Fixed, Mobile and On-the-Move

The Practical Difference

by Captain Gavin Berke, U.S. Army & Captain Iain Herring, U.S. Army

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In Brief

- Army leaders must know the difference between fixed, mobile and on-the-move system configurations to equip Soldiers with capabilities that enable freedom of maneuver.
- On-the-move systems remain underdeveloped across the force, creating a critical protection and survivability gap for maneuvering units—particularly those operating near or beyond the forward line of own troops.
- Leaders must build counter-unmanned aerial systems employment around layered defense-in-depth principles, integrating each configuration's unique advantages and limitations to control tempo and terrain and to match threats.
- Understanding system configurations will help prevent leaders from overestimating maneuver and protection capabilities and underpreparing for modern aerial threats.
- Advanced emerging threats from near-peer adversaries must prompt leaders to leverage modular technology like artificial intelligence to rapidly flex specific designated equipment and Soldiers.

Fixed, Mobile and On-the-Move: The Practical Difference

Introduction

On 6 June 1944, Allied forces stormed the beaches of Normandy, marking the decline of Axis control in Europe. Operation Overlord's success relied on precise coordination of the largest amphibious fleet ever assembled and the misjudgment of defense capabilities by the Axis powers.[1] The Atlantic Wall was the defense network envisioned by the Axis powers to prevent Allied forces from gaining a foothold on mainland Europe.[2] Axis leaders overestimated their defensive capabilities, which turned into a vulnerability the Allies would exploit. This historical lesson underscores a fundamental truth in warfare: Misjudging one's own capabilities can lead to devastating vulnerabilities.

The modern battlefield echoes the need to clearly understand system capabilities and deployment tactics to match each unit's mission set. Currently, counter-unmanned aerial systems (CUAS) present similar challenges where leaders are obligated to distinguish between fixed, mobile and on-the-move (OTM), typically referred to as maneuverable, systems to maximize protection and survivability. While the differences are superficially minor, each of these configurations' roles on the battlefield are as distinct as the vehicles, tools and strategies that shaped D-Day's outcome.

Deceptive Labels: Reaching a Common Understanding

Buzzwords like *fixed*, *mobile* and *OTM* surround the discussion of CUAS capabilities and their deployment on the battlefield. These three terms categorize the types of system configurations. OTM and mobile have a subtle, but significant distinction; it may be helpful to think of the term *mobile* as *semi-mobile*. The more important differences, however, lie in the way configurations are implemented to protect friendly assets. While each configuration offers distinct operational advantages, they also have unique limitations. The tactical variables that divide them involve key system characteristics:

- **Displacement time**: This looks at a system's ability to emplace and achieve full operational capability (FOC) within approximately 30 minutes and be torn down to move within 30 minutes of march order. The measurement is based on the optimal amount of time it takes a light infantry company to displace its command post (CP).[3]
- **State-of-motion while FOC**: Specific configurations can operate only while stationary, in a move-stop-shoot-move manner or while continuously moving.
- **Power requirements**: Some systems require infrastructure for external power connection, while others can operate with an internal/attached mobile power source.
- **Physical property constraints**: Each configuration's weight and dimensions affect where and how it can be deployed. These characteristics impact system mobility, required resources and space to mount on a vehicle.

The differences in these variables directly impact each configuration's tactical role and capabilities, making it essential to understand the distinctions.

Table 1 offers a brief side-by-side comparison of the configuration variables as they pertain to optimized equipment effect in the mission of CUAS for end users and the units or assets they protect. The color scale highlights more desirable characteristics, with light gray being most desirable and dark gray least desirable. Clearly, one configuration does not possess all ideal characteristics, meaning leaders must identify and understand the difference of each to successfully leverage their advantages and mitigate vulnerabilities. Although mobile configuration power requirements are usually limited by the ability to carry a power device, there could be an instance where a mobile system jumps from one power source to the next without being FOC during movement. In this context, dimensional constraints limit the amount of space a piece of equipment can occupy. Indeed, larger CUAS systems generally have more capabilities, whereas smaller systems are limited in range or breadth of capabilities.

