Invest in Battlefield Obscuration to Win During Large-Scale Combat Operations

開發戰場煙幕以確保大規模作戰中勝利

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本文

Russian and Ukrainian tactics in the ongoing Ukraine-Russia conflict highlight the need for the U.S. Army to revive battlefield obscuration. Two types of offensive operations—the combined arms breach and the wet-gap crossing—have shown a lack of obscuration capability, understanding, and use in the Russian and Ukrainian armies. This obscuration gap resulted in debilitating casualties on both sides, delaying progress or causing mission failure. It is prudent for the U.S. Army to learn from its tactics in this ongoing conflict and apply these lessons through doctrinal, organizational, and materiel investments.

俄烏戰爭中的作戰經驗顯示，美國陸軍應重新重視戰場煙幕掩護的重要性。在「聯合兵種突擊」與「涉水渡河作戰」這兩類攻勢行動中，俄烏雙方的部隊皆未能有效運用煙幕掩護，無論是在能力、理解還是實際應用上均存在明顯缺陷。這種掩護能力的不足，使得雙方蒙受慘重傷亡，不僅拖慢了行動進度，甚至導致任務失敗。因此，美國陸軍應從這場戰爭的戰術教訓中汲取經驗，並透過準則編修、組織改革與裝備投資來強化自身戰力。

When Russia seized more Ukrainian territory in February 2022, Russia

quickly consolidated gains and constructed defenses, including a labyrinth of minefields, wire obstacles, and trenches. These defenses are reminiscent of World War I when the battle lines stabilized and forces on both sides settled into complex defensives in depth across a wide battlefield. To overcome these defenses, Ukrainian forces attempted to breach the Russian lines in multiple locations with limited success. The Ukrainian military suffered casualties from these offensive operations because the Russians were able to observe their movement and mass a variety of fires, including antitank guided missiles, cannons, mortars, and heavy machine guns. The Ukrainians did not employ vast quantities of smoke, white phosphorus, or other means to blind Russian defenders costing Ukrainian lives in the breach.

2022 年 2 月，俄羅斯進一步奪取烏克蘭領土後，迅速鞏固及修築防禦工事，包括綿密的雷區、交織的鐵絲網和戰壕。這種防禦陣地與第一次世界大戰時的景況類似，當時交戰雙方在廣大戰場上構築層層縱深防線而陷入對峙局面。為了突破這些嚴密的防禦陣地，烏克蘭軍隊在多個戰區展開攻勢，但成效有限。俄軍因得以清楚觀測烏軍動向，並運用各式火力壓制，包括反戰車導引飛彈、火炮、迫擊砲與重機槍，導致烏軍傷亡慘重。此外，烏軍未能大量使用煙幕、白磷等干擾手段來遮蔽俄軍視線，使其在突破戰線時付出了極高的代價。

Similarly, when Russian forces employ their bridging assets, they similarly do not mass obscuration to conceal their movements or enable maneuver. In the spring of 2022, Russia attempted to cross the Donets River using wet-gap crossing techniques. Among the list of failures in their operational planning, the Russian use of obscuration was minimal. It was reported that the Russians suffered the destruction of a battalion during the operation due to failed planning and execution. Part of this can be ascribed to the lack of appropriate obscuration that would have temporarily blinded Ukrainian ground and air assets.

同樣地，當俄軍運用架橋裝備執行機動時，也未能有效運用煙幕來遮蔽其行動。2022 年春季，俄軍嘗試以徒涉方式跨越頓涅茨河，但在作戰計畫上出現多重錯誤，而其中極少使用煙幕來掩護。據報導，由於計劃不周與執行不當，俄軍在此次行動

中損失了一個營。其中一大原因，是未能充分利用煙幕掩護，使得烏克蘭地面與空中部隊能夠清楚鎖定俄軍並加以殲滅。

A key component missing from Ukraine, Russia, and the U.S. Army's tool kit is a panoply of obscuration means that blunts an adversary's observation capability. To affect large-scale combat operations (LSCO) in the current operational environment, the Army must reevaluate its position on battlefield obscurants to enable complex operations and reduce casualties. Conducting a breach on a heavily defended line requires adequate time to reduce obstacles and proof a cleared lane, whether mounted or dismounted. Obscuration is a critical component, providing the breaching force concealment to perform this complicated operation while maintaining combat power. Without an array of obscuration tools, the Army will suffer the same high casualty rates and potential mission failure that Ukraine and Russia suffered in their ongoing conflict.

