded, this can leave far-reaching consequences for NCO training, officer training, military academies, and general staff training. It may even point pathways forward for a necessary radical cultural shift. The development of new concepts for NCO training and responsibilities as well as the development of junior officer skills will be necessary.

The advantages of decentralized networks in the armed forces for defense operations were and still are impressively demonstrated by Ukraine. The country's armed forces survived a major Russian attack on four vectors alone in impressive fashion, forced this offensive to culminate, and maneuvered itself to counterattack. At the same time, however, the disadvantages of decentralized structures for major assault operations and the enormous difficulties in transitioning from one mode to the other are clearly evident. Procedures and demands on leaders and troops differ in extreme ways in these different modes of operation. More pointedly, this lesson from Ukraine yields an important question for future NATO forces that should be explored in further research: Is it possible to conduct flexible, almost fluid, defense in decentralized networks with high degrees of freedom at lower and intermediate levels and switch to tight, unified command of major offensive operations with little decision-making latitude and very high demands on coordination and discipline with the same force? Or would a different forces approach with different procedures and internal cultures for defense and offense even be a promising path?

Decentralized networks: Recommendations to armed forces in NATO

- Develop agile staff and more troops focused on speed and adaptability
- Avoid too detailed military planning and too rigid command and control
- Rely more on oral agreements and verbal decision making
- Promote thinking and acting in network and matrix structures breaking out of rigid formal structures
- Transfer more responsibility to non-commissioned officers
- Investigate further if fundamentally different modes of operation require different sets of forces to be successful

Shaping the battlefield

We all know this video: A Ukrainian farmer with a big grin on his face triumphantly towing a fully intact Russian modern T-80 battle tank with his tractor. It became one of the most important symbolic images of the Ukrainian resistance - as a meme on social networks as well as on T-shirts. A great many videos and pictures went viral in the spring of 2022, embarrassing Russia and at the same time spotlighting the coolness and humor of Ukrainians. Abandoned Russian battle tanks and infantry fighting vehicles, meanwhile, were often found on roadsides in Ukraine at the time. Out of fuel and ammunition, their attack was "starved". Likewise, pictures of the scraps of entire columns of Russian military equipment, completely destroyed by Ukrainian artillery during their approach attempt, were disseminated globally.

Images like these illustrate the success of the indirect fighting style of Ukrainian defenders. From the very beginning of this war, Ukrainian forces shifted to avoiding direct and frontal engagements with Russian combat units as much as possible. Instead, they are defending themselves in a highly mobile manner, patiently luring Russian attackers into ambushes and kill zones, and focusing on combating Russian logistics for fuel and ammunition as well as command, control, and communications. This tactical thread has run throughout the war as the Ukrainian recipe for success: Ukraine focuses its own resources and offensive operations on shaping the battlefield.

> ***"The successful Ukrainian offensives in the direction of Kupiansk and especially on the southwestern bank of the Dnipro River, which led to the largest liberation of territory from the Russian occupiers to date in terms of area, were fundamentally characterized by this tactic of "slice and starve."***

This often entails defense operations almost like from military textbooks: The Ukrainian defenders observe approaching Russian columns very closely, even from great distances, harnessing a variety of effective tools, from satellite images to cell phone videos to drone video feeds. Ukrainian defenders define a precise kill zone and then patiently allow Russian advance forces to pass. They wait with nerves of steel until the main enemy forces arrive in mass in the kill zone and then engage them with precise artillery strikes until annihilation. The Ukrainian artillery then quickly changes positions. The process of mobile defense starts all over again. The Armed Forces of Ukraine appear well prepared for these scenarios. Overall, from a NATO armed forces perspective, this approach to mobile defense is not particularly unusual or surprising. To successfully conduct mobile defense requires a very good overview of the situation, good training, considerable practice, and a high level of discipline. This skill has also been put on display by the Armed Forces of Ukraine.

The application of these methods of mobile defense and delaying operations, prudently aimed at exploiting the available space, has been made easier for Ukraine by the data-driven combat approach described earlier in this report. Ukrainians boast excellent training, a deep fundamental understanding, and high precision capability for artillery; they have certainly continued and expanded their post-Soviet artillery traditions.

This application of mobile defense underscores a basic tenet of successful Ukrainian resistance to Russian invaders: Mobility and precision beat sheer mass.

While the Ukrainian mobile defense, therefore, ultimately appears to be a conventional arrangement, the situation is different for many Ukrainian offensive operations. There is an increasing Ukrainian combat tendency to transform ***"shaping operations,"*** which traditionally are merely preparation for major attacks, into actual offensive operations. Through their high mobility,

Ukrainians are bypassing enemy forces and avoiding direct confrontations. Even in attack mode, Ukrainian forces, if feasible, avoid attacking Russian combat forces but constantly engage railroad bridgeheads, ammunition depots, fuel depots, ammunition and fuel transports, intermediate storage facilities, troop shelters, command posts, command, and communications facilities.

Ukraine, consequently, has consistently pursued a ***"slice and starve"*** tactic out of the ongoing shaping of the battlefield. This strategy has contributed to Russian combat troops exhausting their fuel and ammunition. Russian units have also been unable to act independently without orders and communications and have ultimately been compelled to retreat in flight even without major battles. Abandoned Russian combat vehicles often find themselves towed away by Ukrainian tractors. The successful Ukrainian offensives in the direction of Kupiansk and especially on the southwestern bank of the Dnipro River, which led to the largest liberation of territory from the Russian occupiers to date in terms of area, were fundamentally characterized by this tactic of ***"slice and starve."***

From a NATO perspective, it can be justifiably objected at this point that Ukraine's armed forces were and are probably forced to use these tactics out of necessity. The Ukrainian armed forces lack mechanized forces and strong formations that could attack in combined arms maneuvers. If, on the other hand, NATO has strong mechanized formations at its disposal and can attack with combined arms in large formations, it does not need to resort to protracted "shaping operations" but can strike directly and prevail. This is partly true.

