INFORMATION PAPER

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FROM: Partnership for Peace Consortium/George C. Marshall European Center for Security Studies

DATE: April 20, 2023

SUBJECT: Training while we fight: Lessons from Ukraine's use of distributed learning in war

Purpose: To provide background on Ukraine's use of *distributed learning* in war; identify particular needs and scalable principles to better coordinate training and education security cooperation for effective force employment; offer recommendations to NATO, the EU, and nations to make national and multilateral improvements. Recommendations apply in particular to Ukraine, yet the principles also apply in general to Allies and Partners to enhance preparedness though *distributed learning* in force education and training. (See **Annex A** and **B** for detailed information and recommendations.)

Introduction: The Partnership for Peace Consortium's (PfPC) Advanced Distributed Learning (ADL) Working Group convened a workshop, "Distributed Learning in War," on February 1-2, 2023, with the General Mihailo Apostolski Military Academy of the Republic of North Macedonia, and endorsed by State Secretary Mr. Vladimir Anchev. A panel of 19 civilian and military distributed learning experts from 10 NATO and partner nations, including Ukraine, analyzed technology-enhanced learning relevant to wartime.

Background: The war in Ukraine spotlights the vital importance of training and education to prepare for and sustain major military operations. Meanwhile, *distributed learning's* scale of throughput, flexibility, and reusability prove it is well-suited to meet this training and education requirement. While the international community shows political solidarity with Ukraine through diplomacy and military aid, the war reveals a vital area for improvement in NATO and Partner nations' capacity for interoperable military force education and training security cooperation.

The war in Ukraine exemplifies the essential role of security cooperation among Allies and Partners in effective force employment. In many ways, the Armed Forces of Ukraine (AFU) outmaneuvered hostile forces thanks to reforms in AFU military training and education from 2014 to 2022, which was achieved with the support of many western partners but especially the US, Norway, and NATO. (See **Annex D** for a summary of organizations engaged in security training and education cooperation with Ukraine.)

During operations, the AFU relies on continuously adaptive training and education, including just-in-time assistance delivered via technology-enhanced learning. This meets urgent requirements for training new military recruits, cadets, non-commissioned officers, and officers on topics such as weapons handling, explosive ordinance awareness, and tactical emergency medical support.

Despite many successes, the AFU faces ongoing military training and education challenges, primarily due to the inability to conduct in-resident training and education at pre-war levels. Ukraine needs improved infrastructure for distributed learning to support both immediate and long-term force development—and,

ultimately, civil-military based national resilience. (See **Annex C** for a definition of *"distributed learning."*)
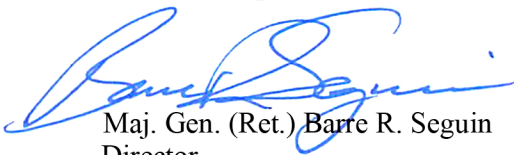
AFU members presented the PfPC ADL WG with anecdotal evidence of the need for better coordination of security cooperation efforts in force education and training. This is an area where processes and institutions can be meaningfully strengthened with relative low cost. Enhanced cooperation in distributed learning can yield significant return on investment in both the current and post-war environments, benefitting the AFU today and Partners in the future through scalability, adaptability, and reusability.

Sustainable solutions must be systematic, streamlined, and include civil-military cooperation to support national resilience. There are numerous NATO, EU, and national initiatives that provide training and education support to Ukraine. Any enhanced security cooperation in force education and training ought to work with these existing efforts across an ecosystem that considers multilateral partnership contexts.

Conclusion: Ukraine requires learning solutions that enable effective training and education to meet current and post-war AFU operational requirements. Allies and Partners require coordination and accountability to provide more efficient means of delivering such capabilities to the AFU and across partnerships. Some vital AFU force training and education requirements can be met by improved distributed learning capabilities.
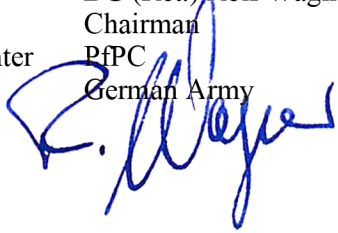
Recommendations: The key recommendations below include near-term actions for security assistance to the AFU regarding force education and training (with detailed implementation actions in **Annex B**):

- NATO, EU, and nations should empower organizations or offices to facilitate cooperation in distributed learning, to more effectively connect Ukrainian organizations to communicate needs to Allies and Partners who coordinate and provide solutions.

- Training and education security assistance should retain simple to administer, simple to use, and multilateral capable approaches; and employ compatible processes for planning and execution.

- Ukraine should conduct a survey of Professional Military Education (PME) institutions to identify distributed military training and education needs across the scope of: infrastructure, personnel capabilities, organizational processes, learning technologies, and courseware/instructional content; and provide prioritized action items to the NATO Comprehensive Assistance Package (CAP).
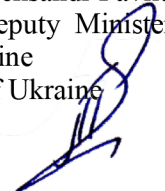
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ANNEXES

Annex A: Problem Statement

Annex B: Recommendations, Actions, and Requirements

Annex C: What is "Distributed Learning"?

