



美陸軍強化電子戰能力

轉譯：干擾、欺敵和監控：美陸軍致力於提升電子戰能力

JAM, SPOOF AND SPY: US ARMY LOOKS TO ENERGIZE ELECTRONIC WARFARE

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提要

- 一、美陸軍正研究運用無人機等方式執行更高效的電子戰，以應對技術先進對手
- 二、整合電子戰能力還需要與其他作戰要素配合，例如納入聯合作戰體系中，包括空中、海上和陸地部隊密切配合，可提供更全面的電子戰作戰環境。
- 三、美軍不斷創新，開發新電子戰系統及套件，應對不斷變化的威脅，以提升戰術和戰略電子戰能力。

關鍵詞：電子戰裝備、未來戰場、整合重要性

War in Ukraine Highlights Importance of Flexible Assets in The Air And on The Ground 烏克蘭戰爭凸顯了空中和地面靈活裝備的重要性

WASHINGTON — The U.S. Army is looking to air- and ground-launched platforms, such as drones, to more effectively wage electronic warfare, amid a Pentagon push to modernize arsenals and the expectation that long-held technology investments are set to pay off. Officials involved in the effort point to two experiments: air-launched effects, or ALE; and ground-launched effects, or GLE. By outfitting them with kit capable of jamming, spoofing or collecting intelligence, the platforms could help deter and neutralize technologically advanced adversaries, such as China and Russia, during a conflict.



華盛頓—在五角大廈推動軍火武器現代化與長期持有之技術投資有望獲得回報的背景下，美陸軍正在尋求運用如無人機等空中和地面發射載台來更有效地發動電子戰。參與這項工作的官員指出了兩項實驗：空射效應（Air-Launched Effects, ALE）與地射效應（Ground-Launched Effects, GLE）。藉由為這些載台配備能干擾、欺敵或收集情報的套件，可在國與國衝突期間，有助於威懾和應對技術先進的對手，例如中國和俄羅斯。

“Ground to space, rear to deep: From a threat standpoint, we have to be prepared to operate in that entire range,” Brig. Gen. Ed Barker, the deputy program executive officer for intelligence, electronic warfare and sensors, said during an Aug. 30 event at Aberdeen Proving Ground, Maryland. “As we operate in this environment, we have to be enabling the larger Army priorities.”

「“從地面到太空，從後方到縱深：從威脅角度來看，我們必須做好全方面的作戰準備”。負責情蒐、電子戰與感測器項目的副執行官艾德·巴克准將（Brig. Gen. Ed Barker）8月30日於馬里蘭州阿伯丁試驗場舉行的一次活動中表示「“當我們在這種環境下作戰，我們必須優先執行對陸軍影響力較大的項目”」。

Air-launched effects are relatively low-cost drones or payloads catapulted midair by larger aircraft, either crewed or uncrewed. They are meant to detect, disrupt, deceive or destroy, and can sync with a larger family of battlefield tools. The Army considers them a crucial piece of the future vertical lift effort meant to overhaul the helicopter fleet. The service is expected to spend billions of dollars in the next five years on both the future long-range assault aircraft and the future attack reconnaissance aircraft, according to fiscal 2023 budget justification documents.

空射效應是相對低成本的無人機或大型飛機（有人或無人）在空中彈射的有效負載。它們的目的是偵測、干擾、欺敵或摧毀，並且可結合更多戰場工具系列進行同步作業。美陸軍認為它們為未來垂直升空計畫的重要組成部分，旨在徹底改造直升機機隊。依據 2023 年財務預算論證文件，預計該軍種將在未來五年內花費數 10 億美元用於未來遠程攻擊機和未來攻擊偵察機。

Coordination on air-launched effects between the electronic warfare camp and



aviation officials is in the early stages.

電子戰陣營與陸航官員在協調空射效應方面仍處於早期階段。

“We have some tech maturity investments happening next year in ALE, and we’re going to share it,” Mark Kitz, Barker’s boss and the leader of Program Executive Office Intelligence, Electronic Warfare and Sensors, said at the same August event. “They’re going to do sort of the vehicle piece, and we’re going to do some electronic warfare prototyping. And we’re going to integrate that together. So that’ll be a partnership.” The prototyping will shape the roles each community plays, or to whom the most work falls.

“If we’re just going to buy commercial technologies to integrate, I think aviation could probably handle all of that,” Kitz said. “If we’re going to do some unique things, or some exquisite target or exquisite sort of EW, we’ll do it as a partnership.”