But at the same time, it is absolutely worth learning from the innovative Ukrainian shaping operations. Looking into the Ukrainian terrain, one quickly sees the vast flat steppe, many medium and small water obstacles, few intact bridges, and even fewer bridges that could support heavy battle tanks and infantry fighting vehicles. In addition, there are many swamplands, forests, and a very long front line with long distances to cover, even on the inner ground lines of communications. For powerful heavy mechanized formations with materiel often weighing 50-60 tons and more, this would be anything but a walk in the park or an easy march through. What counts here, quite decisively, is military mobility.

Against this backdrop, the successes of the Ukrainian mobile defense and shaping operations should be a catalyst for NATO forces to put heightened emphasis on medium and light forces with different equipment and operational principles in addition to heavy forces. These include wheeled tanks, wheeled infantry fighting vehicles, and wheeled artillery with lighter weights, higher speeds, and longer ranges. Learning from the experiences of Ukraine's defense, it is apparent that NATO forces also need more mobile bridges and available rapid-crossing capabilities that can be carried directly in a decentralized manner in many units and used quickly and frequently.

What is also clear, however, in view of the experience of Ukraine is that a mobile defense and an indirect approach to attacks takes considerable time. Ukraine needed to work from August to November 2022 to liberate the southwestern bank of the Dnipro River near Kherson. The tactics of mobile defense and the indirect approach, therefore, can only be effective if the attacks of the opposing forces are stopped by natural obstacles, well-developed positions, or urban terrain; otherwise, these approaches can be accompanied by a continuous loss of territory.

For the commanders and soldiers involved, mobile defense operations always require speed, improvisational skills, and independent decision-making ability. These operations are very demanding and require a great deal of training and practice. The doctrine, structure, and training of forces in NATO face enormous challenges in this regard: While mobility, speed, and precision surpass any advantages that come from mass, an enormously high level of training is required due to changes in types of operations and the alternation between freedom to improvise and hard-core discipline from above that place very high demands on the mental capabilities of personnel. Since the influx of volunteers in 2014, the Ukrainian armed forces have gained many personnel across all ranks with high educational qualifications and practical professional experiences. The armed

forces of Ukraine are benefitting from this expertise, especially in shaping operations – the transferability to NATO forces is not easy or at least may require changes in personnel selection and training. Still, there are important specific lessons to be learned to avoid losses and enhance the cost efficiency of warfare, especially if several theatres or frontline sections need to be managed at the same time.

Shaping the battlefield: Recommendations to armed forces in NATO

- Improve military mobility
- Put more emphasis on medium and light forces
- Increase speed and precision to beat superiority in mass mobility
- Train and exercise "shaping operations" as a special, resource-efficient form of attack

Drones, Drones, Drones

"Just buy up all manufactured drones worldwide and give them to us!" This is how one of the interviewees for this study answered my question about how we can help Ukraine. Though this may sound like hyperbole, in reflecting on the Ukraine's experience during the war, this request appears perfectly reasonable. Drones are ubiquitous in the Ukrainian defense against Russia's aggression. Nothing works without drones anymore. To be able to win a war now and in the future, drones are a necessary part of the arsenal - and they are needed in previously unimaginable quantities.

In addition to special military drones, since the beginning of the war, the Armed Forces of Ukraine have swiftly and pragmatically incorporated all forms and varieties of commercial off-the-shelf drones. Drones became imperative - and at the same time a cheap consumable - for Ukrainian defense. Their supply are indeed exhausted rather quickly on the battlefield and need constant replacement.

> ***The leadership of the Armed Forces of Ukraine was quick to recognize the military significance of ubiquitous drone use and quickly adapted the structures and training of the armed forces.***

The Armed Forces of Ukraine use drones for artillery reconnaissance and fire control. They are, for instance, used in the form of ***"loitering ammunition"*** for direct attacks on Russian vehicles, air defense systems, and troops. More elaborate drone systems such as Turkey's Bayrakhtar TB-2, with its own ecosystem for data management and control, represent the high-end of the broad spectrum of military use of drones in this war. At the other end of the spectrum, every squad, platoon, and company of infantry has relied on their own mostly cheap commercial drones soaring above them reconnoitering the way and the surrounding environment before they carry out movements in the field.

Drones equipped with thermal imaging devices and night vision cameras circle over field camps, positions, trenches, depots, and important infrastructures to carry out surveillance. Drones are used to reconnoiter minefields and plot them directly on digital maps. And they deliver food, ammunition, and supplies to hard-to-reach areas or to small forward-deployed units such as patrols or artillery observers.

The uses for drones has continued to expand throughout the war, with their need continuing to grow too.

In the process, Ukraine's armed forces carry on with developing and building new drones and crafting new modifications during the ongoing conflict. Ukrainian soldiers are constantly experimenting with these drones and routinely sharing the knowledge they gain with each other through horizontal communication within the force.

Whereas at the beginning of the war, for example, improvised commercial drones capable of releasing simple grenades by remote control were still derided as dubious gimmicks, they have since become an integral part of warfare against trenches and certain types of enemy vehicles - with specially trained operators and detailed operational principles.

In many cases, the commercial drones needed en masse for military units are procured in an absolutely decentralized manner in the process: through donations from local populations, organizations that raise money internationally for drones and bring them to Ukraine, or through commercial donors.

The leadership of the Armed Forces of Ukraine was quick to recognize the military significance of ubiquitous drone use and quickly adapted the structures and training of the armed forces. The armed forces established a central drone school for all troops shortly following the start of the war, providing basic knowledge on the technology, its operational purposes, and drone operations through flash-developed standardized courses and curricula. Current and future drone operators from all branches of the armed forces have been required to complete these courses for several months now. The focus of the training is not on rigid operating instructions for specific models or on cramming regulations and pocket cards, but rather on basic knowledge that should enable Ukrainian soldiers to get a firm grasp on different types of drones as quickly as possible.

Following the conflict between Armenia and Azerbaijan, much has been written about the importance of drones for future warfare. The focus so far has broadly been focused on large reconnaissance drones and drone systems for unmanned warfare against ground targets. The Ukrainian defense against Russia's war of aggression again underscores this trend. Turkish drone systems, in particular, have repeatedly proven to be particularly capable.

Apart from this category, however, Ukraine's defense against Russian aggression may potentially facilitate a broader breakthrough of a wide variety of drones, constituting different forms and purposes, into all military force types and domains. There are numerous lessons to be learned for forces within NATO.