Annex D: Security Assistance Organizations Supporting Ukraine

Annex E: Acknowledgements

ANNEX A: PROBLEM STATEMENT

This annex covers a general background and a summary of the current situation as related to training and education in Ukraine. It highlights some of the challenges and suggested solutions emerging from Ukraine related to distributed learning for training and Professional Military Education (PME).

Background

Military training and education are typically viewed as what we do to prepare for war, and Ukraine is a golden example: Ukraine's force development methods were a fundamental delta between the Armed Forces of Ukraine (AFU) of 2014 and the AFU of 2022. During that period, Ukraine made substantial progress related to its NATO interoperability and educational curricula compliance, including the following achievements:

1. First military education system institutional audit in the Ministry of Defence of Ukraine, involving American, Canadian, Danish, German, and Lithuanian subject-matter experts (2020)
2. Roadmap for Language Training Enhancement in the AFU for 2021–2025
3. Policy of the Ministry of Defense of Ukraine in the Realm of Military Education (2021)
4. Law of Ukraine "On Amendments to Certain Laws of Ukraine on Military Education and Science" (2021)
5. Resolution of the Cabinet of Ministers of Ukraine for the "Concept of Transformation of the Military Education System" (2022)
6. Update of the AFU curriculum, in compliance with the NATO standards

Ukraine also shows us that training and education are essential capabilities during a sustained fight. Ukraine combined the creative use of distance learning and localized partner-nation content to quickly adapt its training and education offerings to address the changing battlespace, a shifting mix of weapons systems, and influx of new personnel. The AFU likewise persisted in providing training and education to military members throughout their careers; and while at war with Russia, the AFU continues to pursue higher-level ambitions, including ongoing reforms to their PME systems to bring them further in line with NATO standards and doctrine.

Current goals for the AFU's training and education modernization include:

1. Maintain ongoing commitment to Euro-Atlantic integration.
2. Establish a PME system that enables NATO officers to study in Ukraine.
3. Create up-to-date leadership curricula based on the lessons learned from the Russia-Ukraine War.
4. Develop faculty adept at using the methodologies adopted by NATO (including instruction on NATO planning, decision-making methods, and leadership in accordance with IAW NATO PME standards) and capable of teaching at NATO military education institutions.
5. Empower the best commissioned officers and non-commissioned officers (NCOs) with real combat experience to serve as mentors in the PME system.
6. Create an educational environment that motivates service members to continuously self-improve.
7. Ensure the AFU is manned by service members trained and educated to NATO standards.

The AFU have set the following timelines for this modernization:

Sep 1, 2023	Implement new military education system with NATO PME standards.
Sep 1, 2024	Improve administration, management, organization of military educational institutions.
Dec 30, 2024	Achieve PME system's interoperability with the corresponding NATO systems.
April 1, 2025	Conduct institutional audit of the military education system.
Sep 1, 2026	Update infrastructure, including training and material assets of PME institutions.
Sep 1, 2026	Apply for the certification (accreditation) of PME courses IAW NATO standards.

Finally, the AFU continues to prepare for the future through research and documentation of lessons learned from the current war. As Ms. Caroline Baxter, U.S. Deputy Assistant Secretary of Defense Force Education and Training, observed in her November 2022 remarks to the National Defense University of Ukraine (NDUU):

> Ukraine's innovative work leveraging blended and e-learning has set a new standard for excellence in adaptability. Ukraine has demonstrated that training is not just to prepare for the fight, but that training is essential to sustain the fight. Your experience has made clear that we have to train while we fight, helping our forces to adapt to meet changing needs in complex environments…. Delivering at the speed of relevance means that we must field responsive training capabilities informed by data-driven insights. The National Defense University of Ukraine, in collaboration with the U.S., is a leader in learning analytics research, and the information that you are collecting now, during wartime, will be an invaluable resource. We must continue to apply this research to enhance the integration of acquisition, development, and delivery of training solutions, and keep up with the dynamic requirements generated in the contemporary battlefield.

AFU Distributed Learning

This section describes the challenges the AFU faces in training and education supported by distributed learning. It is informed by the experience and observations of Colonel Maksym Tyshchenko, Ph.D., Chief of Scientific Distance Learning Centre at NDUU.

Ukraine's PME institutions use distributed learning to deliver tactical education, operational and strategic education, and education for reserve officers. NDUU provides the staff, infrastructure, and access to distributed learning content for several PME institutions, Command and Control (C2) bodies, and other users within the AFU. For several years, the AFU matured their distributed learning system through improvements to infrastructure, professional development, and joint research projects and cooperation with partners such as the Norwegian Defense University College, NATO Defence Education Enhancement Programme (DEEP), NATO Training Group, U.S. Department of Defense, Partnership for Peace Consortium (PfPC), and Jefferson Institute.