Table 1

Configuration Variable Comparison

	CHARACTERISTICS			
CONFIGURATION	**Displacement Time**	**State-of-Motion While FOC**	**Power Requirements**	**Dimensional Constraints**
Fixed	> 30 minutes	Sedentary	External	Limited by infrastructure
Mobile	< 30 minutes	Sedentary	Mobile / Attached	Limited by chassis mount / storage or Soldier storage
On-the-Move	0 minutes	Sedentary or moving	Internal	Limited by chassis mount or Soldier carry

Fixed Site: The Foundation

Fixed site (FS) systems increase survivability for fixed location elements with detection, warning and engagement capabilities. They have been most effective when deployed with a stationary or slow-moving element, providing protection for friendly forces within their effective range. FS equipment projects its capabilities farther due to their ability to draw power from higher wattage sources and their unconstrained volume and weight. That is why long-range detection and defeat capabilities are well-suited for support locations with longevity. FS examples include radar installations, air or sea ports of embarkation, airfields and forward operating bases.

Mobile or Semi-Mobile: What's the Better Title?

Semi-mobile systems rapidly deploy to offer adaptable protection support where a conflict has an emerging defensive gap. Semi-mobile advantages allow flexible emplacement of detection and defeat capabilities while maintaining distance from frontline troops. These characteristics keep the danger of radiation-seeking missiles farther from friendly troops. Semi-mobile systems are ideal to protect semi-permanent locations like command posts, temporary forward area refueling points or field hospitals. By maintaining proximity to support elements, semi-mobile systems can operate effectively, while offering adaptability with quick setup/teardown and reliable defense for semipermanent positions. Army examples of mobile systems include the Paladin self-propelled artillery and light infantry CPs.

On-the-Move: The Future of Battlefield Flexibility

A gap currently exists for shoot and detect OTM CUAS systems, and it must be filled for future maneuver unit protection. Infantry is the original OTM capability. From Greek hoplites to the Allied invasion force of Normandy, infantry closes with and destroys the enemy. Today's warfighters will continue that tradition with the latest human-portable systems. OTM systems are designed to provide real-time threat detection and engagement while moving to meet the unique demands of dynamic battlefields. Light maneuver units would be vulnerable to Group 1–3 unmanned aerial system (UAS) attacks without detection, early warning and neutralizing UAS threats on-the-move. These capabilities will best support operations involving close protection, movement to contact, reconnaissance and reinforcement at or beyond the forward line of own troops (FLOT). OTM systems have enough speed to keep up with and adapt to maneuver elements as they seize objectives or key terrain and continue to enable freedom of maneuver to the next objective.

The AH-64 Apache is a great example of an OTM configuration that prioritizes flexibility and mobility. Future OTM system development includes integrating advanced artificial intelligence (AI), which opens possibilities for adaptive autonomous responses to UAS threats, enabling units fighting near the front line to adjust tactics in real time and freely maneuver.

Layering Configurations: A Defense-in-Depth

Defense-in-depth is an air defense artillery employment tenet that ensures aerial threats are detected, assessed and countered at multiple points by layered systems before the threat can reach critical personnel or assets.[4] In CUAS operations, defense-in-depth should mean using fixed, mobile and OTM systems to create a resilient network, addressing threats at each stage: detection, identification, tracking and engagement. The following hypothetical scenarios illustrate how each configuration could fit in a battle.

1. As the division's main effort pushed deep into enemy territory, a key forward operating base was established in a strategic valley, serving as a hub for sustained operations. To protect the base from enemy drone reconnaissance, a team of specialists installed a robust CUAS system, tapping into the base's high-power grid to fuel its advanced sensors and effectors. The system's large antenna and radar arrays were mounted on a permanent foundation, allowing for unobstructed views of the surrounding airspace. As enemy forces launched a series of probing attacks, the CUAS system's long-range detection capabilities picked up multiple drones, tracking their movements and engaging them with precision-guided munitions. The system's high-volume power supply enabled it to sustain continuous operations, providing uninterrupted protection to the troops as they flowed through the valley, securing key terrain and disrupting enemy supply lines. With the airspace secured, the base remained a stable anchor for the ongoing campaign, allowing friendly forces to project power deep into enemy territory.

Fixed configurations anchor the defense network, providing long-range surveillance and engagement capabilities against high-altitude threats or named areas of interest. Positioned at key strategic points, fixed systems offer early warning and ample reaction time, allowing commanders to assess and deploy effective responses. Fixed systems sometimes form the first line of detection and defeat for larger threats beyond Group 3 UAS, such as fixed-wing aircraft. Ultimately, early warning and engagement enable fixed systems to increase the protected unit's survivability.