無論是烏克蘭、俄羅斯還是美國陸軍，目前都缺乏一套完善的煙幕掩護戰術，來削弱敵軍的觀測與監視能力。在當前作戰環境下，若要成功執行大規模作戰(LSCO)，美軍必須重新審視戰場煙幕的運用，以確保能支援複雜的戰術行動並降低人員傷亡。在突破嚴密防禦時，部隊需要足夠的時間來破障、開闢安全通道，無論是機械化部隊還是一般步兵，都須要煙幕掩護來提供隱蔽，確保行動順遂，並維持戰鬥力。若缺乏多層次的煙幕掩護手段，美軍恐將重蹈俄烏戰爭中的覆轍，面臨高傷亡率與行動失敗的風險。

Current State 當前狀態

The Army has relied on the same breaching fundamentals for decades. These five fundamentals are suppress, obscure, secure, reduce, and assault. Although these fundamentals have not changed, the tools available for each have. Over the last few decades, the Army has divested obscuration capabilities due to myriad factors. These include the loss of Chemical Corps organizations, including smoke platoons, smoke producing equipment, and obscuration-related doctrine. Currently, the Army relies on mortar and cannon delivered obscurants for area coverage and vehicle mounted systems for individual armor systems

(Stryker, Bradley, and Abrams platforms). Unfortunately, these limited capabilities are not enough to succeed in LSCO.

在突穿戰術行動中，美國陸軍數十年來一直遵循相同的五大基本原則：「壓制、煙幕掩護、確保、削弱、突擊」。雖然這些戰術原則未曾改變，但支援這些行動的工具卻有所不同。近幾十年來，由於各種原因，美軍大幅削弱了煙幕掩護能力，例如裁撤化學部隊編制，包括煙幕排(smoke platoons)、淘汰煙幕施放裝備，以及準則中對煙幕戰術的重視程度下降。目前，美軍主要依賴迫擊砲與火炮發射的煙幕來進行區域掩護，並透過裝甲載具（如史崔克、布萊德利步戰車和艾布蘭斯戰車）上的煙幕系統提供個別防護。然而，這些有限的煙幕掩護手段，無法滿足大規模作戰。

The obscurants available to Army combat units at echelon are at a nadir. At the platoon level, obscurants include hand-employed smoke grenades and grenade launcher (M320) smoke rounds. At the company and battalion levels, the tool kit is not much larger; it only adds mortar (60 mm, 81 mm, and 120 mm) white phosphorus rounds. At the brigade level, 105 mm and 155 mm cannon artillery can provide smoke rounds, but these compete for other, arguably equally important high explosive missions. Individual vehicle systems use a vehicle obscurant smoke system to obscure their location, but these systems only screen a single vehicle and must be reloaded after one use. These handheld, small arms, and indirect ammunition are a good start, but commanders need more capability to succeed in LSCO.

美軍各級作戰單位目前的煙幕掩護能力已降至歷史低點。在排級單位，煙幕掩護僅限於單兵煙幕彈與 M320 榴彈發射器的煙幕彈藥；連級與營級部隊雖額外配備了 60 毫米、81 毫米與 120 毫米迫擊砲發射的白磷彈，但可運用的掩護手段仍然有限。旅級雖可使用 105 毫米與 155 毫米火炮發射煙幕彈，但這些火炮同時還須執行高爆彈藥攻擊等其他關鍵任務，導致掩護資源受到限制。此外，裝甲載具配備的車載煙幕系統雖能短暫隱蔽自身，但僅限單輛車輛使用，且一次使用後須重新裝填。雖然這些手持、輕武器與間接使用的煙幕系統提供了基本掩護能力，但要在大規模作戰中確保行動成功，指揮官仍須更完善、更具規模的煙幕掩護手段。