In 2018, working with its partners, the AFU established a Moodle e-learning platform and launched other Advanced Distributed Learning (ADL) platforms for Ukraine's various PME institutions. Today, the Ukrainian military offers many e-learning courses and digital materials available in a variety of forms, including digital documents (PDFs), 360-degree images, and videos.

Since 2022, the use of distributed learning in Ukraine increased sharply for both civilian (non-military) education and military force development purposes. Presently, some of the most popular military distributed learning (in terms of usage) involves two-minute instructive videos delivered via YouTube on topics such as weapons handling, tactical medicine, and other tactical training topics. A majority of learners (70%), use a mobile phone to access this instruction.

The war created many challenges for the AFU's distributed learning capabilities. First, immediately after February 24, 2022, the ADL staff who would typically support the AFU's distributed learning systems were assigned to combat missions, reducing the availability of system administrators and helpdesk operators. Simultaneously, administrative requirements surged as tens of thousands of new personnel sought access to learning materials. This initial imbalance of staff resources limited access to distributed learning resources. The situation has stabilized, but administrative staff continue to face high demands with little slack in their schedules.

Second, Ukraine's distributed learning infrastructure is a target. Some of Ukraine's PME institutions were forced to relocate their ADL platforms to continue operations. For other PME institutions, the war resulted in damage to—or destruction of—their infrastructure. Intermittent electricity and internet connectivity problems across the nation continue to create access issues.

Third, Russia can use personal information to threaten or kill Ukrainian citizens; therefore, personal data handling is extremely sensitive. If adversarial actors obtain personal data, it may lead to the terrorizing of those users' relatives, persecution of the users directly, and even their murder. Consequently, the data stored in distributed learning systems must be absolutely protected or omitted entirely.

Finally, the delivery of digital learning materials is disjointed within the AFU across a variety of open, off-the-shelf services. For example, the AFU's Moodle Learning Management System (LMS) and e-library, are both supported by NDUU. Meanwhile, the AFU also uses other PME institutions' LMSs and commercial offerings, to include YouTube, Signal, and Telegram. This diverse approach facilitates ad-hoc access to content, but it results in a lack of coherence across resources and creates a "technical debt" that will be difficult to maintain effectively in the future.

Challenges in Distributed Learning Cooperation

Our current security cooperation systems were not built to support the kinds of education and training coordination that Ukraine currently requires, both for its wartime effort and its post-war ambitions. While security cooperation frameworks excel at transferring equipment, they are less prepared to deliver relevant, interoperable training and education to a Partner engaging in conflict.

A wide range of temporary collaborations with civilian and military academic institutions are striving to bridge this capability gap, and while the multinational response to support Ukraine has been dynamic, sustainable solutions must be systematic and structural. The many entities providing direct support are not necessarily aware of the others. This leads to gaps, duplications, and confusion.

Coordination is required to ensure effective ongoing support that covers all required areas, avoids duplication, and ensures that all provided components work effectively in combination—without putting undue burden on Ukrainian organizations trying to navigate the disparate aid they are receiving. The AFU has further identified the following challenges related to security cooperation assistance related to distributed learning:

- The AFU has insufficient distributed learning materials to support training on the new armament items and vehicles. Any delivered weapon system or other capability should include related distributed learning content, such as e-learning, microlearning, and/or mixed reality materials.

- The AFU has limited access to digital learning assets from Partners and/or a lack of awareness of the available assets and requirements for using them within the Ukraine defense sector. This is at least partially an information and coordination problem. There are willing Partners with available distributed learning resources that are largely unknown to Ukraine.

- The AFU's mechanisms for delivery of distributed learning support are ad hoc.

- The lack of standards, interoperability, coordination, and structured cooperation often limits sharing of available materials and content.

- In the long term, the AFU aim to reach NATO standards, including English-only courses. For now, language translation into Ukrainian is required, but the AFU's translation resources are currently dedicated to the operation of delivered weapons systems. These resources are limited and disjointed for translation of training and educational content. Support for courseware translation is required.

- In the long term, the AFU aim to build and implement a modern learning ecosystem aligned with the Total Learning Architecture, but the AFU lacks analyses on practical implementations of this sort of enterprise learning architecture. For instance, what kinds of solutions are required, what are the legal and regulatory requirements, and what should the work plan look like for selecting and implementing solutions and services?

Solutions

In the short term, sharing and adapting existing courseware to meet Ukrainian needs can help fulfill the AFU's most urgent training and education requirements. All near-term solutions must be survivable, agile, interoperable, requirement-driven, and usable:

1. **Survivable**: Resilient to damage and destruction (e.g., cloud-based, cybersecure, flexible)
2. **Agile**: Adaptable to meet the needs and pace of battle—driven by empirical data
3. **Interoperable**: Adherent to technical standards for cross-system sharing and modular architectures
4. **Requirement-Driven**: Focused on the topics and delivery modes currently required by Ukraine
5. **Usable**: Easy for users to acquire, implement, find, and complete the instruction

A longer-term response is to help Ukraine develop the skills and facilities to support a resilient distributed learning enterprise more fully. This can be accomplished through train-the-trainer courses, increased Ukrainian participation in formal residential and online courses at NATO and national learning institutions, and the receipt of formal qualifications from NATO/Partner institutions as well as formal recognition of Ukrainian and European military education facilities. National resilience is a hallmark of Ukraine's success in this war, and shared distributed learning resources should also include training and education to support civilian roles in total defense.

