

芬蘭聯合空地戰力整合：建立盟軍協同軍力*

Finnish Joint Air-Ground Integration: Building Allied Partner Capability

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Preface

At the invitation of the Finnish Army commander, Lt. Gen. Pasi Välimäki, the 10th Mountain Division commander, the division artillery commander, and the division fires enterprise converged on Helsinki in April 2023 to attend a Finnish air ground integration seminar. Preexisting relationships and identified capability gaps naturally brought fires and airspace professionals together to review further growth opportunities, but NATO's newest addition sought a niche function. Throughout the seminar, all contributors emphasized the importance of synchronization and integration at the division level and the means to achieve it. Understanding their new role as allies, the Finnish Army studied how they fought and identified a need for reform, specifically to develop and exercise a more robust air ground integration competency.

前言

美軍第 10 山地師師長、師砲兵指揮官及師火力組應芬蘭陸軍司令帕西·瓦利馬基中將之邀請，於 2023 年 4 月齊聚賀爾辛基，共同參與一場芬蘭的空地戰力整合研討會。芬軍當前正面臨戰力缺口問題，美芬兩軍在既有關係基礎下促使火力與空域專業人士齊聚一堂，意在尋求共同解決問題的方法，另芬蘭這個新進北約成員國(2023 年 4 月 4 日加入)，也想找出自身的職能定位。在整個研討會過程中，所有參與者不僅強調在師層級要達到同步與整合的重要性，而且也提出施行手段。芬蘭陸軍在理解其身分轉換成北約盟國的新角色後，著手研究自身作戰方式，發現有必要進行改革，尤其是要發展更健全的聯合空地戰力整合能力。

Furthermore, Välimäki laid out an ambitious timeline to develop initial capability for the Defender Europe exercise series (Nordic Response and Northern Forest) by the end of calendar year 2023. The 10th Mountain Division arrived in the U.S. European Command area of responsibility in March 2023

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and brought subject-matter experts with experience in this skill set. The article details how the United States and Finland paired with each other on a training path to build a clearly defined division-level warfighting capability and address an identified allied capability gap.

鑑此，瓦利馬基制定一個雄心勃勃的時間表，目標是短時間內(在 2023 年底之前)於「歐洲捍衛者」系列演習(如「北歐反應」與「北方森林」實兵聯演)中，展現初始作戰能力。基於協助盟友立場，美軍第 10 山地師在 2023 年 3 月抵達美國歐洲司令部責任區，並帶來擁有相關經驗的技術專家。本文詳述美國與芬蘭如何在訓練道路上結為合作夥伴、共同建立堅強的師級戰力，以及協助芬蘭這個盟友解決戰力缺口問題。

Why Does Finland Need Joint Air- Ground Capability?

Finland has a modern army and is adept at the employment of close air support in singular or limited instances. Now part of the NATO alliance, the Finnish Army's airspace purview must expand to account for the realities of coalition warfare. NATO air capabilities are orders of magnitude greater than Finnish national capabilities in scale and remain essential for optimizing resources toward an adversary who exploits the principle of mass. Now part of the NATO alliance, the Finnish Army must display the capability to leverage all resources the alliance brings. The Finnish Army identified this gap and sought U.S. assistance in building air-land integration capability.

芬蘭為何需要聯合空地戰力整合

芬蘭擁用有現代化軍隊，並擅長在單一或有限戰況下部署空中密接支援。如今作為北約同盟國之一員，芬軍必須擴展空域管制範圍，才能符合北約盟軍作戰的現實需求。北約的空中作戰量能遠遠大過芬蘭的軍力規模，一旦在面對大兵力集中的敵人時，芬蘭軍隊該如何有效駕馭這種龐大軍力至關重要。芬蘭現在已是北約成員之一，其必須展現可以駕馭北約盟軍的所有作戰量能，但經檢視後發現有力不從心的問題，故而尋求美軍協助解決戰力缺口問題，也就是建立聯合空地體戰力整合。

Background: U.S. Joint Air-Ground Integration Center

The joint air-ground integration center (JAGIC) is the action arm of the current operations integration cell (COIC) and must be collaborative, appropriately resourced, and properly organized to efficiently accomplish division collective tasks.¹ A combination of Air Force and Army personnel in the

JAGIC control airspace, coordinate interdiction, ensure friendly force identification, and control joint fires—it is strictly a current operations function.² The JAGIC chief, in constant collaboration with the division current operations chief make informed decisions based on designated priorities on striking targets and integrating joint assets in the division's assigned airspace.³ The current operations fight necessitates mission command.⁴ To operate at the frequency and volume demanded of the JAGIC, the division staff develops high payoff target lists, attack guidance, and target selections standards to enable quick decision making that within the commander's intent but can be executed with mission command.⁵

背景：美軍聯合空地整合中心

聯合空地整合中心(JAGIC)是當前作戰整合組的行動分支，其必須具備協調能力、適當資源配置及良好組織結構，才能有效完成師的集體任務。¹JAGIC 是由陸軍與空軍人員組成，負責空域管制、阻絕協調、友軍識別及管制聯合火力，毫無疑問其具備當前作戰職能。²JAGIC 作戰常與師當前作戰組主任保持密切協作關係，並根據指定的優先順序做出適當決策，以用於目標打擊上或整合師所屬空域內的聯軍武器裝備。³任務式指揮是當前作戰行動不可或缺的指揮哲學，⁴例如在 JAGIC 高頻與高量的作戰需求下，師參謀部的工作事項是制定高效益目標清單、攻擊指導和目標選擇標準，只要妥善運用任務式指揮，就能在指揮官意圖下快速做出決策並分權執行。⁵

The JAGIC must rapidly clear airspace and conduct joint fires in complex environments.⁶ The JAGIC performs these functions through the organization of existing personnel, specifically the functions of the air support operations center (ASOC), tactical air control party (TACP), and the COIC. The ASOC is a decentralized execution element from the supporting air component and controls joint air assets.⁷ “The ASOC may be delegated airspace control responsibilities by the ACA [airspace control authority].”⁸ The JAGIC's collaboration and ability to pass information quickly is its most critical function.⁹ Placing JAGIC members next to or near each other when executing complementary functions enables shared understanding, responsiveness, and

¹ Army Techniques Publication 3-91.1/Air Force Tactics, Techniques, and Procedures 3-2.86, *The Joint Air Ground Integration Center* (Washington, DC: U.S. Government Publishing Office, 2019), 1-1, 2-1.

² Ibid., 1-4.

³ Ibid., 2-1.

⁴ Ibid., 2-3.