Armed forces will need large masses of drones in forces within NATO in the future for very many different purposes. In addition to highly specialized and elaborately developed military drones, large quantities of comparatively simple and cheap drones will also be important for armed forces within NATO in the future.

The widespread military use of drones is indeed the new reality of contemporary warfare. If NATO forces want to adequately defend themselves and become capable of victory, they urgently need to critically examine the extremely protracted and expensive development programs for military drones. At least in parallel with long-running development programs, the immediate procurement of market-available capable systems and the rapid construction and deployment of simpler drone systems in large quantities will be absolutely necessary.

So far, commercial mass drone manufacturing has been structurally dependent on China. Technological and industrial diversification are urgently needed here.

> ***Military competence in the operation of drones must become an integral part of all branches of the armed forces at all levels.***

Training should focus on basic knowledge and understanding aimed at also enabling improvisation

and experimentation as well as mastery of different and future drone types.

The ubiquitous use of drones is also changing the requirements for air defense. It makes little sense to use exorbitantly expensive guided missiles to combat cheap drones or swarms of drones that can be quickly and cheaply replicated. Considerably cheaper guided missiles and other systems for kinetic or electromagnetic countermeasures or even hijacking drones and drone systems will quickly be needed.

Drones, drones, drones: Recommendations to armed forces in NATO

- Introduce drones en masse into all branches of the armed forces
- Utilize cheap commercial drones for military purposes in addition to specially developed military drones
- Quickly develop and deploy new and simple cost-efficient drone solutions
- Reduce dependencies on Chinese commercial drone production
- Introduce and train military competence in the operation of drones in all branches at all levels
- Procure cost-efficient anti-drone systems

Small unit warfare

A delivery man with one of those typical cubic backpacks on a bicycle whizzes through the Ukrainian evening. He arrives at a trench, where a well-camouflaged soldier suddenly appears from behind a bush. From the brightly colored backpack, the messenger delivers the order: a night vision device and a few packs of ammunition. This video, which circulated on Telegram channels in Ukraine in the summer of 2022, is one of many very humorous posts with which armed forces and society in Ukraine continuously use to motivate themselves. But there is a kernel of truth here. Exceedingly small, very largely autonomous units are playing a significant role in Ukraine's military successes in this war. We are witnessing a stunning revival of Jagdkampf.

During the defense of Kyiv in the spring, in the forests near Izium in late summer and also in the fight against the kilometer-long column of Russian vehicles that is still vividly remembered by many observers, small, independent, and highly mobile Ukrainian units have repeatedly been visible. Ukrainian small light infantry units on quads have also gained fame as they repeatedly appear seemingly out of nowhere to attack Russian convoys and vehicles with anti-tank weapons before quickly disappearing again.

Ukrainian small squads are very successful in asymmetrically inflicting casualties on the Russian attackers. Providing effective and digitally driven battlefield awareness, these units usually boast improvised mobility ranging from pickups and commercial minibuses to quads and silent electric bicycles. The small units almost always have their own small drones and night vision capabilities. Core to the armament of this light infantry are ***"fire and forget"*** systems such as Javelin, NLAW, Stugna-P, and Stinger. The small units further enjoy extensive freedom of action in their respective areas of operation and adapt very flexibly to conditions and situations on the ground.

The Armed Forces of Ukraine use the small units in urban terrain particularly efficiently. With small units systematically trained for urban combat and fighting in urban terrain, the military has been able to inflict enormous losses on advancing Russian units and, in some cases, delay or even stop large-scale Russian attacks for a very long time.

The Ukrainian military purposefully built up the small units for Jagdkampf based on the experience of the war in the Donbass since 2014. In doing so, they were also motivated by the possible high efficiency: Even without armored vehicles and strong mechanized forces, it is possible for small, well-trained, and highly mobile units to achieve critically importantly military results at comparatively low cost. This small units warfare is cheaper for Ukraine than deploying large armored units, opening opportunities to asymmetrically inflict extraordinarily high costs on Russia.

The success of the small units warfare in Ukraine is made possible by three factors: First, since the first day of the war, Ukraine's armed forces have benefitted from better situational awareness and a more accurate picture of the situation than the Russian attackers. Second, Ukrainian small units are highly mobile, using all relevant vehicles with ease. Third, very precise and easy-to-use weapon systems are available in large quantities from Ukraine's own production and, above all, from the mass deliveries of partners. This makes small unit warfare efficient even if it at the same time decidedly presupposes much. The small units require a lot of training and experience. They also need precise knowledge of the terrain and preferably deep local knowledge of their own. Of paramount importance concerns the need for significant intensive exercise experience under the most realistic conditions possible, especially for difficult terrain or combat in urban areas. Ukrainians have been practicing small units warfare intensively in real conditions since 2014, with nearly all leaders and sub-leaders having completed several tours in action in the Donbass. Moreover, small units warfare requires granular logistics - this is greatly aided by the decentralized structures, the ingrained broad-based traditions of partisans and Cossacks, and the commitment of Ukraine's civil society.

For NATO, this unexpected revival of Jagdkampf has a number of consequences, even at the doctrinal level. Since the Cold War, the role of Jaeger units has been dramatically reduced. But Ukraine's experience underscores that it may be worthwhile to rethink a renewed bigger role for small units.

For force structures within NATO, this could mean reintegrating light infantry battalions or companies with capabilities for highly mobile, asymmetric combat into mechanized brigades in the future. Equipped with a range of mobility options up to silent fast electric vehicles and mobile weapon systems, this light infantry could transfer the asymmetric approach used very successfully in Ukraine to NATO. And though it could prove more challenging in terms of training and professional focus, it would be worth considering retraining some infantry units within NATO's armed forces for unconventional warfare. This would mean providing these troops with significantly more training in commando operations and urban warfare tactics by dismounted infantry units.

Based on the sheer quantities with which they have been used in Ukraine, it is abundantly clear that there needs to be a significant increase in the equipment of the armed forces within NATO including "fire and forget" anti-tank weapons, anti-aircraft systems, and anti-drone systems. Subsequently, production capacity for these mobile weapon systems for light infantry also requires a significant increase.