Another longer-term goal is to learn lessons from this war that can help Ukraine, NATO, Partners, and other nations improve the efficiency, resilience, and adaptability of our training and educations systems—especially during major combat operations. This war has provided a crucible of lessons and innovation

that would have otherwise taken years to uncover. Workshops to share lessons learned (such as the February 2023 PfPC "Distributed Learning in War" workshop) are a source of valuable analysis.

An initial, running list of some lessons related to distributed learning from the AFU include the following:

1. When staff is limited, develop processes of automation.
2. Use a cloud solution to mitigate infrastructure limitations.
3. Personal data must be well-protected or simply not used.
4. Access to materials and content requires a structured approach that involves curating authoritative information, and this process must be supported by existing and new partnerships.
5. The format of digital materials needs to be standardized to facilitate re-use and interoperability.
6. Resources are limited; interoperability, translation, and quality-assurance are critical.
7. Capture and incorporate both national and partnership lessons.

Conclusion

The Russia-Ukraine war spotlighted the importance of collective commitment and the value of interoperability—as well as shortfalls in security cooperation systems.

The character of sustaining a war effort changed, to include the way militaries and homeland defense organizations must rapidly learn and adapt during combat operations. Understanding these lessons from the Russia-Ukraine war not only can help better support the AFU in their current response; this coordination also forms a vital two-way path, helping Allies and Partners to collaboratively improve through lessons learned. Enhanced NATO participation in this process is crucial.

In sum, training and education must be principal components of security cooperation; and NATO, Europe, and other Partners can—and must—elevate our collective readiness and military modernization, while also providing timely support to Ukraine. NATO, Allies, and Partners are requested to incorporate the concerns and recommendations described in this Information Paper into a prioritized support framework to provide capability enhancements to Ukraine, with considerations for the future, as well.

This annex includes specific recommendations and corresponding actions to support Ukraine in terms of training and education, with a particular focus on distributed learning, which is also called Advanced Distributed Learning or ADL. (See **Annex C** for a description of that term.)

Recommendations

The following list is a summary of 11 recommendations. They are developed into suggested actions over the subsequent pages.

1. Ukraine should conduct a survey of PME institutions to identify distributed military training and education needs across the scope of infrastructure, personnel capabilities, organizational processes, learning technologies, and courseware or other instructional content.
2. NATO, EU, and nations should designate organizations to facilitate cooperation and encourage a lessening of restrictions on sharing distributed learning with Ukraine's military education system.
3. NATO and Partners should draft and maintain a how-to guide for Professional Military Education (PME) distributed learning related to cooperation with Ukraine.
4. Identify a primary Ukrainian liaison office for cooperation on distributed learning in the military education system.
5. NATO should specify an Office of Primary Responsibility (OPR) for information sharing and coordinating cooperation on distributed learning with the Ukrainian PME system.
6. Streamline the sharing of distributed learning courseware and instructional media with the Ukrainian military education system by actively pursuing needed materials.
7. Streamline the translation of distributed learning courseware and other instructional media into the Ukrainian language for the military education system.
8. Establish a secure cloud-based portal to facilitate access to shared distributed learning courseware and media for the military education system.
9. Provide technical expertise and assist Ukraine on the development of a Total Learning Architecture for its military education system.
10. Provide faculty professional development on key subjects, such as military planning processes.
11. Facilitate longer-term institution patronage and pairing.

Actions

The following sections describe the recommended actions in detail, including proposed timeframes and desired outcomes. The sections are organized into loose conceptual categories marked by subheadings.

Requirements

1. **Conduct a Ukrainian survey within PME institutions on ADL requirements:** As an immediate action, in coordination with other military and government institutions, a Ukrainian organization should survey Ukrainian PME institutions to identify their distributed military training, education needs across the scope of infrastructure, personnel capabilities, organizational processes, learning technologies, and courseware or other instructional content.

Desired Outcome: A prioritized list of Ukrainian PME institutions' short- and long-term distributed learning needs, along with their associated levels of urgency and in-country stakeholder organizations.

<u>Responsibilities and Authorities</u>

2. **Designate cooperating Allied/Partner organizations and encourage a lessening of restrictions on sharing distributed learning with Ukraine:** As an immediate action, NATO, EU, and national senior leaders should issue directives on security assistance related to distributed learning for Ukraine's military training and education system. These directives should name respective organizations/programs to facilitate Allies/Partners' distributed learning security cooperation and align coordinated efforts with an Office of Primary Responsibility (OPR; see task #5). These directives should (as feasible) also relieve NATO and nations from certain restrictive bureaucratic processes that slow cooperation. These directives should include the "How to Cooperate" guide as an enclosure (see task #3).