⁵ Ibid.

reduces risk.¹⁰ While the right personnel remain essential components of the JAGIC, consistently training together creates the familiarity and confidence required to execute proper battle drills.¹¹

JAGIC 要在複雜環境中快速明確空域並執行聯合火力任務，⁶必須借重各單位人員的專業職能來完成這項工作，諸如空中支援作戰中心、戰術空中管制組及當前作戰整合組。空中支援作戰中心是一個分權式執行單位，其職責是支援空中部隊與管制聯合空中武器裝備，⁷同時也被空域管制權責單位賦予空域管制責任。⁸JAGIC 最關鍵功能為協作與快速傳遞資訊，⁹而且在作戰職能相互搭配時，JAGIC 成員會被安排在彼此相鄰或接近的位置，以利於達成共同理解、提升反應能力及降低風險。¹⁰對的人放到對的位置是 JAGIC 人員編組重點，但還要持續進行共同訓練，才能培養整個團隊執行戰鬥演練所需的熟悉度與信心。¹¹

To perform its designated mission, a JAGIC must know, possess, or understand the following:

- ◆ All communication capabilities with supporting or supported entities to include (and rehearse) primary, alternate, contingency, and emergency methods of communication.
- ◆ The target synchronization matrix, which includes high-payoff target list, attack guidance matrix/target selection standards, close air support distribution decisions, air tasking order, airspace control order, delegation of authorities matrix, decision support template, synchronization matrix, current orders and fragmentary orders.
- ◆ The required scheme of fires and sequence of effects that achieve the commander's end state.
- ◆ The fires and effects missions that are essential to achieve objectives and which, if not performed, result in mission failure.
- ◆ The operations synchronization brief, a battle rhythm event during which the future operations plan is handed off to the current operations team. This battle rhythm event normally takes place twenty-four hours prior to execution and includes prioritized planned targets, scheduled fire missions, and missions that the JAGIC must execute or not

⁶ Ibid., v, 1-2.

⁷ Ibid., 1-3.

⁸ Ibid., 1-2.

⁹ Ibid., 1-6.

¹⁰ Ibid.

¹¹ Ibid., 1-17.

interfere with.

- ◆ Situational understanding of ongoing operations and a common operational picture.
- ◆ Allied and partner-nation capabilities and caveats to optimally employ their systems.
- ◆ Sustainment limitations.

JAGIC 為了執行受指派的任務，其必須了解、擁有或掌握以下事項：

- ◆ 與支援或被支援單位的所有通信聯繫，應包含(並演練)主要、替代、應急和緊急通信的各種方法。
- ◆ 目標協同管制表應包含高效益目標清單、攻擊指導表/目標選擇標準、空中密接支援分配決策、空中要旨命令、空域管制命令、授權表、決心支援圖解、協同管制表、當前命令與個別命令。
- ◆ 制定指揮官所望戰果與所需的火力運用和效力射順序。
- ◆ 了解目標達成必須執行的火力與效力射任務，若未能執行會導致任務失敗。
- ◆ 執行作戰同步簡報為「戰鬥旋律」**的重大事項，在此一期間未來作戰計畫要交接給當前作戰小組。戰鬥的重大事項通常在行動前 24 小時執行，工作事項包含排定優先的目標、表定射擊任務，以及 JAGIC 應執行或不得干擾的任務事項。
- ◆ 當前戰況理解與掌握共同作戰圖像。
- ◆ 了解盟國與夥伴國能力，以及他們在使用各種作戰系統上的限制。
- ◆ 掌握後勤支援的限制因素。

Normal JAGIC Collective Training Plan

With frequent turnover of personnel and constantly evolving training calendars, U.S. units have become accustomed to building JAGIC capability—normally oriented on a series of command-post exercises (CPX) and culminating in a Mission Command Training Program Warfighter exercise. The U.S. Army has been refining the JAGIC concept for more than a decade with the Air Force and formalized it in 2019 with Army Techniques Publication 3-

** 譯者註：「戰鬥旋律」(battle rhythm)與「作戰節奏」(operational tempo)兩者不同。前者係指揮官、參謀及單位活動三者間所形成的一個程序循環，旨在統合當前與未來的作戰行動；後者在我國《國軍軍語辭典》(民 92 年修訂本)之定義為戰爭中具有規律性的作戰過程，一般是指作戰過程的快慢、作戰規模的大小、作戰情況的激烈程度，以及攻勢極限與決戰間隙等問題。「戰鬥旋律」應視「作戰節奏」發展現況保持調整彈性。「戰鬥旋律」之討論，請參見，Matthew Prescott，劉宗翰譯，〈策進「戰鬥旋律」之規劃〉，《陸軍砲兵季刊》，第 196 期，2022 年 3 月，頁 112-131。

91.1, The Joint Air Ground Integration Center.¹² A normal U.S. Army JAGIC training progression would include the following steps:

1. Identify JAGIC members to serve with longevity to build relationships and confidence.
2. Develop procedures for how the center operates and codify in a tactical standing operating procedure.
3. Individual study by each contributing member.
4. Formal education by the echelons above brigade and specialized joint air-ground training team at Hurlburt Field, Florida. The entire team attends this training together after steps 1-3.
5. Training events that focus on integration of systems from all participating staff entities.
6. Training events that externally stimulate JAGIC battle drills and rehearse digital connectivity among all systems.
7. Certifying training event(s).

JAGIC 常態的集體訓練計畫

儘管面臨人員更迭頻繁與訓練日程不斷變動，美軍仍制定出一套建立 JAGIC 能力的作法，也就是以一系列指揮所演習為始，最後則以任務式指揮訓練計畫戰鬥員演習作結。美陸軍與空軍共同致力於精進 JAGIC 構想已超過十年，並於 2019 年時在美陸軍技術出版品第 3-91.1 號《聯合空地整合中心》中正式確立該構想。¹²美陸軍 JAGIC 的常規訓練進程包含以下步驟：

1. 讓 JAGIC 成員固定並長期任職，以利建立彼此關係與信任。
2. 制定 JAGIC 運作程序，並納入戰術標準作業程序中。
3. 各成員貢獻個人研究。
4. 旅級以上層級之正式培訓，為與佛州赫爾伯特機場的專業聯合空地訓練團隊共同進行，雙方要先完成步驟 1 至 3 後再進行訓練。
5. 訓練科目是聚焦於所有參謀單位作業系統之整合。
6. 用外部事件來模擬 JAGIC 的戰鬥演練，以驗證所有作業系統的數位連結。
7. 完成訓練簽證。

Initial Steps

While at the April 2023 Helsinki Conference, 10th Mountain Division leadership invited the Finnish fires personnel and joint terminal attack controllers to their headquarters to observe Saber Guardian 23, one of

¹² Ibid.