Although this appears to be a wealth of obscuration, it is not. These are most of the widely available obscurants available to Army combat units, and they are not enough to succeed in LSCO. One concern for the mortar and cannon obscurants is they are meant to be used in a two-dimensional fashion. This means that they are employed between friendly and enemy units. They cannot obscure friendly units from aerial observation. Another concern at the tactical level with these tools is the binary choice commanders must make. For every cannon-delivered smoke round, a high-explosive round is not being directed against enemy equipment or troops. The same applies to hand grenades, grenade launcher rounds, and mortar rounds. The United States does not use white phosphorous rounds against troop formations due to a convention on certain conventional weapons.

雖然表面上美軍似乎擁有多種煙幕掩護手段，但實際上仍遠遠不足，這些已是作戰部隊能獲得的主要煙幕工具，且難以滿足大規模作戰需求。首先，迫擊砲與火炮的煙幕彈主要是用於地面作戰，在友軍與敵軍之間形成煙幕屏障，但無法有效遮蔽友軍免受敵軍空中偵察的觀測。其次，在戰術層面上的挑戰是指揮官在使用這些煙幕工具時，必須做出取捨：每發用於煙幕掩護的火炮或迫擊砲彈，都意味著少發一枚可直接摧毀敵方人員或裝備的高爆彈藥。同樣的問題也存在於單兵煙幕彈、榴彈發射器及迫擊砲的煙幕彈。此外，由於美國簽署禁止使用白磷彈的公約以對抗敵方軍隊，使得煙幕掩護的選項進一步受限。

As seen in Russia's wet-gap crossing operation, there is a need for a ground-based, persistent, area obscuration solution. Dated solutions such as the M56 Coyote and M58 Wolf provided the capability to obscure visual and infrared observation. However, they are old systems and are not widely available to combat units. The Army does have the Screening Observation Module (SOM) that is more capable than the M56 Coyote but is not widely available. Compounding the availability concerns, the SOM does not produce a large enough cloud for an extended length of time. The SOM can only screen half an acre for twelve minutes before it needs refueling. The M56 was capable of screening visually for ninety minutes or against infrared for thirty minutes across

a much larger area. Further, the SOM's weight at sixty-four pounds is too large for dismounted operations. The Army needs more tools to enable obscuration at echelon supporting critical operations like combined arms breaches and wet-gap crossings.

從俄軍的徒涉行動可見，戰場上迫切需要一種能夠持續提供大範圍煙幕掩護的地面系統。舊型裝備如 M56 Coyote 渦輪發煙機與 M58 Wolf 狼式渦輪發煙機雖然具備遮蔽可見光與紅外線觀測的能力，但這些系統已過時，且未能廣泛配發至作戰部隊。目前美軍雖然擁有更先進的「掩護遮蔽模組」(SOM)，其性能優於 M56 Coyote，但部署數量有限。此外，掩護遮蔽模組在掩護範圍與持續時間上仍存在缺陷：其煙幕施放範圍約半英畝(約 2,023 平方公尺)，且只能持續 12 分鐘，之後必須重新加注燃料。相比之下，M56 的掩護能力更強，能提供 90 分鐘的可見光遮蔽，或 30 分鐘的紅外線遮蔽，且覆蓋範圍更廣。此外，掩護遮蔽模組的重量達 64 磅(約 29 公斤)，對於徒步部隊而言過於沉重，不利於機動作戰。要有效支援聯合兵種突擊與徒涉等複雜戰術行動，美軍必須強化其煙幕掩護能力，並開發更多適用於不同作戰層級的掩護工具。