The granular logistics of small-unit operations require considerable manpower. Ukraine's decentralized supply from civil society will be difficult to transfer to forces within NATO. To reap the benefits of fighting with small independent units in the future, NATO will need military logistical innovations. These could include the prepositioning of equipment, weapons, and ammunition at territorially distributed small depots, more transport systems based on standard containers, and a

greater reliance on drone systems for military logistics.

As it pertains particularly with respect to the revival of small units warfare, Ukraine's experience underlines that the only way to achieve high military performance is through frequent, high-intensity exercises under real conditions. The potential of a new light infantry for Jagdkampf is recognizably high; at the same time, the decisive quality differences in performance that can be achieved through effective and very intensive training and, above all, through constant, high-intensity exercises, especially in hunting combat and combat in urban terrain, are enormous. After the war, forces in NATO should clearly consider using Ukrainian trainers for this purpose as well.

Small unit warfare: Recommendations to armed forces in NATO

- Reintroduce light infantry battalions or companies with capabilities for asymmetrical highly mobile combat
- Retrain infantry units in commando operations and urban warfare tactics
- Increase equipment, stocks, and production capacities of mobile anti-tank, anti-aircraft, and anti-drone weapons
- Strengthen granular logistics and prepositioning, also using standard containers and drones
- Establish a system of constant and high-intensity training and exercises for dismounted infantry

Advanced smart artillery

If you talk to artillerymen in Ukraine these days, you quickly get into conversations reminiscent of extensive car tests and the portals that compare their features: The German Panzerhaubitze 2000 is well protected but it is very heavy and can fire too few shots a day for Ukrainian needs; with the French Caesar, the computer-controlled FAST-Hit firing system works well and it is possible to quickly disappear after firing the grenades; the Polish-Korean AHS Krab is similar to the Panzerhaubitze 2000 - particularly effective with Excalibur precision ammunition (but there are unfortunately again too few shots); the towed American M-777s are so light that they can be moved with jeeps or pickups without any problems. There are also considerable differences in propellant charges that need to be taken into account, etc...

No one in the world boasts as much knowledge and combat experience with so many different types and calibers of towed and self-propelled artillery as the Armed Forces of Ukraine. This knowledge is invaluable - also for NATO forces.

> ***Ukraine's experience in defending against Russian attacks illustrates a massive renaissance for artillery and provides a glimpse at the future of artillery warfare with mobility, precision, and ever longer ranges.***

And it must be soberly noted that in the process, Ukraine's armed forces often succeed in making better use of partner-supplied modern artillery systems than the armed forces of the supplying nations are currently capable themselves. The Ukrainians, traditionally well trained and prepared for artillery warfare, developed a new system of advanced, smart artillery with additional guns and

the supply of different types of ammunition and propellants.

Data-driven combat also forms the basis for the deployment of artillery for the Armed Forces of Ukraine. Data fusion of reconnaissance data from a variety of sources, ranging from artillery observers and cell phone photos to drone feeds and satellite imagery, enables the quick identification of targets and their prioritization according to their value, a process supported in part by AI. Once the targets are acquired and prioritized, they are assigned via data transmission to the guns in the battlefield that are logged into the system, depending on the respective range of the systems and the ammunition and propellants used. The guns move into position and fire at the assigned target. And even before the projectiles hit the target, the artillery piece is already leaving the firing position as a drone flies above the target and sends back the video feed of the fire control. All data throughout the process is transmitted via Starlink, which provides constant connectivity with a low orbit satellite constellation. The result is "shoot and scoot" close to perfection.

The Ukrainian artillery implements the kill chain described above with impressive speed, so that in many cases it takes only a few minutes from target acquisition and assignment to shoot and scoot. Of course, this method is not always successful and is not used across the entire front line. But at the same time, Ukraine's experience in defending against Russian attacks illustrates a massive renaissance for artillery and provides a glimpse at the future of artillery warfare with mobility, precision, and ever longer ranges.

The artillery of Ukraine's armed forces also broadly relies on drones, often even cheap and simple models that have quickly become almost indispensable for target acquisition and fire control. But cell phone photos and videos of the impacts of artillery fire in Telegram channels or social media posts from Russian accounts are also evaluated live and used for fire control and target correction.

The Ukrainian artillery has very well trained personnel with solid basic knowledge. Even soldiers who reload ammunition into the guns are familiar with parabolas and trajectories, with basic geography and physics. The wealth of experience of Ukrainian artillerymen is also particularly invaluable. They typically know not only the advantages and disadvantages of different guns, ammunition, and propellant charges based on their own experience, but also countless details and tricks of complex artillery warfare that can only be gained through considerable practice and battlefield experience.

Ukrainians, undoubtedly, are closely familiar also with the guns, ammunition, and operational principles of their adversary too, in part from their own military experience before the modernization and reforms of the Ukrainian armed forces since 2014.

This distinct combination of knowledge has contributed to a significant capabilities advantage. For example, Ukrainian artillerymen can fire different guns in intersecting trajectories in such a way that every projectile hits its target, and, at the same time, Russian anti-artillery radars struggle to calculate the trajectories of the projectiles and reconnoiter Ukrainian fire positions. This single example shows that artillery warfare is a discipline of its own with high complexity. To master this high complexity, rich experience is needed. As a Ukrainian interlocutor puts it: "If you want to be good, you have to shoot a lot."

The Armed Forces of Ukraine do not operate different guns of towed and self-propelled artillery and rocket artillery separately, but increasingly merge the different guns, ammunition, capabilities for mobility, and ranges into an overall system of advanced smart artillery. The ranges of artillery systems and precision munitions from 155mm artillery systems, such as Excalibur at 50-70 km, smoothly transitions to guns such as HIMARS, Mars 2, or M270 with GMLRS munitions at up to 90 km. All the different systems are integrated with their respective capabilities and ranges and are assigned

appropriate targets to engage. The key lies in the software that brings the hardware together. Future guns or ammunition with longer ranges can also be quickly integrated into the Ukrainian artillery system.