「“明年我們將完成空射效應（ALE）項目並分享投資結果。”」在 8 月份同一個活動中，巴克（Barker）的上司兼情蒐、電子戰與感測器項目執行官馬克·基次（Mark Kitz）提到了相同事情。

「“他們將製作某種車輛零件，而我們將製作一些電子戰雛型機。我們將把它們整合在一起，所以這將是一種夥伴關係”」。

雛型機的設計將塑造每個單位所擔任的角色，或由誰承擔最多工作。「“如果僅透過購買商業技術進行整合，我認為陸航內部本身能夠應對所有問題”」，基次（Kitz）說道「“然而，如果我們的目標更為獨特，或需要更精確的技術，例如精準電子戰運用，我們將作為合作夥伴來完成這個專案”」。

Already, the service is tinkering. The Future Vertical Lift Cross-Functional Team, a group focused on replacing legacy Army aircraft, worked with air-launched effects during the 2021 iteration of Project Convergence, a large-scale Army demonstration. During that exercise series, officials want to propel the Joint All-Domain Command and Control concept by putting cutting-edge tech to the test in demanding conditions. In addition, at an earlier Edge 21 exercise, air-launched sensors were used to collect and distribute real-time information.



陸軍正在補強中，未來垂直升降跨功能團隊是一個專注於取代傳統陸軍飛航的小組。在 2021 年陸軍大規模融合項目演習（PC21）期間，此小組便納入空射效應（ALE）做研究。在該演習中，官員們希望通過在苛刻條件下測試尖端技術以推動全域指管概念。此外，在 Edge 21¹演習初期，運用空射感測器即時收集並分發情報。

The Army has studied air-launched effects for years. In 2020, the Army's Combat Capabilities Development Command published a related request for information detailing a future battlefield rifle with “highly lethal and complex” targets.

Those targets, the documents stated, “will include networked and mobile air defense systems with extended ranges and long- and mid-range fires systems that will deny freedom of maneuver.”

陸軍多年來持續研究空射效應（ALE），2020 年美陸軍作戰能力發展指揮部發布了相關文件需求，深入描述未來戰場上充滿高度致命和複雜目標情境。依據文件所述，這些目標涵蓋具有較增程及中長程行動拒止武器的網路化及機動化的防空系統。

Even less mature are the ground-launched effects, which Kitz said lack actual requirements. Early stage experimenting with the ground-launched systems coupled with industry consultation could inform the path forward.

基次（Kitz）表示由於缺乏實際需求條件，導致地射效應（GLE）的研究相對不夠成熟。透過地面發射系統的早期實驗結果與廠商諮詢回饋，我們能夠更明確地導引地射效應的研究方向。

“We’re just looking at doing some prototyping to figure out: OK, what types of effects, what types of collection, could we get?” he said. “Very small. There’s not a ton of power. So what could we actually deliver? These are the types of things that we’re asking industry: What can you do?”

¹ Edge 21 於 2021 年 5 月 3 日在猶他州杜格威考察基地舉行，以印太區域場景與聯合部隊為基礎之演習。這次演習在 2020 年陸軍大規模融合項目演習(PC20)中學到的經驗基礎上進行，旨在為 PC21 做好準備。

<https://m.youtube.com/watch?v=KIURqUZIY4I>(2021 年 7 月 14 日)



「“我們只是想做一些雛型設計來弄清楚：好吧，我們可以獲得什麼類型的效果，什麼類型的資料蒐集?”」，他說「“很小，因為功率不大。那麼我們實際上可以傳送什麼?這些是我們向業界提出的問題：你能做甚麼?”」。

Kitz has yet to be involved in a GLE industry day, an indication of the endeavor's infancy.

基次 (Kitz) 目前尚未參加 GLE (地射效應、Ground-Launched Effects) 工業日活動，這顯示該項目還處於起步階段。

Electronic Warfare in The Wild 非傳統戰爭之電子戰

Air- and ground-launched effects are part of a grander vision for U.S. electronic warfare. EW, as it is known, is a fight for control of the electromagnetic spectrum, relied upon for weapons guidance, communications, situational awareness and more. While EW lacks the bluster of bursting bombs or thundering tanks, it can be pivotal, considering the sensitive digital portfolio of modern militaries.

空射與地射效應是美軍電子戰宏觀願景的一部分。眾所周知，電子戰是一場爭奪電磁頻譜控制權的戰爭，電磁頻譜廣泛應用於武器導引、通信戰場和戰場覺知等項目。儘管電子攻擊缺乏像炸彈爆炸或戰車戰鬥那樣的震撼效果，但考量到現代軍隊的數位化結構，這方面可能至關重要。

The Army is rethinking its networks, sensors and EW armory after decades of counterterrorism operations in the Middle East — a period when electronic systems were at less risk of harassment, and when U.S. and allied troops engaged forces outfitted with less-advanced gear.