Defender Europe's foundational exercises. Acting as higher command to the 2nd Romanian Division for Saber Guardian, the 10th Mountain Division exercised the full battle rhythm, developing all outputs for JAGIC execution. Romanian and Finnish leaders witnessed the 10th Mountain Division in full warfighting mode, providing further contextual understanding for the importance of addressing identified gaps. During the exercise, 10th Mountain and Finnish Army Command (ARCOM) leaders developed a plan to achieve initial air-ground capability by the end of the calendar year. While this relatively straightforward task became a division priority, the 10th Mountain Division did not know many of the unique variables associated with guiding their new ally to the desired end state.

初步計畫

在 2023 年 4 月賀爾辛基的研討會上，美軍第 10 山地師領導層邀請芬蘭火力組成員和聯合終端攻擊管制員前往師部，以觀摩「軍刀護衛者-23」多國演訓，其為「歐洲捍衛者」系列演習中的基礎演習之一。在該演習中，第 10 山地師擔任羅馬尼亞第 2 師的高層指揮部，完整演練戰鬥旋律，並擬定所有與 JAGIC 有關的作業成果。羅馬尼亞與芬蘭軍事領導人見證美軍第 10 山地師的全作戰模式，進一步認知到必須解決戰力缺口問題。在演習期間，第 10 山地師與芬蘭陸軍司令部雙方領導人制定一項計畫，目標是在當年度年底前實現芬蘭的初始空地戰力整合，這是一項相對明確的任務，並成為美軍師的優先順序，至於在引導芬蘭這個友軍達成所望目標過程中，將涉及許多未知領域的變數。

Seek First to Understand

The 10th Mountain Division leaders sought first to understand. The duration of this initiative will extend beyond 10th Mountain's tenure in the U.S. European Command area of responsibility, but the purpose of the effort was to bring a tailored warfighting capability to NATO's newest ally on an abridged timeline. ARCOM cannot simply replicate the U.S. process, it must tailor and scale the effort within the current Finnish force design and joint architecture.¹³ 10th Mountain Division leaders attended Finland's Lightning Strike exercise in May 2023 to better understand how the Finnish Army operates in the field and to better inform the effort moving forward. Many cultural, doctrinal, technical, modernization, and relationship-based hurdles remained for the paired allies despite attempts to prepare a logical training path.

先理解當前狀況

為達成協助芬蘭友軍的任務，美軍第 10 山地師領導高層在理解完當前狀況後發現，執行期程將超出該師在美歐洲司令部責任區的駐防時間，所以必須在縮短的期程內，為北約這個新盟友量身打造合適的作戰能力。芬蘭陸軍司令部不能只複製美軍的流程，必須根據當前芬軍兵力設計與聯戰架構來打造適合自己的模式。¹³第 10 山地師的領導幹部於 2023 年 5 月參加芬蘭的「閃電打擊」演習，以利進一步了解芬蘭陸軍的野戰攻防模式，並為未來工作提供更有價值的資訊。雖然雙方試著制定合理的訓練流路，但仍存在文化、準則、技術、現代化及人文關係等挑戰尚待克服。

The Catalyst

The Russian invasion of Ukraine on 24 February 2022 changed assumptions across Europe for the first time in over thirty years.¹⁴ The 2022 mass invasion was the largest and most lethal Russian attempt to reunite portions of its diaspora. In Finland, the invasion unsettled peace of mind. Despite worldwide support for Ukraine, Russian aggression reinforced the idea that if you are not treaty-bound, nobody is coming to help. Despite potential tactical gains, one obvious Russian strategic failure was the addition of a new NATO partner that shared a 1,300 km Russian border. With political conditions aligning for the formal introduction into NATO, the Finnish Army had to greatly expand their capability to fight as a member of a collective security agreement and as an ally.

催化劑

2022 年 2 月 24 日俄羅斯入侵烏克蘭，首度改變了歐洲各國三十多年來既定的認知。¹⁴2022 年大規模入侵是俄羅斯試圖重新統一部分僑民土地所發動的最大且最致命的行動。對於芬蘭而言，此次入侵讓人們內心充滿不平靜，儘管世界各國紛紛對烏克蘭伸出援手，但俄國入侵表明一個事實，若無集體防衛條約的約束力，沒人會派兵協助被入侵國。俄羅斯看似在戰術上獲得小利，但明顯的失策是促成與俄國共享長達 1,300 公里邊界的芬蘭成為北約新進成員國。正式加入北約的政治氛圍轉變下，身為集體安全協定成員與盟友並肩作戰，芬軍必須大幅提升其能力。

The Culture

As 10th Mountain leaders approached potential training solutions, an

¹³ Mikko Viren (lieutenant colonel, Finnish Army), in conversation with Thomas Goettke, n.d.

¹⁴ Ibid.

incomplete understanding of the Finnish culture proved to be an obstacle in early progress. With national defense in mind, the Finnish Army had to be able to follow through and act on any threat to the homeland,¹⁵ and to emphasize self-reliance and maintained large-scale combat capability in the form of light, autonomous, and cold-weather proficiency. Finland's geographically focused training demonstrated credibility in its force and hedged against external assistance should hostilities arise. Inherently distrustful of outsiders, when sharing a 1,300 km border with Russia, any unilateral military action carries political implications.

文化

美軍第 10 山地師領導幹部著手研擬可能的訓練解決方案時，對於芬蘭文化的片面認識為初期進展的一個障礙。在國防安全的觀點上，芬蘭陸軍對外來援軍始終抱持質疑態度，認為必須要能獨自面對威脅本土的侵略者，所以在建軍備戰上強調獨立自主並保持大規模作戰能力，尤其著重於輕裝作戰自主能力與寒帶氣候作戰能力，而且在因地制宜的訓練模式下，其部隊的可恃戰力就能在敵情出現時將援軍需求降至最低。¹⁵此外，由於芬蘭與俄國共享 1,300 公里邊境，任何單方面的軍事行動都不可避免會帶來政治影響。

Traditionally, service in the armed forces is seen as a rite of passage, where citizens support mobilization requirements and the total defense concept. The Finnish Defence Forces can muster 280,000 combatants in minimal time to address external threats, providing them a rich talent pool of readily accessible and exploitable civilian skills.¹⁶ Their ability to rapidly fill identified needs from the private sector stands in stark contrast to some of their larger allies who struggle to meet their recruiting and retention goals. Similar to U.S. units, the Finnish Army has unit-specific cultures, influenced by their regional location, unit legacies, and history. Finnish Defence Forces have only nascent interaction with sister services and possess limited joint capability. The Finnish Army approach their role as an existential one. Even their national sport, Pesäpallo, a derivation of the word baseball, is grounded in developing combat skills—the ball is the same weight as a hand grenade.¹⁷ The Finnish cultural approach would bring both advantages and disadvantages to the air-ground integration (AGI) training effort.