For all the impressive strengths of the Ukrainian artillery, however, there are also identifiable weaknesses that need further work. Counter battery capabilities are still woefully underdeveloped compared to artillery capabilities and coordination for counter battery fire at higher levels of command is too weak. Russian artillery can often fire completely unchallenged for far too long.

Ukrainian ammunition logistics have partly failed to keep up with the pace of deliveries of new guns, different calibers, and different types of ammunition in terms of their expansion and robustness. In addition to a lack of ammunition, inadequate ammunition logistics in some cases prevents the effective use of artillery at its full strength.

Maintenance and repair - or the replacement of barrels - further can often only be carried out several hundred kilometers away from theaters of operations. This inefficiency often leads to additional wait times for rail capacity and rail transport.

The overall impact of the artillery renaissance in Russia's war against Ukraine will be significant and is already emerging in many places. Foremost among these will be the redeployment of significantly larger artillery forces within NATO forces and the need to considerably increase production capacity for materiel and ammunition.

NATO and armed forces within NATO should systematically research and evaluate the knowledge gathered in Ukraine about the advantages and disadvantages of the different systems of towed and self-propelled artillery. The data gathered by using a wide variety of guns, munitions, and propelling charges in real high-intensity artillery war must be used as foundation for any further development of equipment, strategy, and tactics.

The use of artillery as a system of systems based on a data and data transmission infrastructure in which artillery and rocket artillery guns with different mobility, ranges, and ammunition are logged in and can be deployed simultaneously is groundbreaking. In addition to different guns and ammunition types, artillery in the future will depend on software and AI support that interacts to enable hardware in a rapid kill chain. Mobility, speed, and precision are again the keys to success. This software side of the artillery system is getting a huge boost based on Ukraine's experience.

On the hardware side, NATO forces will need much more precision artillery in the future, both wheeled and tracked. This applies to 155mm artillery and rocket artillery alike. The integration of drones for target acquisition and fire control will be as indispensable to NATO forces in the future as it is in Ukraine. In addition, there is a need for investment in better counter battery capabilities and the integration of these capabilities into the artillery kill chain in software and hardware.

The training and exercise regime for artillery troops must be based on the experience in Ukraine and oriented towards achieving the highest possible speed of the kill chain, high mobility, and maximum precision. This places high demands on personnel and will require a great deal of high-intensity training.

NATO forces will need to build up large storage capacities of artillery ammunition and propellant charges. In this context, new types of ammunition logistics will also be needed. The transport of artillery ammunition will be an important prerequisite for successful warfare with artillery in the future. It should preferably be based on standard containers and pallets, simple for transport by air, ship, rail, or road and with differentiation for rapid distribution and pre-positioning in operational areas.

Advanced smart artillery: Recommendations to armed forces in NATO

- Redeploy significantly larger artillery forces, wheeled and tracked, towed and self-propelled
- Increase production capacity for artillery pieces and ammunition
- Research and evaluate the knowledge gathered in Ukraine on different guns and ammunitions
- Transform artillery into a software and AI-driven system of systems
- Integrate drones for target acquisition and fire control
- Improve counter battery capabilities
- Equip, train, and conduct exercises aimed at achieving high-speed kill chain, high mobility, and maximum precision
- Build more ammunition storage and improve standardized, fast ammunition logistics

Complex logistics and resilient railroads

"Russia launched more than 60 cruise missiles and more than 20 drones at Ukraine today, including at railroad network structures. Unfortunately, the train to Kharkiv was delayed for ten minutes because of this." This or similar comments have often been made by the head of Ukrainian Railways throughout the war. The resilience of Ukrainian railroads is simply impressive.

What is hardly seen in public, apart from passenger trains, concerns the extent to which the Ukrainian railroads also constitute an important backbone for the military logistics of Ukraine's armed forces. Ukrainian military logistics, that said, are deliberately kept out of the public eye.

The tasks of supplying and repairing large numbers of troops on very long front lines are complex. Added to this is the ever-increasing complexity of logistical support for a very large number of vehicles and weapon systems, extensive ammunition logistics over very long distances, and managing the transportation requirements for the delivery of new weapon systems from partners and the maintenance and the repair of weapon systems outside Ukraine's borders. The complex logistics of the Armed Forces of Ukraine is a truly Herculean task.

As soon as the Russian attack began, the Ukrainian armed forces switched to a war logistics mode. This also means that the large state sector of Ukrainian railroads and the sizable vehicle fleets of state-owned enterprises and large Ukrainian companies were acquired directly to support military logistics. This has enormously increased the logistics potential of the armed forces.

Significant parts of the logistics, nevertheless, remain deliberately decentralized and, in contrast to the post-Soviet tradition, rigid centralism is deliberately avoided. Regional responsibilities in the oblasts for civil defense and support of military logistics help with rapid supply and allow for the integration of the enormous amount of civil society assistance and activities to support and supply the armed forces. The system of Ukrainian military logistics breathes.

The Armed Forces of Ukraine have traditionally relied on rail for loading and transportation. Loading operations under operational conditions and at night are standard and the necessary technical equipment is in place, often with technically

obsolete but robust fallback systems. Large stocks of locomotives, railroad cars, transport cars for fuel, ammunition, and material are available. Old rail cars have also been stored rather than scrapped, with their simple and robust construction making them relatively easy to put back into service. If the electric locomotives do not run, diesel locomotives are used. If the diesel locomotives were to be unable to run, then it would even be possible to put steam locomotives back into service if necessary. Redundancy and fallback options, in other words, function to stabilize wartime logistics in Ukraine.

Ukraine's rail network, like its power grid, was deliberately designed for redundancy in the Soviet tradition. Ukraine's armed forces now benefit from this today. Even when key hubs are destroyed, there are always options for alternative routes and bypasses without bringing train operations to a halt. The sensitive shipment of important weapons, ammunition, and equipment can be split up for security reasons and transported separately along indirect routes to training areas, staging areas, and the front lines. To achieve this, Ukraine combines the low-tech of the redundant rail network and older, robust locomotives, and rail cars with the high-tech of software-optimized routes and position- and software-based live monitoring of transports.

It is precisely the combination of low-tech and high-tech capabilities that has proven to be particularly effective in logistics, as in other military areas.