The U.S. Defense Department is preparing for potential fights against China and Russia. The two world powers have constructed anti-access and area-denial infrastructure in an attempt to counter U.S. strengths and keep at bay forces or weapons that could overwhelm.

在經歷了數十年的中東反恐作戰後，美陸軍正在重新評估其網路戰、感測器和電



子戰裝備。在這段時期，因為美軍和盟軍與武器較不先進敵軍交戰，因此電子系統受到干擾的風險較低。

目前，美國國防部正在為應對中國和俄羅斯可能的作戰做好準備。這兩個世界大國正在建設反介入和區域拒止基礎設施，試圖對抗美國的實力，以牽制可能對中、俄兩國造成壓倒性優勢的部隊或武器的接近。

“Really, what the Army is asking for electronic warfare is: How do you deliver an integrated architecture that will help me operate in the air and on the ground? And how can electronic warfare enable some of those future operations, whether that’s a [future attack reconnaissance aircraft], whether that’s an [optionally manned fighting vehicle], whether that’s long-range precision targeting, in terms of long-range sensing?” Kitz said. “All of that sort of integrated architecture is what we’re attempting to deliver.”

「“陸軍電子戰實際上所關切的是：如何提供一個統整的體系，以協助在空中與地面作戰？在未來作戰中，電子戰如何應用，無論是應對未來攻擊偵察機、可選人員操控戰鬥載具，還是遠程精準目標獲得系統？我們致力於提供相關類型的統合體系”」。

PEO IEW&S tests and fields a variety of defense kit, including navigation suites, missile warning systems and biometric tools. The office’s reach is long, and its portfolio touches “everything from the sights on an Abrams tank” to “identity access of somebody driving on the Redstone Arsenal,” Barker said.

情報、電子戰與感測器項目計畫執行辦公室（PEO IEW&S）測試並部署各種防禦套件，包含導航套件、飛彈預警系統及生物辨識工具。巴克（Barker）說，該辦公室影響範圍很廣，其產品組合涵蓋可從「“艾布蘭戰車（Abrams tank）上各種瞄準、觀測裝置”」到「“識別在紅石兵工廠（Redstone Arsenal）行駛的某人進入權限”」。

Among other Army EW pursuits are programs known as the Terrestrial Layer System-Brigade Combat Team, or TLS-BCT; the Terrestrial Layer System-Echelons Above Brigade, or TLS-EAB; and the Multi-Function Electronic Warfare-Air Large, or MFEW-AL. Each serves its own purpose.



陸軍電子戰的其他計畫包括被稱為陸域系統-旅級戰鬥隊（TLS-BCT）計畫；陸域系統-旅以上梯隊（TLS-EAB）計畫；以及大型多功能電子戰（MFEW-AL）計畫，每個計畫都有其目的。

The service in July awarded a nearly \$59 million contract to Lockheed Martin to furnish prototypes for TLS-BCT. In August, the Army inked separate deals with Lockheed and General Dynamics Mission Systems for TLS-EAB concepts and demonstrations.

今年 7 月，美陸軍向洛克希德·馬丁公司簽訂一份近 5,900 萬美元合約，為陸域系統-旅級戰鬥隊（TLS-BCT）提供原型裝備。8 月陸軍與洛克希德公司和通用動力任務系統公司個別簽署陸域系統-旅以上梯隊（TLS-EAB）概念與展示的協議。

The self-contained MFEW-AL pod is made by Lockheed, too. Together, the trio will provide to soldiers a bevy of electronic warfare, signals intelligence and cyber capabilities.

獨立的大型多功能電子戰（MFEW-AL）夾艙也是由洛克希德公司製造。這三者將共同為士兵提供一系列的電子戰、信號情報與網路能力。

“The Army is developing force structure, developing doctrine, developing training — whether it’s leader, individual or collective training,” William Utroska, a leader at PEO IEW&S, said Aug. 30. “And at the same time, we’re trying to develop systems to address our needs from an EW and cyber perspective.”

The Air Force is similarly doubling down on its EW portfolio, after spending years asleep at the wheel, according to Gen. CQ Brown, the chief of staff.