   Desired Outcome: Formal directives that catalyze action in NATO and nations, designate the OPR, and help remove barriers to cooperation.

3. **Draft and maintain how-to guide for distributed learning-related cooperation with Ukraine:** As an immediate action, NATO should develop an initial, releasable how-to guide designed to support (a) NATO, EU, and national organizations with distributed learning resources to share and (b) Ukrainian organizations seeking distributed learning resources. The guide should be included as an enclosure to the directive memo (see task #2), and the Distributed Learning Security Cooperation OPR (see task #5) should be tasked with maintaining the guide. The initial guide should include succinct and specific guidance on how to share distributed learning with Ukraine (e.g., formats, points of contact, regulatory requirements) for a NATO and Allied/Partner nation audience, guidance on how to discover and rapidly receive distributed learning resources for a Ukrainian audience, information on the OPR, and a link to the living version of the how-to guide.

   Desired Outcome: Easy-to-use how-to guide that removes friction from the process of sending or receiving distributed learning support and helps stakeholders find more information from the OPR.

4. **Identify primary Ukrainian liaison office:** As an immediate action and as input to the directive memos (task #2), the Department of Military Education and Science of the Ministry of Defense of Ukraine should be identified to serve as the primary Ukrainian liaison office for coordination with the Distributed Learning Security Cooperation OPR (identified in task #2 and detailed in task #5). It is assumed that designation of this liaison will align with existing processes for coordinating aid with Ukraine.

   Desired Outcome: Formal designation of the Ukrainian organization that is responsible for primary coordination and direct liaison with the Distributed Learning Security Cooperation OPR.

5. **Designate Distributed Learning Security Cooperation OPR:** As an immediate action and as input to the directive memos (task #2), NATO should specify an OPR to take responsibility for information sharing and coordinating cooperation on distributed learning with the Ukrainian PME system, reporting to the CAP for oversight and accountability, and assisting other NATO and national coordination offices (as identified in task #2) with their direct efforts. In other words, the

OPR should help coordinate across related distributed learning Ukrainian support efforts—serving as an informational clearinghouse and concierge, not as an authoritative executive or required gateway. The OPR should be a "switchboard" that NATO, national, and Ukrainian organizations can contact for information and for connections to other stakeholders. (NOTE: This OPR is not an authority on cooperation with Ukraine, nor does it need to be involved with bilateral exchanges. It is a facilitative organization, not an oversight organization.)

Desired Outcome: An office is formally assigned the duties outlined in this Information Paper, with that designation enabling the corresponding resourcing, oversight processes, and authorities. The recommended responsibilities for this office are listed below:

Recommended OPR Responsibilities

a. Information broker: Serve as an information clearinghouse, coordinating across other organizations (e.g., EU Military Staff, NATO SHAPE, Operation Interflex) and with the designated Ukrainian distributed learning liaison office (task #4) to better facilitate security cooperation related to training, education, and other distributed learning elements.

b. Catalog of available services: Actively develop and maintain a catalog of available distributed learning products and services that Allied/Partner nations and security cooperatives (such as NATO and the EU) can share with Ukraine. Use this catalog to help connect available resources to Ukrainian needs (as identified in task #1).

c. Stakeholder map: Actively develop and maintain a catalog of relevant organizations, including points of contact from both national Allies/Partners and security cooperatives. Use this stakeholder map to facilitate communication, to create pathways for bilateral or multilateral capability/resource exchanges, and to help connect different initiatives regarding support to Ukraine. Host regular (e.g., quarterly online) meetings to better structure the ecosystem of cooperation.

d. Strategic messaging: Create and share information about distributed learning cooperation efforts with Ukraine to facilitate more systematic, collaborative delivery of resources across Allies, Partners, security cooperatives, and other stakeholder organizations.

e. Lessons learned and (long-term) future capability planning: Document lessons learned for the utility, risks, and best practices of distributed learning in war, such as cooperation lessons, infrastructure (survivability, cloud, cyber, platform flexibility), and considerations for resiliency. Lead the future capability planning line of effort (in alignment with the NATO CAP for Ukraine) related to distributed learning security cooperation during the Ukrainian war. The results from this longer-term task should help inform improved cooperation, efficiency, resilience, and adaptability of training, education, and other distributed learning components across Allies, Partners, and security cooperatives. These generalizable lessons can be shared via reports (or inputs to a larger report, e.g., authored by NATO SHAPE), workshops (such as PfPC meetings), and addressed through new national or collective projects. The future capability planning should include, at a minimum:

- Documentation of successes and lessons learned (viz., distributed learning cooperation)
- Prioritized report outlining Ukraine's long-term (post-war) distributed learning needs
- Summary of missing or restrictive policies that inhibit distributed learning cooperation

- Recommended standards (e.g., quality, technology, interoperability, language) for supporting international distributed learning security cooperation

<u>Courseware</u>

6. **Streamline the sharing of courseware and other instructional media:** The Distributed Learning Security Cooperation OPR (task #5) will help facilitate the delivery of courseware and other Interactive Multimedia Instruction (IMI) materials to Ukraine, based on its needs (identified in task #1). Time is limited, and it will unduly drain Ukrainian resources to review materials that are a mismatch for its requirements, of subpar quality, or lack interoperability. Hence, the Distributed Learning Security Cooperation OPR will provide services that improve the efficiency and usability of this sharing process.