Beyond the limited tools available, new technologies complicate the issue. Again, the Ukraine-Russia War provides salient examples of the need for obscuration. The proliferation of unmanned aircraft systems (UAS) has exacerbated equipment losses and casualties. Russia has been able to field UASs to observe, report, and destroy Ukrainian forces. A single kamikaze-style UAS has been capable of destroying main battle tanks at an alarmingly low cost. And they are effective attacking the least protected part of the tank: the top. Due to Russia's massing of observation platforms, Ukraine changed its tactics to using dismounted infantry to clear mines only at night. This methodical means of breaching will not gain ground quickly and goes against combined arms theory. And Russia is not the only U.S. adversary in the UAS game. Iran has been supplying Russia with drones as well because Russia has been unable to keep up with its own demand.

除了煙幕掩護手段不足，新技術的發展更讓戰場環境變得更加複雜。俄烏戰爭

的經驗顯示，戰場上迫切需要有效的掩護手段，特別是在無人機高度普及的情況下，造成裝備損失與人員傷亡均大幅增加。俄軍廣泛使用無人機執行偵察、回報與精準打擊，甚至能以低成本的自殺式無人機摧毀主戰戰車，並針對戰車防護力最薄弱的上方裝甲發動攻擊。此外，由於俄軍部署大量觀察平台，烏軍被迫改變戰術，只能在夜間由步兵執行排雷作業。然而，這種緩慢而謹慎的突破方式無法快速推進戰線，並且違反聯合兵種作戰的核心原則。而且，俄羅斯並非是唯一掌握無人機戰術的美國對手。由於俄軍本身的無人機產量無法滿足戰場需求，伊朗也向俄羅斯提供無人機，以協助其戰場運作，進一步提升俄軍的無人機戰力。

Iran has been reported to have a well-established production capacity that not only fills its need but is also capable of supplying others. Iran has been reported to support other potential adversaries, including Houthis in Yemen. It is probable that the United States or its allies could face a similar scenario where a large quantity of observation assets can observe and attack breaching operations.

據報導，伊朗擁有成熟的無人機生產能力，不僅能自給自足，還能向其他國家或武裝組織輸出裝備。例如，伊朗據稱已向葉門的胡塞組織(Houthis)等潛在對手提供支援。因此，美國及其盟友未來可能也會面臨類似局勢，敵方透過大量無人機與觀測裝備掌控戰場情報，進而對突擊作戰發動精準攻擊。

Obscuration is needed for other critical battlefield operations. Wet-gap crossings are arguably more complex and difficult than a combined arms breach. A brigade combat team owns all the capabilities to conduct a combined arms breach; a wet-gap crossing requires more capability, making it a division or corps operation. Not only does it require more capability, but it also takes more time to accomplish. The time required to conduct a wet-gap crossing could be measured in hours or days whereas a combined arms breach would be measured in minutes. Erecting an assault float bridge is a time-consuming process that happens without natural cover as vehicles cross.

煙幕掩護在許多關鍵戰場行動中都不可或缺，尤其是在高度複雜的涉水渡河作戰中，其重要性甚至可能超越聯合兵種突擊。旅級戰鬥隊(brigade combat team)

具備執行聯合兵種突擊的完整能力，但涉水渡河作戰的規模更大，通常須要動用師級或軍團級部隊來執行。不僅如此，這類行動所需時間更長，聯合兵種突擊可能在數分鐘內完成，而涉水渡河作戰則可能耗時數小時甚至數天。架設突擊浮橋更是一項高度耗時且極具風險的作業，過程中缺乏天然掩護，使車輛與工兵單位極易遭受敵軍打擊，因此必須搭配有效的煙幕掩護，以提升行動的生存率與成功率。

Many of the currently fielded counter-UAS focus on destroying the UAS or breaking one of its communication links. As shown at the 2023 Association of the United States Army annual conference, many vendors are attempting to sell the military counter-UAS systems. The Army has fielded interim solutions including fixed site, mounted, and dismounted/handheld systems. These are necessary because obscuring an operational environment all day, every day is unreasonable. However, these solutions appear to be the main effort of the Army's counter-UAS efforts. The Army needs to expand counter-UAS solutions including obscuration means and methods.