¹⁵ Narrative summary provided by Mikko Viren (lieutenant colonel, Finnish Army), n.d.

就芬蘭文化而言，服兵役被視為是一種成年禮，公民也都支持動員需求和全民防衛概念。所以，芬蘭國防軍能在極短時間內集結 28 萬名戰鬥人員來因應外來威脅，人員大量匯集不僅能為軍方所用，還可以將民間技能運用於戰場上，¹⁶也就是藉此迅速從民間企業徵召軍方需要的人才，這種文化型態可以緩減像軍隊規模較大的盟友一樣，面臨人員招募與留營目標難以達成的處境。芬蘭陸軍也與美軍單位類似，各單位有其特定文化，而這些文化受到所處地理區、單位傳統及歷史之影響。不過，芬蘭國防軍與其他軍種互動往來尚處於初步階段，也就是擁有的聯合作戰能力有限。芬蘭陸軍將自己視為是攸關國家生存的重要角色，甚至芬蘭的國家運動 **Pesäpallo**(芬式棒球)是一種類似棒球的運動，其設計來源也是基於培養戰鬥技能，而且使用的球與手榴彈重量相同。¹⁷然而，芬蘭文化的軍事元素在為聯合空地戰力整合訓練帶來優勢的同時，也帶來劣勢。

State of Interoperability

The three most common categories of military interoperability are human, procedural, and technical. The Finnish Army is currently focused on human and procedural interoperability; they are confident that they can catch up technically. The Finns have a professional army and know themselves well. Their objective assessment has informed a path forward.

檢視軍事互通程度

軍事作業互通最常見的三個類別是人員、程序、技術。芬蘭陸軍當前著重於人員與程序的互通，至於在技術的互通，他們有自信能夠迎頭趕上。芬蘭擁有一支專業化部隊並清楚自身情況，而且他們軍隊未來發展方向是基於客觀評估的結果。

First, Finnish leadership focuses on human interoperability, informed by their emphasis on international experience and service outside Finland. Although viewed equally, promotion rates heavily favor those who have expeditionary experience and foreign international service. The idea that previous experience will grow foundational competencies and enhance future service is a sound approach upon entry to NATO, but internal personnel structural reform is a noteworthy undertaking to fully contribute to the alliance. Active-duty Finnish Army leaders make up only one out of every ten service members. These leaders are task saturated, performing or reforming processes while instructing, informing, or updating reservists during critical

¹⁶ Ibid.

¹⁷ Ibid.

training events. From the onset of discussion, one repeating theme during the training path was the lack of flexibility in the Finnish manning construct. Creating new positions or making permanent moves to match an identified capability gap would take considerable time and require tough institutional decisions. Understanding these limitations, the ARCOM prioritized the right personnel for continued AGI capability development but experienced delays and shortfalls with joint partners throughout 2023. Finally, the Finnish relationship with the United States was the easiest hurdle to overcome—two professional armies discussing the details of building a niche capability against a shared threat naturally brought like-minded organizations together.

首先，在人員互通上，由於芬蘭領導高層重視國際經驗與海外部署，這讓即使是公正評審，卻明顯偏向擁有遠征經驗與海外服役背景的人。由於領導高層認知過去經驗既有助於培養基礎能力，又能強化軍種未來發展，等於是做好加入北約的先期準備，但為了對整個北約盟國做出實質貢獻，芬軍內部的人事結構改革勢在必行。舉例而言，芬蘭陸軍的現役領導幹部僅佔全體人員的十分之一，人力不足導致任務繁重，他們在關鍵訓練活動中既要執行或改進程序，又要對後備役人員進行指導、通知及更新資訊。芬軍在訓練過程中無可避免會一再碰到的問題，就是人員編制結構缺乏靈活性，但要建立新職缺或進行調整來彌補這個已知的人員問題，將需要相當長的時間，還要做出艱難的體制決策。考量要解決這個人員問題，芬蘭陸軍司令部優先安排一批人員從事空地戰力整合發展，但卻在 2023 年與聯軍夥伴們的合作過程中發生延遲與落差問題，雖然如此，芬蘭與美國的關係是最容易克服的障礙，因為兩支專業化軍隊在討論針對共同威脅所建立的專精能力，彼此有志一同讓關係拉得更緊密。

The ARCOM encounters a procedural problem in their current force design because multidomain operations demand a large degree of integrated and centralized command and control at scale. Historically, disaggregated squads, platoons, and snipers on skis have won the day and remain a foundational component to Finnish national defense, but managing a volume problem on multiple fronts requires integration and synchronization. Pre-NATO, Finland was well-rehearsed and integrated at the land tactical level. Now, with the full complement of NATO resources in support, the Finnish Defence Forces must develop processes to become jointly integrated. Target prioritization, airspace management, and codifying a battlefield architecture remain critical to

maintaining tempo along multiple corridors with finite resources in the joint fight. Additionally, now an ally, Finland must heavily weigh national decision-making against NATO partner support, authorities, and timing. Preparing for both a supporting and supported role changes much of ARCOM's historical human and procedural assumptions.

芬蘭陸軍司令部在當前的兵力設計中面臨程序上問題，原因在於多領域作戰要求在各種不同戰況下實現指管的高度整合與集權化。不過，就芬蘭歷史而言，其曾以班、排小部隊行動，雪地狙擊手突擊等作戰方式建立戰功，這種戰術編組仍為芬蘭國防的基石，考量往後將面對多個戰線的型態，這將需要整合與同步化管理。再加入北約之前，芬蘭在陸地戰術層級已經十分熟練且具備整合能力，如今加入北約後，將獲得其全般資源的支援，芬蘭國防軍必須制定一套適切程序，才能有利於聯合作戰整合之執行，像是目標優先順序、空域管理和戰場架構編制等，對於在資源有限的聯合作戰中，維持多條戰線的作戰節奏至關重要。此外，作為北約成員國之一，芬蘭的國家決策必須要能與北約夥伴國的支援、授權及時程相互配合，同時也要為擔任支援者或被支援者的角色做好準備，芬蘭陸軍司令部以往套用在人員與程序上的作法也應與時俱進，才能運用於未來的戰場環境。

Technically, the Finns have an army suited and rehearsed for their unique terrain. However, an identified gap is their integration into the joint community. Previously, autonomous operations would enable the use of singular air platforms in support of brigade and below actions. The volume of air support that can be expected from NATO allies, at a minimum, requires an integrated air picture at echelon. Parallel efforts to technically integrate command-and-control systems are underway but require time for testing and validation. Communications interoperability must occur within the ARCOM at echelon and then to the joint force before branching out to the alliance to integrate a communications architecture in line with NATO standards and expectations.