   Desired Outcome: Streamlined and effective sharing of courseware and IMI with Ukraine, enabled through systematic and documented processes. Subcomponents of this task also include the following:

   a. <u>Active pursuit of required courseware and IMI</u>: The Distributed Learning Security Cooperation OPR will actively engage with NATO, nations, and other organizations (such as the Red Cross and national universities) to solicit them for sharable courseware and IMI to provide to Ukraine. The OPR will seek to acquire for Ukraine original source files (necessary for translation purposes) and facilitate mitigation of limitations or rules of re-use (including legal permissions for re-purposing of content and intellectual property). Additionally, as part of this task, the OPR may need to recruit potential project teams to assist with elements of the courseware exchange (e.g., updating older materials, changing imagery to align with the Ukrainian theater).

   b. <u>Quality assurance consulting</u>: The Distributed Learning Security Cooperation OPR is not envisioned as an oversight body or formal gateway, but as part of its role as an information broker, the OPR can provide consultative services, such as reviewing courseware and IMI for its alignment with Ukrainian needs, instructional quality, usability, technical interoperability, metadata documentation, and language (translation). As an initial action, the OPR will provide these services upon request of either external partners or Ukrainian organizations. The OPR will also gradually develop a summary of quality standards and best practices to share with stakeholder organizations.

7. **Facilitate the translation of courseware and instructional media:** Courseware and other IMI must be translated into Ukrainian. The AFU have a finite capacity to perform this translation. The Distributed Learning Security Cooperation OPR (task #5) will work with partnering organizations to streamline the translation process. As part of its role as an information broker, the OPR will create a list of those donating organizations who need translation services, and the OPR will actively recruit and create a database of partner organizations with relevant translation capabilities, including creative options such as student projects at defense language schools. Finally, the OPR will connect donating and translating organizations and provide them with a set of best practices for streamlining the translation process for distributed learning materials.

   Desired Outcome: Streamlined and effective translation of courseware and IMI with Ukraine, enabled through systematic and documented processes.

8. **Establish a secure cloud-based portal for courseware and IMI:** Provide support in ensuring all distributed learning training materials and courses shared by partners are available via a secure cloud-based portal. This serves as a central repository of educational resources and training material (e.g., microlearning, e-learning courseware packages, augmented or virtual reality content packages, simulation scenarios, e-books, curricula, and other IMI). The repository should be well-organized to facilitate sharing and reuse, such as differentiated folders with courses ready to be used in their original version, content ready to be used with/without due modifications, and content ready for translation.

   Desired Outcome: Accessible and secure cloud-based repository that Ukrainian organizations and other stakeholders can access.

9. **Support development of a Ukrainian Total Learning Architecture (TLA):** The AFU aims to build and implement, step by step, a modern learning ecosystem aligned with the TLA. However, the AFU lacks analyses on practical implementation of this modernization. For example, what kinds of technical solutions are required, what are the legal and regulatory requirements, and what is an optimal work plan to incrementally implement the vision?

   Desired Outcome: A vision document, architecture, infrastructure requirements, and work plan for long-term implementation of a TLA in the AFU.

Faculty and Staff Training and Development

The NATO Defence Education Enhancement Programme (DEEP) already provides PME faculty and staff security cooperation support to Ukraine and other Partners. This section recommends a reinforcement and extension of those responsibilities and authorities, as well as increased coordination between NATO DEEP and the other distributed learning collaborating offices and Distributed Learning Security Cooperation OPR (task #5) described above.

10. **Expand professional development support to Ukrainian faculty on key subjects:** Extend existing train-the-trainer and teach-the-teacher programs (such as the DEEP Master Instructor Program) and provide other professional development on subjects identified in the Ukrainian needs survey (task #1). For example, early inquiry suggests that Ukrainian faculty may need more development in Troop-Leading Procedure (TLP), Military Decision-Making Process (MDMP), and the Operational Planning Process (OPP). NATO DEEP may be able to provide this additional assistance or advise on sources and best practices for delivering it. As part of its role as an information broker, the Distributed Learning Security Cooperation OPR should engage DEEP, NATO Partnership Training and Education Centers (PTECs), Centers of Excellence (COEs), and other Allied or NATO Education Training Facilities (NETFs) to support this effort.

    Desired Outcome: Streamlined and effective extension of train the trainer resources with Ukraine, enabled through systematic and documented processes.