「“陸軍正在發展部隊結構，制定準則，進行培訓——無論是領導者、單兵還是組合訓練”，PEO IEW&S 領導威廉·尤特羅斯卡於 8 月 30 日表示「“同時，我們正試圖開發系統，從電子戰及網路面向來定位我們的需求”」。

空軍參謀長 CQ 布朗將軍（CQ Brown）表示，在沉寂多年後，美國空軍同樣在其電子戰領域加強投資。



The service is now organizing a campaign to identify deficiencies, requirements and funding sources, said Lt. Gen. Leah Lauderback, the deputy chief of staff for intelligence, surveillance, reconnaissance and cyber effects operations.

負責情報、監視、偵察和網路效應作戰項目的副參謀長利亞·勞德巴克中將（Lauderback）表示，該軍種目前正在組織一場活動，以確定不足之處、需求和資金來源。

“We are nowhere near where we need to be with that,” she said Sept. 20 at the Air Force Association’s Air, Space and Cyber Conference in National Harbor, Maryland. “We are just starting the sprint. It’s with the acquisition community, it’s with the operational community.”

她在 9 月 20 於馬里蘭州國家港由空軍協會舉辦的「航空、太空和網路會議」上表示，「“我們距離我們需要的目標還很遠”」。「“我們才剛剛開始衝刺。這涉及到採購團隊，也涉及到作戰團隊”」。

Lessons From Ukraine烏克蘭戰爭的教訓

Given the Army’s need for flexibility and readiness, backed by a philosophy known as multidomain operations, Kitz does not expect to buy massive quantities of rigid gear. Instead, the executive officer thinks small batches of upgradeable, alterable kit will be the correct choice.

鑑於陸軍對靈活性與戰備需求，並支持多域作戰的理念，基次（Kitz）不準備購買大量固定式裝備。相反的，這位執行官認為，小批量、可升級和可調整的裝備將是正確選擇。

“I don’t think we’re going to ever be in a situation where we’re going to buy thousands of ALEs,” he said, “because the threat is going to continually change.”

他說：「“我不認為我們會處於需要購買數千個空射效應（ALE）裝備的情況，因為所面臨威脅會持續變化”」。



A prime example is in Ukraine, where even “six months ago, the environment looked very different than it looks now,” Kitz said. Both cyberwarfare and electronic warfare have played roles in the bloody Russia-Ukraine conflict, leaving government websites paralyzed, command-and-control methods jeopardized, and GPS signals jammed.

Ukraine’s defense minister in July said the military was providing U.S. and other friendly nations with information about Russian tactics, including the use of electronic warfare.

基次 (Kitz) 說：一個典型的例子就是烏克蘭，即使「“6 個月前，那裡環境看起來也與現在截然不同”」。電子戰和網路戰都在俄羅斯-烏克蘭血腥衝突中發揮了作用，導致政府網站癱瘓、指揮和控制手段受到威脅、GPS 信號受到干擾。烏克蘭國防部長 7 月表示，軍方正在向美國和其他友好國家提供有關俄羅斯戰術的信息，包括電子戰的使用。

“We are asking you to listen to Ukraine and act now. We have been warning our partners about everything that has come to pass,” Oleksii Reznikov said at an Atlantic Council event. “Russia has to be defeated on the battlefield. Ukraine has proved that this is possible.”

奧萊克西·雷茲尼科夫 (Oleksii Reznikov) 在大西洋理事會的一次活動中表示：「“我們要求你們聆聽烏克蘭的聲音，並現在就採取行動。我們已經向我們的合作夥伴警告了所有已經發生的事情”」。「“俄羅斯必須在戰場上被擊敗，烏克蘭已經證明了這是可能的”」。

Such information can influence what the U.S. sends to the front lines in Eastern Europe — like the electronic jamming equipment Pentagon officials in May said they would dispatch. It can also shape what the U.S. Army, specifically, invests in back home.

這樣的訊息可以影響美國向東歐戰線派遣的裝備-例如 5 月份五角大廈官員宣布要派遣電子干擾裝備，它也可以決定美陸軍的具體投資內容。

“We have got to be able to have systems or capabilities that can adapt,” Kitz said.

“What we’re trying to understand in these prototyping activities is: How can we get



to an adaptable system?”

基次（Kitz）表示：「“我們必須擁有具適應力的系統或能力”」。「“我們在這些原型設計活動中試圖了解的是：我們如何才能獲得適應性強的系統？”」。

譯者簡介

鄭敏秀，美國威爾猛軍校2007年班數學系，歷經：排長、副連長、外連官、電戰官、教官、訓參官，目前任職於陸軍教育訓練暨準則發展指揮部。