就技術互通而言，芬蘭擁有一支適合其獨特地形且訓練有素的軍隊，但一個明顯弱項是在聯合作戰體系中的整合能力不足。以往芬蘭在獨自作戰時只要運用單一空中平台介面就能支援旅級及其以下部隊的行動，但面對北約盟國所提供較大的空中支援規模，在運用上至少要在各作戰層級之間建立一個整合的空域圖像，雖然指管系統的同步整合技術在著手進行中，惟仍需要時間來做測試與驗證。至於通信互通則必須先在芬蘭陸軍司令部轄下部隊中實現，然後推展至聯合作戰部隊，最後再到北約盟國，循序漸進才能建構符合北約標準與期望的通信架構。

Regional Dynamics

A notable advantage for the Finnish Army is its long-established regional relationships. With a common enemy and similar cultures, the Nordic countries share a long history of cooperation. Pre-NATO, there was no emphasis on interoperability; the Finnish Army strictly operated on bilateral relationships. However, Finland has found itself in an advantageous position by accurately forecasting likely outcomes, hedging its bets, and moving toward NATO interoperability prior to 2023. While not deliberately orchestrated, the Nordic countries and regional allies favorably postured themselves with like equipment over time, gaining efficiencies and economies of scale that can be exploited in a crisis. The Finnish, Norwegian, and Danish Air Forces have all invested in procuring F-35 capability over the next five years.¹⁸ Norway, Sweden, Estonia, and Finland possess CV90 infantry fighting vehicles.¹⁹ Norway, Estonia, and Finland all have K9 (South Korean) howitzers.²⁰ The possession of like equipment sets make tactical interoperability an easier regional problem and mitigates risk in mobilizing regional allies against a threat.

區域動態

芬蘭陸軍一個顯著優勢是長期與周邊國家維持良好關係，由於北歐國家有著共同敵人(俄羅斯)與相似文化，歷史上一直維持密切合作關係。雖然芬蘭在加入北約之前並未特別強調集體軍事互通程度，但嚴謹的對外雙邊關係一直持續進行中。芬蘭的有利地位在於能準確預測各種事件可能發生的結果、採取分散風險措施，而且先前奠定的雙邊軍事互通發展，也成為在 2023 年加入北約後的基礎。雖然北歐國家並未刻意安排，但渠等逐年軍事裝備採購品項與區域盟國相類似，裝備相近的好處在於一旦危機發生時可以發揮利用率與經濟規模優勢，例如芬蘭、挪威和丹麥空軍都已預劃在未來五年內逐步採購 F-35 戰機；¹⁸挪威、瑞典、愛沙尼亞和芬蘭都擁有 CV90 步兵戰車(瑞典生產)；¹⁹挪威、愛沙尼亞和芬蘭都擁有 K9 自走砲(南韓生產)。²⁰不僅如此，藉由使用相近裝備，不僅可以解決區域各國軍隊之間的戰術互通問題，也可以降低各國軍隊在集體動員對抗未

¹⁸ Kati Pohjanpalo and Niclas Rolander, "Nordic Nations Agree to Jointly Operate Fighter Jet Fleet of 250," Bloomberg, 24 March 2023, <https://www.bloomberg.com/news/articles/2023-03-24/nordic-nations-agree-to-jointly-operate-fighter-jet-fleet-of-250>.

¹⁹ Sam Hart, "Insight: Why the CV90 Infantry Fighting Vehicle Is Making a Clean Sweep of Nordic Markets," Shephard, 19 September 2023, <https://www.shephardmedia.com/news/landwarfareintl/insight-why-the-cv90-ifv-is-making-a-clean-sweep-of-the-northern-european-market/>.

²⁰ Defense News January 2024, "Six Countries of K9 Self-Propelled Howitzer User Group Meet in Helsinki," Army Recognition, 23 January 2024, <https://www.armyrecognition.com/news/army-news/2024/six-countries-of-k9-self-propelled-howitzer-user-group-meet-in-helsinki>.

來侵略者時的風險。

Training Plan Execution

Building Finnish joint air-ground capability occurred across seven distinct training events (see figure 1). Through the lens of John Kotter's leading change model, Lt. Gen. Pasi Välimäki studied the problem and developed a sense of urgency, gathered a coalition, and communicated his vision at the April 2023 JAGI Conference in Helsinki.²¹ In partnership with Maj. Gen. Greg Anderson, 10th Mountain Division commander, both leaders empowered action, looking to exploit quick wins through scheduled training events through the remainder of 2023. The two leaders set the stage by creating an impetus for change, engaging the collective organizations, and mobilizing efforts to address the identified gap. Again, all parties left the conference with Välimäki's sense of urgency owing to guidance of establishing initial capability by the close of calendar year 2023.

執行訓練計畫

芬蘭聯合空地戰力整合之建立，區分為七個不同訓練項目(如圖一)。在發想上，芬蘭陸軍司令帕西·瓦利馬基師法約翰·科特(John Kotter)的領導變革模型後，提出精簡版本的施行作法：為目標營造迫切性、建立友軍聯盟，以及在 2023 年 4 月於賀爾辛基的空地戰力整合研討會上傳達未來願景。²¹帕西·瓦利馬基與第 10 山地師師長格雷格·安德森兩位領導人齊心協力，尋求利用 2023 年剩餘時間內的既定訓練活動來快速獲取成果。兩人致力於創造推動變革的動力、發動組織的集體動員，以及尋找芬軍戰力缺口的解決方案，為芬軍的轉型奠定基礎；再者，在瓦利馬基的迫切感推動下，所有與會人員在研討會後都明白必須在 2023 年底前建立初始能力的指示。

²¹ "The 8 Steps for Leading Change," Kotter, accessed 30 April 2024, <https://www.kotterinc.com/methodology/8-steps/>. The framework to John Kotter's eight-step model is creating a sense of urgency, building a guiding coalition, forming a strategic vision, enlisting a volunteer army, enabling actions by removing barriers, generating short-term wins, sustaining acceleration, and instituting change. 約翰·科特的八步驟模型架構為營造迫切感、建立指導聯盟、形塑戰略願景、招募志願軍、消除障礙來推展行動、創造短期勝利、保持加速推動、變革制度化。