Ukraine's rail-based military logistics support is also benefitting from the country's steel and metal industries – this sector largely produce rails and switches domestically and large decentralized stocks of spare parts, special components, and tools. It is feasible to rapidly carry out mending, repairs, or even the laying of tracks and switches anywhere and at any time.

It is probably no exaggeration to state that no European NATO state today would be capable of military logistical achievements like those of Ukraine during this war. Deliberately created redundancies and stocks, by and large, no longer exist in NATO countries. Yet a lesson to draw from Ukraine's successful defense against the Russian invasion concerns the need to rebuild them. Defense capability and logistics sustainability are only possible with many redundancies and large decentralized stocks. ***"Just in time"*** is simply not defensible.

Looking at Ukraine, where millions of civilians were fleeing at the same time as military logistics on rails and roads needed to flow, also makes it clear that resilient management of civilian transportation of people on roads and rails is what creates the space for functioning military logistics in national defense in the first place. It is simply completely erroneous to think that civilian traffic can be halted altogether to give priority to the military. NATO countries, to this end, need to develop the ability to manage civilian traffic and passenger transport even under the extreme conditions of war as military logistics simultaneously carry on.

This is a task for civil-military cooperation and will require enormous nationwide preparation. At the same time, it will necessitate considerable redundancy and crisis capability in commercial transport companies that must be financed by state funding. The enormous reserves required in terms of personnel and the training of personnel to operate the various vehicles and tools for loading, transport, refueling, etc... must also be considered. The politics here requires the creation of the necessary legal framework and a decision on sizable funding requirements.

Military logistics primarily involve night operations during wartime. The armed forces of the NATO countries, consequently, need comprehensive capabilities for loading and transport at night and the general capabilities to operate logistics on rail and road around the clock.

Logistic night operations, war logistics as a whole, and civil-military cooperation, in particular, must be practiced extensively and under the most realistic conditions possible on a large scale.

It is an old adage that battles, campaigns, and entire wars are won or lost through logistics. The task for improving the military logistics of NATO countries, drawn from the experience of Ukraine, is certainly among the most important and greatest challenges for sustainable security in Europe.

Complex logistics: Recommendations to armed forces in NATO

- Create considerable redundancies and crisis capabilities in commercial transport
- Develop and stack deep reserves of materiel, trained personnel, capabilities for emergency repairs, and stocks of spare parts; if necessary, this should be fully financed by government crisis provision funds
- Provide the legal framework and financing for the extensive use of civilian infrastructures for defense logistics
- Practice night-time logistic operations intensively under realistic conditions

Operational security, secrecy, and deception

> ***In early September 2022, Ukrainians, Russians, and all observers of the war looked in unison to Kherson and the surrounding countryside on the southwestern bank of the Dnipro River.***

Ukraine had launched a counteroffensive there in August, the first major counterattack since the Ukrainians had repelled the Russians north of Kyiv.

Then, suddenly, the news rolls over to another region. Completely by surprise, Ukrainian mechanized formations push through Russian lines northeast of the front in Kharkiv oblast, wreaking havoc and getting as far as Kupiansk. The Russians are forced to abandon Izyum, a strategically important city that had only been captured following months of fighting. Ukraine swiftly liberates all territories in Kharkiv oblast and parts of Luhansk oblast. Kyiv had successfully maintained preparations for these operations as a closely guarded secret, successfully deceiving Russia, professional war monitors, and the general public all alike. How was this possible?

Deception is exceedingly difficult. Ukraine succeeded in this case due to the very deep and detailed knowledge that Ukrainians possess about their Russian opponent. They speak the language of the other side and know the structures of the opposing forces very well. Ukraine also specifically incorporated components of the Russian leadership culture and reporting system into its operation planning. They knew the Russian sensors and what Russia was paying attention to and were able to incorporate that into their deception operation. At one point on the front, the Ukrainian military even transported their own soldiers on stretchers and in ambulances in mass before the attack in the direction of Kupiansk to deceive Russian reconnaissance about the numbers of dead and wounded and thus about true troop strengths. This was only possible because Ukraine knew at that point exactly how and where it was being watched by Russia.

Deploying this extensively deep knowledge about their opponent and their internal structures and psychology, the great deception was laid out and Russia's weaknesses exploited.

Operational security, importantly, is a basic prerequisite for the success of such deceptive maneuvers and a critical factor for the success of

Ukrainian defense. Ukraine knows this all too well based on its own very painful experiences in 2014. Many soldiers were killed or wounded in Donbass in 2014 and afterwards due to the use of cell phones that were tracked and used for targeting by the other side. But Ukraine learned from these brutal experiences and came considerably better prepared and trained for the Russian attack in 2022.

Though cell phones and other electronic devices are not banned in the Ukrainian armed forces, soldiers have been well trained in using them safely. Since 2014, the handling of these devices has been implemented with absolute seriousness, precision, and discipline; everyone is aware that there is no tolerance for mistakes here. The experience of 2014 taught this lesson the hard way.

Especially in the initial phase of the Ukrainian defense against the Russian attack, operational security made a crucial difference. Russian troops were often identifiable by the cell phones they carried and frequently even turned on. They were, moreover, often communicating through open lines or unencrypted radio. Concentrations of cell phones and individual devices could be observed, located, and used for targeting by Ukraine.

Ukraine, additionally, quickly enforced internal rules requiring that photos and videos of Russian attacks, artillery, and missile strikes on Telegram channels pixelate the exact locations of the impacts. Awareness of operational security was promoted not only among the troops but also the broader civilian population. The issue was repeatedly addressed via television and Telegram channels. Ukrainian operational security has developed an aware and supporting culture within the broader public.

After a report from a Ukrainian television station led to the geo-location of a Ukrainian weapons factory that was subsequently targeted by Russia with missiles, the National Security Council decided that only a unified television program where the armed forces retain control over such images and maintain operational security can be broadcast. This move is not without its critics but it has contributed to better operational security.

Possible lessons for forces within NATO are obvious on the one hand and not entirely straightforward on the other.

The hard tangible experiences of Ukraine reveal that considerable exercises held under full operational security are absolutely necessary. Operational security has to be enforced strictly internally and needs almost drill-like training, as no mistakes can be tolerated. In an age where cell phones and electronic devices are always available, this is a major challenge.