目前美軍的反無人機技術，主要聚焦於摧毀無人機或干擾其通訊鏈。在 2023 年美國陸軍協會年度會議上，許多軍事廠商競相推出各類反無人機系統，希望獲得軍方採購。美軍目前已部署部分解決方案，包括固定式、車載式與徒步部隊可攜式系統。這些系統確實有其必要性，因為戰場環境無法全天候保持煙幕掩護，而目前美軍的反無人機策略似乎過於側重這些攔截手段。要有效應對無人機威脅，美軍應拓展反無人機戰術，除了摧毀與干擾技術外，還須強化煙幕掩護等其他手段，以降低敵軍無人機的偵察與攻擊能力。

Commanders do not have enough material solutions to enable a multicorps conflict in any geographic combatant command. Near-peer threats loom large, and the potential for LSCO has increased. It is time that the Army recognizes this gap and begins to fill it.

目前，指揮官手中的裝備仍不足以支援任何戰區內的多個軍團級衝突。面對近儕威脅帶來的日益嚴峻挑戰，大規模作戰的風險正持續上升。美軍應認清這一戰力缺口，並迅速採取行動，以確保未來戰場上的優勢。

Solutions 解決方案

Using the doctrine, organization, training, materiel, leadership and education, personnel, facilities, and policy (DOTMLPF-P) model, several recommendations can improve the current state of the Army to better prepare for LSCO.

透過「準則、組織、培訓、軍品、領導和教育、人員、設施和政策」(DOTMLPF-P)模式，美軍可從多方面提出改進建議，強化作戰能力，以更有效地應對大規模作戰的挑戰。

Doctrine. The Army needs to adopt obscuration in its lexicon more formally. A potential solution could be the addition of obscure as a tactical mission task in Field Manual (FM) 1-02.2, Military Symbols. As the foundational field manual describing operational terms and graphics, a friendly focused tactical mission task of obscure could be defined as “a tactical mission task in which the unit employs all available means to conceal the location of friendly units and/or terrain features from enemy observation.” An enemy focused task to obscure could be “a tactical mission task that denies the enemy the ability to locate friendly forces and target them with direct and indirect fires.” Either of these would provide commanders the ability to tactically direct assets to preserve combat power through denying enemy observation. Without a formally defining and codifying obscure as a tactical task, commanders will assume it is being incorporated. If it were formally defined, commanders would focus combat power, use it as a shaping effort, and enable critical events like wet-gap crossings and combined arms breaches.

準則。 美軍應正式將「煙幕掩護」納入準則體系中，以確保其在戰場上的有效運用。一種可行的方法，是將其新增至《野戰手冊》(FM 1-02.2《軍事符號》)，並將其定義為正式的戰術任務。例如，可將「煙幕掩護」作為友軍導向的戰術任務，定義為：「部隊利用所有可用手段，隱蔽友軍位置或地形特徵，以防敵軍偵察與觀測。」針對敵軍的定義則可為：「阻止敵軍鎖定友軍位置，進而削弱其直接與間接火力攻擊能力。」若「煙幕掩護」未被正式定義為正式的戰術任務，指揮官可能會假設它已經內建於作戰計畫中，導致其應用不足。而若將其明確定義，指揮官則能

更有效地分配戰場資源，將其作為塑造戰場的關鍵戰術行動，進一步支援涉水渡河與聯合兵種突擊等高風險行動，確保作戰成功率與部隊生存能力。

Further, the Army needs to revive significant elements of FM 3-101-1, Smoke Squad/Platoon Operations. This manual described battlefield applications of smoke (e.g., obscuring, screening, protecting, and marking) and visibility criteria (e.g., haze, blanket, and curtain). When thinking of using obscuration methods, commanders and staffs must be sure to provide a clear task and purpose. At times, there may even need to be multiple tasks and purposes to distinguish the effect of the obscuration such as facilitating movement to a position or enabling an assault element. Combined with a formal definition of obscuration, these doctrinal definitions will enable combat formations to employ the tools appropriately.