Finnish Army Command AGI Training Progression

■ Indicates Primary Training Focus
■ Training Objective Exercised

	FIN AGI Conference	Northern Forest	Saber Guardian	UK AGI Conference	FIN ALI Workshop	Ruska 23	Combined Resolve 19	FIN Army CPX	Nordic Response	Northern Forest	Dynamic Response
Identify JAGIC members to serve with longevity to build relationships and confidence	■	■	■	■	■	■	■	■	■	■	■
Develop procedures for how the center operations and codify in a tactical standing operating procedure	■	■	■	■	■	■	■	■	■	■	■
Individual study by each contributing member	■	■	■	■	■	■	■	■	■	■	■
Formal education by the echelons above brigade/specialized joint airspace training team at Hurlburt Airfield	■	■	■	■	■	■	■	■	■	■	■
Training events that focus on integration of systems from all participating staff entities	■	■	■	■	■	■	■	■	■	■	■
Training events that externally stimulate JAGIC battle drills and rehearse digital connectivity among all systems	■	■	■	■	■	■	■	■	■	■	■
Certifying training event(s)	■	■	■	■	■	■	■	■	■	■	■

(Figure by Col. Thomas Goettke)

Figure 1. Finnish Army Command AGI Training Progression

綠色方框為主要訓練重點

黃色方框為已執行的訓練目標

讓 JAGIC 成員固定並長期任職，以利建立彼此關係與信任
制定 JAGIC 運作程序，並納入戰術標準作業程序中
各成員貢獻個人研究
旅級以上層級之正式培訓，為與佛州赫爾伯特機場的專業聯合空地訓練團隊共同進行
訓練科目是聚焦於所有參謀單位作業系統之整合
用外部事件來模擬 JAGIC 的戰鬥演練，以驗證所有作業系統的數位連結
完成訓練簽證

芬蘭空地戰力整合會議
「北方森林」演習
「軍刀護衛者」演習
英國空地戰力整合會議
芬蘭盟軍研討會
「魯什卡-23」演習
「聯軍決心-19」演習
芬蘭陸軍指揮所演習
「北歐反應」演習
「北方森林」演習
「動態應變」演習

圖一：芬蘭陸軍司令部空地戰力整合之訓練進程

To better understand how the Finnish Army fights and observe the identified AGI gap, a team from 10th Mountain Division fires attended Operation Lightning Strike, an annual Finnish multinational live-fire exercise with Finland, Norway, Sweden, the United Kingdom, and the United States. The exercise's interoperability goal was to integrate Finnish fires via the artillery systems cooperation activities bridge to demonstrate technical interoperability, but 10th Mountain representatives attended to understand the full suite of capabilities and systems resident in the Finnish Army. May's Saber Guardian exercise served as the initial step to solidify Finnish relationships, conduct detailed coordination for future training, and observe the desired AGI competency real time. The largest component required for success of the AGI capability build was the integration of the Finnish Air Force (FAF). In June, the UK hosted an annual Air Land Integration Conference that offered a perfect venue to initiate integration of critical JAGIC roles. The 10th Mountain team brought their senior air director; intelligence, surveillance, and reconnaissance

liaison officer; and procedural controller from the 1st Expeditionary Air Support Squadron in Mihail Kogalniceanu Air Base in Romania to amplify the need for air force inclusion. However, the timeline proved too ambitious, and the FAF was unable to attend. This missed opportunity was the first in a series of indicators highlighting how difficult it is to impart institutional change on an accelerated timeline.

為了更進一步了解芬蘭陸軍的作戰方式並觀察戰力缺口問題，第 10 山地師派出一個火力組參與芬蘭年度多國實彈演習「閃電打擊行動」，參與者包含芬蘭、挪威、瑞典、英國和美國。該演習的操作互通目標是藉由「火炮系統合作活動指揮臺」來整合芬蘭火力，以展示各國軍隊之間的技術互通，而美軍第 10 山地師的代表參與該演習是為了理解芬蘭陸軍擁有哪些完整能力與系統。另在 2023 年 5 月的「軍刀護衛者」演習中，可以觀察芬蘭與各國軍隊的關係、未來訓練細節的協調，以及實地理解芬蘭所望的聯合空地戰力整合能力。由於芬蘭空軍的整合為實現聯合空地戰力整合的最大關鍵，英國每年在 6 月舉辦的空地戰力整合會議，剛好成為推動聯合空地整合中心職能整合的最佳場合。第 10 山地師派出高級空中引導官、情監偵聯絡官，以及來自羅馬尼亞米哈伊爾·科格爾尼恰努機場的第 1 遠征航空支援中隊程序管制官等人共同參與該場會議，凸顯空軍不可或缺的角色。然而，由於推進時間表過於緊湊，芬蘭空軍尚未準備好參與此一盛會，這次機會的錯失也顯露一個跡象，意即在加速的時間表下推動單位變革有其難度。

Acknowledging a clear joint service gap, the 10th Mountain and Finnish Army headquarters teams met several times during the UK conference to adjust the path forward. With insight on how to gain solidarity for the joint inclusion and buy-in of the FAF, the two parties agreed on a “JAGIC workshop,” which would be attended by FAF officers across several commands, all Finnish training components, and all Finnish Corps headquarters. Taking the better part of four months of preparation, this early August 2023 gathering generated much interest among attendees and initiated discussion throughout the Finnish joint community on the necessary capabilities for corps warfighting as a NATO ally.

鑑於明顯的聯合戰力缺口問題，第 10 山地師與芬蘭陸軍司令部兩單位團隊在英國會議期間多次會面，以調整未來的合作路線。在進一步了解必須將芬蘭空軍納入以獲致聯合戰力後，雙方達成一致並預計舉辦一場聯合空地整合中心研討會，邀請來自多個不同指揮部的芬蘭空軍軍官、芬蘭所有訓練部門，以及芬蘭

各個軍級指揮部等共襄盛舉。經過近四個月的準備，這場於 2023 年 8 月舉行的研討會引起與會者極大興趣，也引發芬軍討論作為北約成員國之一，該擁有哪些軍級必要的作戰能力。