11. **Facilitate long-term "Patronage" between partner and Ukrainian academic institutions:** Support Ukraine's drive to meet NATO standards for their PME process by enabling partnerships between Ukrainian PME institutions, academies, and training centers with well-recognized NATO and national organizations. An office assigned by NATO HQ, such as DEEP, could serve as a coordination hub, supporting liaison with exchange programs from NETFs, PTECs, CoEs, other education and training facilities. For instance, the office could recommend requirements,

host working groups, and meet with leaders. DEEP could also facilitate the NATO certification process and outline the steps necessary to achieve accreditation, and then provide mentorship to Ukrainian institutions, including a maturation of their distributed learning offerings, to meet the certification and accreditation goals.

Desired Outcome: Assistance provided to modernization of training and PME in the AFU shifts from piecemeal delivery of tools and content to a more strategic capacity building development assistance approach, for total system transformation.

ANNEX C: WHAT IS "DISTRIBUTED LEARNING"?

This annex provides a general description of the term "distributed learning" and the scope it covers.

The terms "learning" and "distributed learning" both refer to broad concepts. "Learning" is a general term that applies to training, education, and other experiences. Training and education are inputs; they are the formal mechanisms used to help individuals and teams grow their knowledge and skills. Learning is the output of those experiences. Learning is a change in someone's long-term memory that results in downstream changes to thoughts, emotions, or behaviors.

"Distributed learning" refers to technology-enabled learning that is separated by time and/or place. That is, learners participate at different points in time (asynchronously) and/or from different geographical locations. Most often, distributed learning refers to lightweight technology-enabled training and education empowered by the internet (or intranets). Examples include e-learning, mobile learning, consumer-grade virtual and augmented reality, some simulations, and a blending of these modalities with other methods.

The international security community often uses the term "ADL" (which stands for *Advanced* Distributed Learning) as shorthand to refer to distributed learning and its components. The addition of the word "advanced" is an artifact from the 1990s, when online learning was viewed as an emerging capability. Today, the terms "ADL" and "distributed learning" or "distance learning" (both sometimes abbreviated as "DL") all generally mean the same thing—at least in common usage outside of the most precise academic publications.

By whatever name, the "ADL" concept encompasses all parts of the learning lifecycle; in other words, it covers all of the capabilities needed to design, develop, deliver, and continuously improve technology-enabled learning. This includes personnel (e.g., instructional designers, media developers, systems administrators, learning analytics professionals), processes (e.g., intellectual property rules, methods for managing digital identity, cybersecurity standards, data architecture designs), and technologies (e.g., learning management systems, virtual reality headsets, network connectivity, authoring tools), as well as the actual courseware (e.g., e-learning packages, simulation-based training scenarios).

In sum, cooperation related to distributed learning may involve direct donations of courseware (content), hardware, and/or software. It may also involve the delivery of training or professional development to administrative personnel in topics such as cybersecurity, maintenance, content development, or policy best practices for distributed learning systems.

ANNEX D: SECURITY ASSISTANCE ORGANIZATIONS SUPPORTING UKRAINE

This annex summarizes some of the existing international structures that are supporting (or that could readily support) security cooperation with Ukraine related to education and training assistance.

Multinational Allied/Partner Security Cooperatives

1. **Operation Interflex:** Operation Interflex is the British-led multinational military operation to provide five weeks of basic training and related support to the Armed Forces of Ukraine (AFU). The training primarily uses conventional (face-to-face, not technology enabled) means and takes place within the United Kingdom. This program may offer a cooperation framework to support distributed learning cooperation, or it may benefit from supplementary distributed learning components such as reinforcement e-learning and videos that can be accessed after Ukrainian personnel complete the training. This operation is the successor to Operation Orbital that began in 2015 following the Russian annexation of Crimea.

2. **U.S. European Command (EUCOM):** In November 2022, General Christopher G. Cavoli, Commander EUCOM, established the Security Assistance Group-Ukraine (SAG-U, based in Wiesbaden, Germany) as a new U.S. EUCOM organization to coordinate Ukrainian training support. SAG-U reports to EUCOM as well as to NATO Supreme Allied Commander Europe (SACEUR) and is designed to execute decisions made by the Ukraine Defense Contact Group, a coalition of 40 countries that the U.S. Defense Department created to address Ukraine's needs and requests after Russia's 2022 invasion of Ukraine.

3. **NATO Defence Education Enhancement Programme (DEEP):** DEEP provides tailored practical support to individual countries in developing and reforming their professional military education institutions through faculty development, curriculum development and peer-to-peer engagements. The DEEP eAcademy provides "e-Teacher" and "e-Instructor" training programs (with graduates from six different Ukraine PME programs), H5P application training sessions (in some cases, with DEEP-trained Ukraine SMEs as the tutors), multimedia creation including videocast and podcast training sessions, and Canva application training sessions (with Ukraine SMEs as some of the tutors). DEEP also supports a joint project with Ukraine on Computer Adaptive Language Testing.