The targeted deception of an adversary also requires significant practice and strict discipline. Above all, it requires precise knowledge and constant updating of information concerning the opponent's sensor technology. This task, in turn, requires special and dedicated capabilities.

The relations between Ukraine and Russia are special, right down to the understanding of the respective languages. Not all experiences in the abstract, consequently, are easily transferable to other conflicts. Nevertheless, it is apparent that deceptive maneuvers only succeed if one side possesses intensively deep knowledge about their opponent. This includes in-depth regional expertise, mastery of the other side's language, psychological knowledge, and broad awareness about the organizational and leadership cultures of the opposing forces. This knowledge must be systematically fostered, nurtured, and maintained over the long term and extend far beyond the observation of enemy potential and troop movements.

Operational security and secrecy clearly are contributing factors to a successful defense. But they also may harbor conflicts for the internal organization and processes within the armed forces. Operational security and secrecy demand as little involvement as possible in decision preparation and decisions. This stands in tension with many military bureaucratic processes that rely on wide participation and coordination within the

bureaucratic apparatus, frequent co-signatures, and the broadest possible involvement. These processes require critical review in light of the security requirements of real-world conflicts. This also applies to general organizational unit email inboxes, shared documents, and internal information culture. It further includes a need to manage the human hunger for information and rumors that is inherent to large military bureaucracies and troop formations.

Operational security, secrecy, and deception capabilities also stand at odds with the high demands of parliamentary and public oversight of the armed forces that are common in many NATO countries. Although it will not be possible to resolve these contradictions completely, it is nevertheless necessary to address them considering the Ukrainian experience. Democratic principles, parliamentary control, and free media coverage are important even in war, but at the same time, issues of operational security and secrecy are often matters of life and death that can have an absolutely decisive impact on the outcome of battles and the course of wars. A new balance needs to be found that allows the tightening of security and secrecy.

Operational security: Recommendations to armed forces in NATO

- Perform regular intensive exercises under fully realistic conditions of operational security
- Stay closely up-to-date with sensor capabilities of opponents
- Include more in-depth language skills, regional knowledge, and cultural knowledge
- Review internal bureaucratic procedures and proclivities towards institutional cultures of broad participation and CC-culture from a strict operational security perspective
- Navigate a better balance between tight operational security and civil and parliamentary oversight

The story wins

"Let it be spring!" To this Ukrainian tune, a female combat soldier comes home for furlough. Her little daughter, whom she has not seen for months, runs towards her in rubber boots as fast as she can. The family dog wags its tail in joyful excitement somewhere in between - then everyone is in each other's arms. As if by chance, the scene was filmed with a cell phone and posted on Telegram channels, TikTok, Instagram, Twitter, Facebook, and the Internet pages of numerous news channels just like hundreds, if not thousands, of similar videos have before and after. These include videos of speeches of the Ukrainian president and videos and memes featuring ironic, combative, funny, sad, scary, and enraging expressions. There can be no dispute: Ukraine totally dominates the war as far as strategic communication goes.

Ukrainian strategic communication is fast, creative, and skillful. It reaches its audience at any time, day or night. It is consistently targeted at different audiences around the globe. Ukraine, in other words, is setting completely new standards in strategic communication during a war.

This success has been made possible by, among other factors, strong communicators and amplifiers. It starts at the top with the president who has been providing daily briefings since the start of the war via selfie videos broadcast in Ukrainian, English, and sometimes Russian.

Throughout the course of the war, Zelensky has repeatedly delivered strong, historic speeches - from the powerful simple "Ya tut" ("I am here") in the early days in Kyiv to the fiery "Without water, without electricity, without heating, without food - but

without you!" after the Russian cruise missile attacks on Ukrainian infrastructures to a deeply moving New Year's speech in which he mentioned himself only a single time.

But behind the president, many other leaders in Ukraine also communicate authentically and regularly: the commander-in-chief of the armed forces, the mayor of Kyiv and other mayors of big cities, governors, members of the government, deputies, ambassadors, representatives of civil society. They are almost always visible, authentic and clear, and focused on the tangible. They regularly speak out, frame issues early, classify events, provide information and orientation, and set and influence the tone of many international debates.

Strategic communication is an interesting phenomenon. Everyone knows in principle how to do it - the guiding formulas are clear and often prescribed. Often it is even pretended to be a rather simple art even though it rarely succeeds properly. Ukraine applies the same rules for successful strategic communication known to all but it has done it in an exemplary manner throughout the war. It all starts with regularity and routines: the president, for instance, records a statement every evening and the Ukrainian general staff gives a written briefing every day. All official information is immediately played out on different channels: Telegram, TV, press releases, TikTok, Instagram, Twitter, Facebook, even LinkedIn. Everyone knows that this is how it should be done - but Ukraine does it every day in a disciplined and consistent manner. This is the secret to its success.

In doing so, Ukrainian communicators have demonstrated that they understand the news cycle in Ukraine and key partner countries perfectly and can adapt when necessary. The president's evening speeches set the tone for the coming day; in Europe, it is better to be early with messages to set the tone for the news day; in the U.S., it has to be primetime.

At the same time, the president in particular consistently tailors his communications to different target groups. He talks differently to the G7 than to African interlocutors and to the Bundestag differently than in the Knesset or the U.S. Congress. Zelensky always incorporates historical and cultural references, incidents, and quotes familiar to the target groups in his speeches. Regularity, simultaneous multi-channel playout, adaptation to the target groups, insertion into the entry points of the news cycle - the communication of the Ukrainian president will probably quickly find its way into textbooks on strategic political communication.

This also applies to the strategic communication of the Armed Forces of Ukraine and the government with regard to the Russian war of aggression and Ukrainian defense in the narrower sense. The Ukrainian military regularly produces high-quality content and uses a connected global network of amplifiers and communicators in a kind of ***"controlled anarchy"*** for dissemination with enormous reach. In doing so, the Armed Forces of Ukraine specifically cooperates with journalists, experts, and the global open-source intelligence community; they even became a part of these communities themselves.

An exploration of the many very successful content-related motives of the strategic communication of the Armed Forces of Ukraine is beyond the scope of this report. However, there are a few outstanding examples that are representative of the system as a whole.