2. As the infantry battalion rapidly repositioned to outflank the enemy, their mobile low, slow, small unmanned aerial vehicle integrated defeat system (MLIDS) was halted in place, its advanced sensors and interceptors detecting a surge in enemy drone activity. However, the commander recognized that the current position was no longer optimal, and that repositioning the MLIDS to a new vantage point would be crucial to maintaining protection over the troops. Although moving the system would temporarily leave the battalion vulnerable to drone attacks, the commander made the pivotal decision to reposition the MLIDS, weighing the risks against the potential benefits of gaining a more advantageous defensive posture. As the MLIDS was quickly relocated and set up in its new position, its sensors and interceptors reestablished a protective umbrella over the troops, engaging enemy drones and safeguarding the infantry's exposed flanks. The commander's understanding of the environment and the current threat had enabled a timely and effective repositioning of the MLIDS, proving decisive in the battle.

Mobile configurations are adaptable and set up rapidly, while maneuverability isn't essential for their purpose. They are placed in the vicinity of these assets to provide early warning and protection for rapid response for a short duration. These configurations fill the gap between fixed and OTM defenses by providing a crucial intermediate layer of detection and engagement.

3. As a platoon in the multifunctional reconnaissance company conducted reconnaissance through the dense urban terrain, their OTM CUAS system alerted them to the presence of enemy drones, through its real-time threat detection and warning capabilities. The squad's alpha team leader, equipped with the OTM system, quickly relayed the threat information to the rest of the platoon, allowing them to take cover and prepare for potential attack. Meanwhile, the platoon's vehicle-mounted OTM system, equipped with precision-guided

munitions, moved in tandem with the unit, providing an additional layer of protection and engagement capability. As they moved farther, the platoon suddenly received contact from enemy small arms fire, and the OTM systems sprang into action, detecting and engaging enemy drones that were attempting to provide overwatch for the enemy forces. The vehicle-mounted OTM system rapidly engaged the drones, neutralizing the threat and allowing the platoon to focus on returning fire and maneuvering against the enemy. With the OTM systems providing real-time protection, the platoon was able to maintain their freedom of maneuver, quickly repositioning and flanking the enemy forces to gain a decisive advantage. The platoon's ability to move and operate without being slowed down allowed them to dictate the pace of the battle, ultimately breaking through the enemy's defenses and achieving their reconnaissance objectives.

OTM configurations create the frontline layer, ensuring flexible protection of maneuver units that require rapid, real-time engagement and detection capabilities for high-risk fluid operations. These systems can gather and share real-time sensor data with other systems, enhancing situational awareness and enabling more effective threat detection and engagement. As a result, OTM systems are particularly well-suited for operating in areas where forces are transitioning between fixed and mobile positions, or operating near the FLOT, where the likelihood of encountering low-flying or small UAS threats is higher. This is critical for maintaining a well-informed common operating picture that will inform commanders' decisionmaking through a shared understanding of the operational environment, protecting their forces and assets.

Survivability is at the heart of all CUAS detection, early warning and engagement operations. The categories of deployment capabilities have varied strengths to improve unit survivability by contributing unique roles within a multilayered defense-in-depth network. Multirange detection or defeat layers ensure threats are addressed from initial detection to close-in defeat, strengthening overall battlefield protection. By integrating fixed, mobile and OTM CUAS configurations with other passive air defense measures, such as concealment, dispersion and deception, commanders can significantly enhance the survivability of their units. A comprehensive approach to survivability considers not only the ability to detect and engage UAS threats, but also the ability to prevent or mitigate the effects of an attack. Ultimately, the effective employment of CUAS systems as part of a larger survivability strategy enables units to maintain their operational tempo, despite the presence of UAS threats, and to accomplish their missions with confidence and reassurance.

Bolstering the Layers: Enhancing Command and Control Integration

Effective CUAS operations require seamless integration into the Army's command and control (C2) network of the future. This C2 framework aims to consolidate data, communication and decisionmaking processes. An integrated C2 network enables real-time sharing of detection and tracking information across fixed, mobile and OTM systems. This creates a unified operational picture allowing commanders to make informed, rapid decisions using systems interoperable across tactical networks.

Integration with the Army's future C2 allows efficient threat prioritization, adaptive resource allocation and precise defensive responses. Future C2 networks improve the speed and accuracy of engagements by centralizing data from each defense layer, thus maximizing the effectiveness of all CUAS assets in the field.