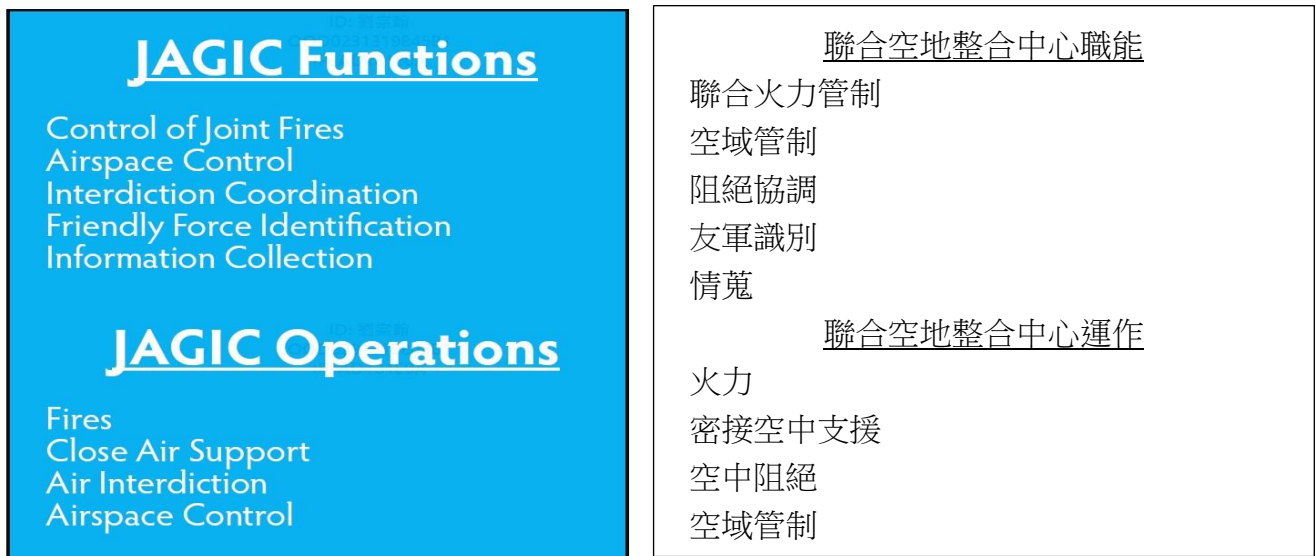
In late August, the Finnish conducted a wargame of the Finnish defense plan with their Nordic allies and U.S. representatives. In a merger of historical plans and new assumptions, the need for a robust AGI capability that can solve simultaneous discrete tactical airspace actions and handle a large volume of joint air assets became abundantly clear before everyone's eyes. While the FAF participated in the wargame, joint inclusion on AGI development remained in an embryonic stage.

在 8 月底，芬蘭跟北歐盟友及美國代表共同進行一場芬蘭國防計畫的兵棋推演。整合既有計畫與新想定的兵推演習中，各方清楚認知到需要堅強的空地戰力整合能力，才能解決各自離散的戰術空域行動問題，以及處理大規模的聯合空中武器裝備。芬蘭空軍也參與這場兵棋推演，但其在空地戰力整合的聯合作為上仍處於初始階段。

The two allied nations continued to pursue existing training opportunities as a vehicle for AGI capability advancement; ARCOM brought its joint fire support element (JFSE) to Ruska 23, the FAF's largest annual live multinational exercise. This exercise is the primary mechanism for the FAF to train their force with live aircraft. As a result, the training objectives remained air force focused and inflexible. However, ARCOM planners introduced change by offering their JFSE as a training enhancer, with a secondary objective of forcing recognition of the identified AGI gap into the joint environment. The ARCOM elbowed their way into the exercise, understanding they would likely be viewed as a nuisance. The ARCOM JFSE forced the FAF to recognize the reality of joint requirements and communicated the capability gap to the FAF in an experiential manner. As a result, the ARCOM advanced rapidly in procedural and technical interoperability with the FAF, forcing the acknowledgment of joint requirements and communicating the capability gap in an air force exercise. Again, the biggest shortfall of the exercise remained the lack of FAF personnel supporting the Army's JFSE. A single navy joint terminal attack controller supported the JFSE, leaving Finland unable to perform three of the five JAGIC functions and two of the four JAGIC operations as outlined in Army Techniques Publication 3-91.1 (see figure 2). To highlight the nascent level of discussion between the

services, the coordinating altitude started at five thousand feet above ground level to accommodate unmanned aircraft, then to twelve thousand feet to accommodate mortars, then eventually to twenty thousand feet to accommodate artillery. The changes to this metric alone indicate a better shared understanding and a joint approach to airspace management. Both services realized the efficiency and permissiveness associated with these adjustments, but these principled changes did not introduce the requisite complexity or anticipated volume associated with a large-scale, multidomain environment. Many senior leaders observing Ruska 23 saw the tangible AGI gap firsthand and organized efforts to address the personnel gap during November's army CPX. Although successful in many ways, Ruska did not prove an adequate training forum for AGI capabilities.

芬蘭與北歐盟友持續利用訓練機會，以提升空地戰力整合能力，例如芬蘭在最大規模的年度多國實兵空中演習「魯什卡-23」中，陸軍司令部就派遣聯合火力組參與這場盛大演習。該場演習是芬蘭空軍主要用來訓練部隊與實機之間的協同作戰，所以訓練目標仍是以空軍為核心，鑑於其中的缺點是靈活性不足，為設法彌補此一落差，陸軍司令部便派遣聯合火力組，以強化自身戰力組合，至於次要目標是讓軍方領導高層認知在聯合作戰環境中，芬軍在空地戰力整合的缺口。芬蘭陸軍司令部不請自來參與這場演習，明知可能會不受歡迎，但聯合火力組的參與讓空軍正視聯合作戰的現實需求，並以親身體驗方式向空軍傳達能力缺口問題。在這場空中演習過程中，芬蘭陸軍與空軍在程序與技術的互通上迅速取得進展，讓空軍不得不承認聯合作戰的現實需求與存在能力缺口問題。此外，該空中演習最大缺陷是空軍並未派遣人員至陸軍的聯合火力組，僅有一名海軍聯合終端攻擊管制員派駐支援，這種情況讓芬軍無法完整執行美陸軍技術出版品第 3-91.1 號《聯合空地整合中心》中所律定的五項職能與四項運作(如圖二)，只能做到三項職能及兩項運作。為了讓軍種間可以逐步熟悉彼此，由淺入深，協調高度最初設定為 5,000 英呎來適應無人機，隨後提升至 1 萬 2,000 英呎來適應迫擊砲，最終拉高至 2 萬英呎來適應火砲。協調高度指標變動展現出更佳的軍種共識與聯合空域管理方法，陸軍與空軍都在這個合作過程中體會到不同高度的作戰許可環境與作戰效率，但美中不足的是並未引進與大規模多領域作戰環境相匹配的那種複雜性與規模。許多高階領導人在觀察「魯什卡-23」演習時目睹空地戰力整合缺口問題，於是在同年 11 月的陸軍指揮所演習期間，採取相關作為來解決此一問題，雖然該演習在許多方面取得成功，但它並不足以作為空地戰力整合的訓練平臺。



(Figure by authors; adapted from Army Techniques Publication 3-91.1, *The Joint Air Ground Integration Center*)

資料來源：Army Techniques Publication 3-91.1, *The Joint Air Ground Integration Center*，由作者自行繪製