Almost immediately after the Russian attack, when thousands of Ukrainians stood in lines as volunteers to enlist in the armed forces, a video of the well-known singer BoomBox spread rapidly. Freshly dressed in uniform, he sang the Ukrainian patriotic folk song, ***"Oi, u luzi chervona kalyna"***, a cappella in Sofia Square in Kyiv with tremendous emotion, expressing the state of mind of millions of Ukrainians: We will stay, we will volunteer for the troops, we will fight. Its dissemination on Telegram channels (the main news sources for quick and reliable information about the war) saw the video viewed by the entire country during the first days of the war. "Oi, u luzi chervona kalyna" quickly became

the soundtrack of Ukrainian self-assertion – it has been sung, re-recorded, and disseminated over and over again in countless versions: by troops on the front lines, choirs of different troop branches, people in subway stations during Russian air raids, small children, opera singers, Estonian friends of Ukraine, and many more.

Almost as well known is the gloomy electric piece with the line, ***"Dobroho vechera, my s Ukrainy"***. It is used as the background music for numerous videos featuring images of the deployment of the Armed Forces of Ukraine against the Russian intruders. These videos advance a harsh and clear military message: Whoever attacks us and enters our Ukrainian soil to take it away from us will have a rough time. Videos of the destruction of Russian vehicle columns, tanks, and command posts by drone attacks on Russian military equipment and the impact of Ukrainian artillery on enemy positions certainly do not meet the standards of political correctness in peacetime and could raise ethical questions. But combined with ***"Good evening, we're from Ukraine,"*** they communicate to soldiers their strength and cohesion and the societal support backing them; they connect the armed forces and society behind a grim mood needed for successful national defense. It would be a mistake to shy away from such strategic communication.

The Armed Forces of Ukraine, apart from content encompassing battle scenes, repeatedly communicate with two strong emotional themes. First, they promote new videos and short stories of soldiers on the front lines with their pets - dogs, cats, mice, and sometimes exotic creatures - again and again. This content creates moments of humanity and closeness despite the cruel war - it also fosters a positive image of Ukrainian soldiers defending the homeland. At the same time, by objective standards of communication on social media platforms and messenger services, these videos are really light and entertaining, always authentic and therefore encourage sharing. The videos don't seem strained, they don't "smell" of stiff government communication or overly strained strategic communication. This is also true for the widely circulated "silly dances" of Ukrainian soldiers. And it is even more true for the family scenes of farewells and reunions described above, which are connected with the song ***"Bude vesna"*** ("Let it be spring"). They are real families, real fighters, real children, real people, and real pets. These are the authentic messages of an authentic defense against a brutal assault that form the core of the strategic communication of the Armed Forces of Ukraine. At the same time, music, pets, children, families, and the entire register of emotions of joy, sadness, fear, anger, shock, and relief are the well-known recipes for success of the entertainment industry, which the Armed Forces of Ukraine apply in strategic communication exceedingly skillfully and implement professionally in terms of craftsmanship.

For Ukraine, communication is part of the war. Strategic communication is therefore a matter for the top leadership, starting with the president. In the Armed Forces of Ukraine, a deputy minister for strategic communication is responsible for this area, which underlines its importance.

Ukraine's groundbreaking strategic communications in this war must lead to a complete rebalancing of capabilities in NATO country forces in this regard. This requires brutal honesty in analysis: The strategic communications of forces within NATO are extremely far from being able to communicate even remotely as successfully as Ukraine, both in terms of content and structure. Radical transformations and improvements are needed.

This must include the establishment of much more extensive communications capabilities and the generation of significantly more professional output of content on all conceivable channels. Forces in NATO absolutely need considerable more media content production capabilities and resources than they have today.

The speed of strategic communications in forces within NATO needs to be significantly increased too. The ability to frame the narrative first and shape the information space offensively rather than reacting belatedly is absolutely critical to war. Radical

rethinking is needed here to enable short and rapid decision-making processes, ample freedom for communicators, and "controlled anarchy" of high-reach amplifiers in NATO forces as well.

NATO troops urgently need creative partners and help from professional creatives who can reshape strategic communications embedded in the forces. Both the attempts to outsource their own strategic communication to agencies and the attempted imitation of strategic communication techniques by bureaucratic structures should be seen as failures. In view of the level reached in Ukraine, nothing less than a radical new beginning is needed in strategic communications in NATO's armed forces.

Strategic communication is an integral part of warfare that must be performed directly at the top political and military echelons of any armed forces. A deputy defense minister dedicated to strategic communications and backed with appropriate resources, as in Ukraine, would be a groundbreaking and prudent step.

Strategic communication is now a mandatory component to military tasks that needs to be heeded. Only those who understand and implement strategies to this effect will be able to achieve military success now and into the future.

The story wins: Recommendations to armed forces in NATO

- Radically transform the structure and content production of strategic communications of the armed forces in NATO countries
- Establish more media production capabilities and more extensive communication capabilities
- Produce much more quality output across many different channels
- Introduce reforms aimed at achieving rapid decision-making procedures and ample freedom for communicators
- Embed creative partners and creative professionals
- Anchor strategic communications structurally at the highest political level

Conclusion

Russia is still continuing to wage its war of aggression against Ukraine. And yet, Russian forces are already defeated. Against the resistance of Ukrainians who are supported by partners, Russia has achieved nearly none of its military goals. Ukraine will prevail.

The armed forces in NATO countries, the EU, and beyond should learn important lessons from the course of the war. Though the analysis and study of the war will certainly continue, this report provides a starting point for those discussions and debates.

If we learn from Ukraine, we will be better able to defend against aggressors and deter aggression in the future.

Let it be spring!

My heart hurts,
The fight is tiring,
And the enemy does not sleep.

Bullets fly as the snow falls,
And the enemy lies in silence.

Sleepless nights, we're not cold,
The family is waiting in the outskirts,
Together we will all win
This is our homeland.

Let it be spring!

As long as we stand until the end,
And we will not be broken by war,
Our faith unites hearts,
Ukraine is alive forever.

Ukraine is our land,
Ukraine unites hearts.

Let it be spring!


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