Future System Deployment: Countermeasures for Emerging Threats

New challenges like UAS swarms, autonomous UAS and cyber vulnerabilities in unmanned aerial vehicle (UAV) networks necessitate capability innovations beyond the distinction between fixed, mobile and OTM configurations. Modular CUAS systems, swarm-specific defense measures and AI system integration are three potential capability avenues to anticipate and protect against advancing threats.

- **Modular configurations**: Platforms with interchangeable hardware, such as sensors and kinetic/non-kinetic countermeasures that would allow units to tailor CUAS systems based on mission needs and probable threats on the battlefield. These systems could integrate detection, engagement and jamming capabilities, enabling them to cover multiple functions with a minimal amount of equipment. Modular systems may be set up to combine different configuration capabilities as well. For example, you may be able to use your electronic warfare (EW) to detect and defeat OTM, but not your kinetic weapons.
- **Swarm defense section**: Specially trained counter-swarm sections with multiple teams utilizing modular CUAS systems, where a swarm is defined as enough UAS coordinated in a group to overwhelm conventional defense measures. Directed energy systems are well-suited for this unique threat, as they emit highly focused energy to physically degrade or destroy targets. Additionally, systems capable of disrupting or disabling UAS sensors, including directed energy, EW and other non-kinetic countermeasures, are particularly effective against swarm threats, because they can effectively "blind" individual UAS, disrupting their ability to coordinate and navigate. They provide precise, quick engagements ideal for multiple fast-moving UAS threats. Each team would integrate into fixed, mobile or OTM meshed defenses to detect and counter-swarm threats. The anticipated or immediate threat would determine the appropriate counter-swarm weapon system configuration and deployment method.
- **Automated and AI-driven CUAS**: Systems capable of autonomous detection, tracking and engagement could minimize human exposure and oversight while providing adaptive responses to evolving threats.[5] Leveraging AI-driven predictive analytics, future CUAS could anticipate UAS threats based on environmental factors, adversary patterns and real-time battlefield data. Predictive capabilities may enable systems to track threats before they are launched, providing units preemptive countermeasure courses of action (COAs). Additionally, indications from passive sensors could cue AI software to activate active radars and create a more definitive track of the threat. This would reduce the electromagnetic spectrum (EMS) signature time emanating from the active radars.

Conclusion

Studying how near-peer adversaries, such as China and Russia, utilize UAS and countermeasures offers valuable data to help the United States anticipate future requirements. This allows preparation for potential future threats, including drone swarms, autonomous UAVs and the need for cyber-resilient CUAS systems, ensuring Army units remain ready in an evolving battlefield.

Understanding the distinctions between fixed, mobile and OTM CUAS capabilities is essential to avoid operational inefficiencies. Leaders and planners in the Army must be well-versed in each system's legitimate capabilities and limitations to make informed operational decisions. This is critical because the modern battlefield requires comprehensive defenses to enable freedom to maneuver.

A to-and-fro ensued over the terrain model as leaders and staff refined plans for Operation Overlord. Allied plans leveraged their capabilities and exploited Axis vulnerabilities to properly analyze the most likely and deadly COAs, giving the Allies an upper hand. Leaders who discern the subtle variation in terminology appreciate the consequential difference in the capabilities and limitations of fixed, mobile and OTM systems. Understanding and applying the distinctions of these categories will impact the efficacy of CUAS systems in future conflicts.

Notes

[1] John Keegan, "Normandy Invasion," in *Encyclopedia Britannica*, last updated 19 April 2025, www.britannica.com/event/Normandy-Invasion.

[2] William H. Baumer and John F. Guilmartin, "Fortification," in *Encyclopedia Britannica*, last updated 29 May 2025, https://www.britannica.com/technology/fortification.

[3] Andrea Notter, "Soldiers Test New Army System to Increase Command Post Mobility," U.S. Army, 28 July 2021, https://www.army.mil/article/248893/soldiers_test_new_army_system_to_increase_command_post_mobility.

[4] Department of the Army, Field Manual (FM) 3-01, *Army Air and Missile Defense* (Washington, DC: US Government Printing Office, December 2020).

[5] Adib Bin Rashid, Ashfakul Karim Kausik, Ahamed Al Hassan Sunny and Mehedy Hassan Bappy, "Artificial Intelligence in the Military: An Overview of the Capabilities, Applications, and Challenges," *International Journal of Intelligent Systems* 4 (2023): 1–31, https://doi.org/10.1155/2023/8676366.

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