4. **Norwegian Defense University College (NDUC):** For over a decade, NDUC has led a comprehensive set of capacity building efforts for developing distributed learning capabilities in the National Defense University of Ukraine (NDUU). This encompassed support for strategic planning, physical hardware and software, courseware development, train-the-trainer development on instructional design for distributed learning, and professional networking both nationally and within the international ADL community of Allies and Partners. The Ukraine Armed Forces ADL platform and e-library are today utilized by more than 20 security sector organizations. Most recently, it has centered efforts on collaborative research with NDUU examining virtual reality as a platform for training and education.

5. **NATO Comprehensive Assistance Package (CAP):** In 2016, NATO established the CAP to support Ukraine's ability to provide for its own security and to implement wide-ranging reforms based on NATO standards. More recently, the CAP has been revised to address the current situation. Currently, it includes five pillars, the first with a short-term focus and the other four

aimed at longer-term goals: (1) deliver urgent, nonlethal assistance, (2) interoperability, (3) military infrastructure reconstruction, (4) defense institution building, and (5) lessons learned. Institutional support of the Concept of Military Education Development of Ukraine (in particular, the "patronage" project) could become an inherent component of CAP.

6. **European Union Military Assistance Mission in support of Ukraine (EUMAM Ukraine):** Aimed at strengthening the AFU, EUMAM Ukraine provides basic, advanced, and specialized training to Ukrainian personnel. EUMAM is an international partnership, with 24 EU Member States participating. Its training is supported by the provision of equipment for lethal and nonlethal purposes to the AFU. Increasing the volume and expanding the range of training areas for military specialists within the framework of EUMAM could significantly deepen its benefits in terms of interoperability, standardization, study, and implementation, as well as add specifics to the issue of infrastructure restoration and, accordingly, related efforts in military education in alignment with NATO efforts.

7. **European Union Advisory Mission in Ukraine (EUAM Ukraine):** Established in 2014, the EUAM Ukraine supports Ukrainian civilian security sector reform through strategic advising and practical capability development, which includes providing and coordinating training to Ukrainian law enforcement agencies. After February 2022, its mission expanded to include assistance to Ukrainian law enforcement agencies in managing humanitarian crises and refugee flows as well as the investigation and prosecution of international crimes related to the war. EUAM Ukraine's role as a focal point to the Ukrainian civilian security sector makes it a key actor for the identification and provision of training for civil-military cooperation, which is important for both total defense and the stabilization and reintegration of areas liberated from Russian forces.

8. **NATO-EU Strategic Partnership:** Begun in 2003, the NATO-EU partnership has deepened in recent years, with joint declarations in 2016, 2018, and 2023. The last of these joint declarations called for continued support to Ukraine and closer cooperation between NATO and the EU. This may provide a framework that could encompass the role of distributed learning for the training and support of Partners, including Ukraine.

9. **Partnership for Peace Consortium (PfPC)**: The PfPC is an international security cooperation organization, governed by representatives from NATO and PfP nations, and comprised of over 800 defense academies and security studies institutes across 60 countries. The PfPC has several working groups, including one focused on Advanced Distributed Learning (ADL). The ADL Working Group spearheaded development of a more coordinated systematic and strategic approach to assistance for Ukraine distributed learning. Working with the NATO International Staff, the PfPC developed several in-depth curricula designed for employment by defense education institutions in Partner countries.

10. **NATO Training Group task group for Individual Training and Educational Developments (NTG IT&ED):** The aim of the NTG is to enhance professionalism, interoperability, and standardization among Alliance forces and with Partner forces through improved coordination of Education, Training, Exercise and Evaluation (ETEE), with a particular emphasis on supporting operations. Ukraine is a long-standing active participant and has contributed to the *NATO ADL Handbook*, which outlines best practices and quality standards for distributed learning, related

NATO standards on the use of ADL in military exercises, and nascent standards on learning analytics. Standards are a critical element of interoperability in distributed learning, and the NTG IT&ED plays a central role in evaluating, formalizing, and promoting such standards.

11. **NATO Next Generation of Modeling and Simulation (M&S):** The Next Generation M&S capability program 2030 will support geographically separated commands and nations by providing tools that enable synthetic training environments reflecting the complexity of NATO operations and other missions at the strategic and operational levels of war. The Next Generation M&S will serve as a supportive platform to facilitate the use of coordinated simulation and information technology, and this platform could potentially be extended to support a wider-range of technology-enabled military learning interoperability, international cooperation, and operational efficiency, including the development of mature ADL for training and exercises.

12. **Ukrainian Patronage System:** *Patronage* is the title of a tentative concept created by Ukrainian organizations as a cooperation framework for the military educational institutions of Ukraine and NATO member states. The idea is for leading military educational institutions to act as "patrons" to Ukrainian military educational institutions for implementing NATO standards, incorporating Western military theory, and deepening interoperability through institutional support, educational exchange, and improved cooperation. The general structure of the patronage system is based on Ukraine's experience with PME cooperation within the framework of NATO DEEP.

ANNEX E: ACKNOWLEDGEMENTS

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