此外，美軍應重新納入 FM3-101-1 Smoke Squad/Platoon Operations《野戰手冊-煙幕班/排作戰》中的重要內容。這本手冊曾系統性地說明戰場煙幕的應用方式，例如掩蔽敵軍視線、提供屏障、保護部隊與標記戰術目標，並詳細解釋了不同類型的煙幕效果，如霧煙、毯煙、與幕煙的區別。指揮官與參謀在規劃煙幕掩護時，必須確保指令清晰，並設定明確的戰術目標。有時，可能須要設置多層次的煙幕任務，以確保不同戰術目標能夠順利達成，例如掩護部隊向特定陣地機動，或支援突擊部隊展開攻勢。將煙幕掩護正式納入準則，並搭配具體戰術定義，將能確保各級部隊正確運用煙幕技術，提升戰場生存力與作戰成功率。

Organization. At times, organizations are thought of as a magic wand. Create an organization to do something, and it will be done. Caution must be maintained, especially considering the latest Army structure changes that Secretary Christine Wormuth recently enacted. It is true that the Chemical Corps, at one time, trained its forces to provide obscuration. The Chemical Corps no longer includes smoke as part of its mission. The proponent of FM 3-101-1 was the Chemical Corps when it was published in 1994. The manual included the organization of heavy division mechanized smoke platoons, corps mechanized smoke platoons, and corps motorized smoke platoons. It is worth reevaluating

the need for smoke generating units that can provide another means of battlefield obscuration as the Army continues to evaluate future needs supporting LSCO. The proliferation of UAS should encourage this look as well when evaluating the protection warfighting function.

組織。 人們往往認為，建立一個專門單位就能解決問題。然而，在考慮美軍最新的組織改革時，必須審慎評估這樣的策略是否合適，尤其是陸軍部長 Christine Wormuth 近期推動的軍改措施。過去，化學兵部隊曾負責訓練部隊執行煙幕掩護任務，而目前該職能已被移除。1994 年出版的《野戰手冊 3-101-1》由化學兵部隊主編，準則中明確規範了重裝步兵師的機械化煙幕排、軍級機械化煙幕排及軍級機動煙幕排的組織與運作模式。隨著美軍持續評估未來大規模作戰的需求，應重新審視是否須要恢復專門執行施放煙幕的單位，以確保戰場上的煙幕掩護能力。同時，在考量作戰保護職能(protection warfighting function)時，無人機的廣泛應用進一步凸顯了這一需求，因為煙幕掩護可有效降低敵軍無人機的偵察與攻擊能力，提升部隊的生存機會與作戰職能。

This is not to say that the Army of the 1990s must return. With the latest change to Army structure, the Army is making greater organizational investments at the theater strategic and operational levels. With fewer tactical units available in the current force, units may need to be able to execute obscuration tasks in their current structure. It is, however, worth evaluating whether tactical units responsible for critical operations, including wet-gap crossings and mounted breaches, need additional combat power. Including a smoke squad in multirole bridge companies or in a combat engineer company-armored are potential solutions worth investigation.

這並不代表美軍應回到 1990 年代的舊編制模式。隨著近期的陸軍結構調整，部隊資源已向戰略與作戰層級傾斜，但由於現有戰術單位的數量減少，各部隊可能須要在現有編制內執行煙幕掩護任務，以確保作戰靈活性。然而，仍應評估負責關鍵作戰行動(如涉水渡河與機械化突擊)的戰術單位，是否須要額外的戰鬥支援能力。例如，在多功能橋樑連(multirole bridge companies)或裝甲工兵連(combat engineer company-armored)內增設煙幕班(smoke squad)，可能是一種值得進

一步探討的解決方案，以提升部隊在複雜戰場環境中的生存能力與作戰效能。

Materiel. The Army needs to evaluate the breadth of tools available to deploy, fight, and win against a near-peer adversary. Even as the Army pursues unmanned systems, the need for obscuration is paramount. As of the writing of this article, Ukrainians continue to pour manned platforms into the breach, and Russians continue to inflict high casualty rates. If the Ukrainians were inserting unmanned platforms into the breach, there is a finite quantity that they possess. Although soldiers are at a reduced risk from an unmanned platform, the regenerative capability of these platforms is not infinite. Obscuration would conceal the movements of any platform and assist in preserving combat power. They could also deceive an adversary if used at multiple breach points or crossing locations to blunt an adversary's ability to mass effects.