Figure 2. JAGIC Functions and Operations

圖二：聯合空地整合中心職能與運作

Despite the lack of objective AGI advancement, Ruska 23 did provide great clarity for the design of November's Army headquarters CPX. In several forums, the 10th Mountain team and ARCOM leaders concluded that a minimum force of four FAF personnel must be collocated with the JFSE to address the airspace complexity they would encounter. Acknowledging that four personnel was an acceptable and tailored solution, the FAF agreed to fill the key functions of the senior air director, airspace manager, and two procedural controllers. In execution, the four FAF personnel supporting the army CPX immediately saw the joint problem set and the associated airspace complexity across services and at higher echelons. As the CPX progressed, 10th Mountain partners helped work through refinements in battlespace architecture, fire support coordination, unit airspace plans, battle drills, and staff processes. FAF personnel also represented the need for an army entity to support the air force, similar to a battlefield coordination detachment's function. All of the polished slide decks, long-form conversations, and good will associated with previous engagements transitioned to a joint understanding of the problem during the November CPX. The Finnish joint force now understands that a \$200 million aircraft is only as good as the procedures you have to employ it across the spectrum of conflict. While there is much work left, November's army CPX served as an inflection point to joint ownership of the AGI problem set.

「魯什卡-23」演習雖然並未對空地戰力整合的進展做出貢獻，但其價值在於為陸軍指揮所演習(2023 年 11 月)設計提供一個清楚方向。另在多場討論中，第 10 山地師團隊與芬蘭陸軍司令部領導高層得出結論，至少需要編組四名芬蘭空軍人員進駐聯合火力支援組，才有辦法處理可能遭遇的空域複雜性問題。鑑此，芬蘭空軍接受編組四名人員是一個可接受且適當的解決方案，並同意補足高級空中引導官、空域協調官及兩位程序管制官等重要職缺。在支援陸軍指揮所演習的過程中，四名空軍人員立即發現聯合作戰的問題，以及跨軍種與高層級作戰編隊的空域複雜性，所幸在演習期間，美軍第 10 山地師團隊協助芬軍改善戰場空間架構、火力支援協調、單位空域計畫、戰鬥演練及參謀作業程序等面向。此外，芬蘭空軍還提出需要一個陸軍編組來支援空軍，類似於戰場協調分遣隊的職能。在陸軍指揮所演習中也達成對各種問題的共識，這都要歸功於在各方簡報、深入對話，以及以往交流的良好關係基礎之下。如今，芬蘭聯合部隊終於理解一架價值 2 億美元的飛機，其價值取決於能在各種衝突情境中實踐作戰步驟，陸軍指揮所演習成為芬軍聯合部隊初期建立空地戰力整合的最佳試驗場，未來軍方仍有很多事情要完成。

Conclusion

Change is not easy or attained quickly; there are always costs and tradeoffs. Furthermore, extensive research supports that changing culture is a difficult and long-term endeavor. Achieving a manning solution alone for joint AGI took seven months of effort and eight training events. Now that air force capability resides inside the ARCOM COIC, it can serve as a model moving forward for developing a subordinate capability inside the Finnish Army Corps. To build upon the progress of the U.S.–Finnish relationship, the 10th Mountain Division could formalize a reciprocal unit exchange through one of the Finnish Corps. Similar to the National Guard Bureau State Partnership Program, a reciprocal unit exchange provides active-duty units the authority to pursue bilateral opportunities that enhance readiness and warfighting capabilities. Partnered training throughout the course of 2023 established a solid foundation for further growth. Looking forward to calendar year 2024, ARCOM must expand the complexity of its exercises to build on the change it achieved in 2023 to make the effort stick. While still ambitious, modernization and larger capability expectations for the next three to five years will drive continued AGI emphasis. Leaders from these sister services understand that to experience capability in three to five years, reform is required today. The Finnish solution

will be a tailored one and likely executed in a nonsequential way, but the need and reality-based nature of this identified gap requires cultural change on an abridged timeline. ARCOM is up for the task; their approach has been informed and is flexible enough to make adjustments throughout 2024. Ultimately, achieving Finnish AGI capability is the result of two allies achieving shared understanding, jointly working a vision for future training, and ardently working with each other to stay on the established training path while overcoming friction.

結論

變革並非易事，也無法速成，總是會伴隨成本支出與各種權衡。此外，眾多研究皆指出，改變文化是一項艱難且需要長期努力的工作。芬蘭光在聯合空地戰力整合的人員方案，就耗費七個月時間和進行八次訓練活動，如今成果是空軍能力已進駐至陸軍司令部當前作戰整合組，這種成功經驗可以套用於陸軍軍級單位，以模組化方式來發展下級空地戰力。至於美國與芬蘭關係的進一步深化，美軍第 10 山地師可以與芬軍軍級單位正式建立互惠交流機制，作法類似於美國國民警衛局的州夥伴計畫，互惠交流有助於現役部隊推動雙邊合作機會，進而提升戰備與作戰能力。2023 年與各國夥伴的訓練活動已奠定深化發展的堅實基礎，展望未來，芬蘭陸軍司令部必須擴大演習的複雜性，以鞏固先前所打下的基礎並持續精進。建立聯合空地戰力整合是芬軍的遠大野心計畫，未來三至五年的發展必須具聚焦於計畫各進程的現代化與戰力強化。美軍與芬軍的軍種領導人明白，要在三至五年內達到這種能力，現在就必須進行改革。芬軍的解決方案應是量身訂製，或許在執行過程中會遭遇阻礙，但擺在眼前的戰力缺口問題，已讓扭轉體制文化成為刻不容緩的課題。芬蘭陸軍司令部已準備好迎接這項挑戰，其方法是在獲得充分建議下維持足夠彈性，以利在執行過程中適時調整。最後，芬蘭聯合空地戰力整合之建立，關鍵在於美芬兩軍要取得共同理解，才能共同制定未來訓練願景，攜手合作排除阻力，堅定朝往既定的訓練進程一步步邁進。

譯後語

芬蘭在加入北約後發現自身空地戰力整合能力不足，考量未來要與北約盟國並肩作戰，因此求助於經驗豐富的美軍，希冀在雙方的齊心協力下，打造適合芬軍的戰力。在這個過程中，由於時間期程有限，初始戰力打造只能以加速方式進行，儘管如此，美軍與芬軍還是能在緊縮時程內，找出問題並提出解決方案，芬軍後續仍有許多工作尚待完成，也必須持續精進，因為軍事轉型或變革不是短時間的事，而是一項長期任務，過程中一定會遇到各種阻礙，唯有靠領導人發揮智慧來逐一克服，才能看見累積的成果。國外軍事交流的經驗與過程，可供國軍

參考，畢竟軍事研究範圍廣泛，多方涉略不同領域，才能增加國軍幹部的智識，進而強化國軍幹部的知識戰力。

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