軍品。 美軍必須全面檢視現有裝備的廣泛性，以在對抗近儕對手的戰爭中取勝。即便美軍正大力發展無人作戰系統，煙幕掩護仍是戰場上不可或缺的關鍵能力。截至本文撰寫時，烏克蘭軍隊仍依賴載人作戰平台發起突破，而俄軍則憑藉火力優勢造成大量傷亡。即便烏軍改用無人載台進行突擊，其數量終究有限。無人載台雖能降低士兵直接參戰的風險，但這些裝備並非取之不盡。煙幕掩護不僅能有效遮蔽所有作戰平台的行動，提升戰場生存力，還能透過在多個突破點或渡河地點同時施放煙幕，干擾敵軍判斷主攻方向，進而削弱其火力集中能力，提高作戰成功率。

The Army owes it to its soldiers to find health-conscious solutions that reduce exposure risk. That is not to say that there are zero health concerns, but the Army must attempt to reasonably reduce health-related hazards. The Army must find the balance between reduced health risks and effective smoke employment. It has been known since at least 1957 that exposure to certain obscurants create health concerns. In 2012, the Army sought to develop high-performance smoke compositions without toxic chemicals. This research, development, testing, and evaluation continues to this day without complete solutions through the U.S. Army Combat Capabilities Development Command's Chemical Biological Center. The Army needs to request additional funding to accelerate these developments. Fighting and winning in LSCO requires

obscuration means and methods that preserve friendly combat power to achieve decisive action supporting campaign objectives.

美軍有責任為士兵尋找更健康的施放煙幕技術，以降低其暴露於有害物質的風險。這並不代表完全沒有健康顧慮，而是美軍應在降低風險與維持煙幕效能之間取得適當平衡。早在 1957 年，軍方就已知某些煙幕材料可能對健康構成威脅。2012 年，美軍開始研發不含毒性化學物質的高效能煙幕配方，至今仍透過美軍戰鬥能力發展司令部旗下的化學生物中心(Chemical Biological Center)持續進行研究、測試與改進，但仍未找到最理想的解決方案。為加速技術突破，美軍應爭取額外研發資金，推動更安全且高效的煙幕技術。在大規模作戰環境下，成功的關鍵在於有效運用煙幕掩護，以確保友軍戰力存續，支援戰役行動，並實現戰場決定性勝利。

Obscuration is not the only tool needed. We must apply lessons learned when improvised explosive devices became the norm during the Global War on Terrorism. Expanding on these lessons and adding the proliferation of UAS creates the need for a tool kit, not a single tool. Defeating UAS prior to its appearance, known as “left of launch,” is a part of the solution. Static camouflage nets are another needed capability. The Army must evaluate its needs when mobile to defeat myriad observation platforms to maintain combat power. Obscuration can add to the tool kit but must not be thought of as the only tool.

煙幕掩護並非戰場上唯一需要的戰術行動。我們汲取全球反恐戰爭的經驗教訓，特別是在應急爆炸裝置(IED)成為主要威脅後，美軍如何適應並開發應對手段。如今，隨著無人系統的大量使用，美軍需要的是一整套多層次的防禦工具，而非單一手段。「發射前攔截」(left of launch)是解決方案的一部分，即在無人機出現之前先行它的破壞指管及運作系統。此外，靜態偽裝網(static camouflage nets)也是另一項亟需的方案。美軍必須檢視自身在作戰環境中的需求，確保能夠對抗各種偵察手段，以維持戰場優勢。煙幕掩護雖然是必要的戰術作為，但必須與其他技術結合，才能形成完整的戰場應對方案。

Counter argument 反對觀點

Some might say that obscuration is antiquated. In a three-dimensional world

with five warfighting domains, and increasing artificial intelligence and autonomous capabilities, they would say obscuration is a wasted investment. Money could be directed elsewhere to speed up decision-making. Although AI and autonomous capabilities need investment, obscuration is not a binary choice. The Army needs to invest in obscuration accounting for these emerging technologies. The Army will still face a shortage of critical systems, no matter if they are manned or unmanned. The preservation of combat power should drive the need to invest in battlefield obscuration tools and technologies. Although autonomous and robotic technologies remove humanity from direct harm, these systems are expensive and will be destroyed en masse.

有些人可能認為，煙幕掩護已經過時。在現代戰場中，作戰不僅侷限於地面，而是涵蓋陸、海、空、太空與網路等五大領域，再加上人工智慧與自主作戰技術的進步，煙幕掩護似乎是不值得投資的項目。他們可能認為，資金應投入更可以提升決策速度的技術。然而，投資 AI 和自主作戰技術，並不代表必須放棄煙幕掩護。這兩者並非互斥，而應並行發展。無論是載人還是無人作戰平台，美軍仍然面臨關鍵戰力短缺的問題。因此，為確保戰場上的戰鬥力，美軍仍須投資煙幕掩護技術，作為防護與戰術欺敵的重要手段。此外，雖然 AI 與自主作戰技術可減少人員暴露於戰場風險，但這些造價昂貴的系統，在高強度衝突中可能遭受大規模摧毀。

Others might say that obscuration is unnecessary in large-scale, multidomain combat operations. The speed that they expect war to happen would outpace an anachronism such as copious amounts of smoke. War will move too quickly to need prolonged obscuration times or a panoply of tools. This is also inaccurate because the Ukraine-Russia conflict displays how war bogs down temporally and becomes an attritional conflict. Obscuration is needed across the spectrum of conflict—using it at rapid speed when acting with haste as well as when conflicts slow for deliberate operations. Wet-gap crossings might not need to be full closure operations, but even rafting operations require three-dimensional obscuration to preserve combat power in the operation and for future engagements.

有人可能認為，在現代大規模、多領域作戰中，煙幕掩護已不合時宜。他們認

為，戰爭節奏將極為迅速，使得大規模煙幕掩護顯得多餘，因為戰場變化過快，無需長時間煙幕遮蔽或多層次掩護手段。然而，這種看法並不符合現實。俄烏戰爭已證明，戰爭不一定如理論般快速推進，反而可能陷入僵局，演變為消耗戰。在這種狀況下，煙幕掩護不僅適用於快速作戰，也同樣適用於僵持許久未果的戰爭。即便是渡河作戰(wet-gap crossings)未必須要完全封鎖敵軍視線，但即使是浮橋架設等行動，也仍須結合立體掩護手段，確保部隊在作戰過程中的生存力與後續戰力維持。

Conclusion 結論

Investing in battlefield obscuration doctrine, organizations, and materiel are necessary to deploy, fit, and win in LSCO. The Army needs to identify capability gaps in this arena to ensure it can deliver the decisive force to the decisive point. Preserving combat power should not be seen as ancillary to seizing an objective—it is critical to it. The blood and treasure that Russia and Ukraine have shed should show the Army that it is an investment worth making.

要在大規模作戰中成功部署、作戰並獲勝，美軍必須投資於戰場煙幕掩護的準則、組織架構與軍品發展。當務之急是識別當前能力缺口，確保在決定性戰場投入足夠戰力，以掌握勝局。維持戰鬥力不應被視為奪取目標的次要任務，而是作戰成功的核心關鍵。俄烏戰爭已證明，缺乏適當的煙幕掩護將導致高昂的人員與裝備損失。美軍應從中汲取教訓，以確保未來戰場上的生存能力與作戰優勢。