



An AN/TPQ-53 radar is staged for the 130th Field Artillery Brigade's premobilization training 15 November 2020 at the Regional Training Center in Salina, Kansas. (Photo by Capt. Patrick Montandon, U.S. Army)

# C-UAS Operations

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**T**he emergence of unmanned aircraft system (UAS) threats warrants the need for the U.S. Armed Forces to continue its innovation across the human, procedural, and technical spectrums of operations. Shortcomings in our organic detect-and-defeat systems, along with our current force structure, leave our formations vulnerable to a dedicated UAS attack in both counterinsurgency and large-scale combat operation (LSCO) environments. The fielding of the

Q-53 Multi-Mission Radar (MMR) is a prime example of how multiple warfighting functions (WfF) have attempted to upgrade existing capabilities to develop a technical solution to counter existing and emerging threats.<sup>1</sup> Critical to any fielded or upgraded emerging technology is ensuring that the systems are digitally compatible with existing warfighting systems, backward compatible within its own technical architecture, or a pathway forward to mitigate compatibility shortfalls.<sup>2</sup>

These are concurrent interests and requirements to facilitate integration into the warfighters' capabilities to provide commanders with the ability to preserve combat power and achieve mission accomplishment. The following is intended to serve as a brief summary of counter-UAS (C-UAS) operations lessons learned from 2nd Brigade Combat Team, 10th Mountain Division's U.S. Central Command (USCENTCOM) deployment from July 2023 to April 2024.

In the near and long term, the U.S. Armed Forces will continue to be challenged to innovate, evolve, adapt, and develop rapid capabilities to counter developing enemy capabilities. However, gaps in knowledge and training are still prevalent today. It is crucial that U.S. forces, especially the air defense community, help close those gaps to successfully defend against the one-way UAS threat during LSCO. Rapidly developing, fielding, and maintaining technology for U.S. forces necessitates continued reliance on civilian and contractor support on the battlefield. Developing enduring and realistic training scenarios that incorporate situations wherein joint forces are challenged to defeat these emerging enemy threats will serve as the most viable way to enable a continued understanding of the emerging capabilities and the emerging threats. The realistic integration of these threats during LSCO-focused training exercises will increase force preservation on the battlefield.

## Assessing the Threat

Throughout the Global War on Terrorism, from Afghanistan to Iraq, we have continued to observe our enemies' evolving use of improvised explosive devices—adapting their tactics, techniques, and procedures to continue their efforts to inflict harm and accomplish their tactical objectives. U.S. forces must continue to draw on history and recent battlefield events to better understand the operational environment and overcome shortfalls in the military's ability to counter and adapt to evolving enemy activity. In their improved utilization of UAS, our enemies employ low-cost capabilities to conduct reconnaissance, surveillance, and kinetic attacks against friendly forces.<sup>3</sup> Enemy forces employ improvised UAS utilizing commercial off-the-shelf technology from distance. In utilizing these systems, they have an advantage with respect to their freedom of maneuver and axes of attack.

The employment of low, slow UAS threats has emerged to expose a capability vulnerability in U.S. air detection systems—historically designed to detect high-flying enemy fixed- and rotary-wing aircraft—necessitating the need to upgrade existing systems and develop new systems to counter this threat. U.S. forces will continue to be challenged in detecting low-flying threats from static positions and while mobile, especially when surrounded by line-of-sight obstructions.

## A Journey to Improved Layered Counter-UAS Capabilities

2nd Brigade Combat Team, 10th Mountain Division (Light Infantry), deployed to the Middle East in support of Operation Inherent Resolve in the summer of 2023. During the unit's predeployment training, a stark dichotomy was evident between the U.S. Army Forces Command-mandated training progression and the real-world requirements that would be necessary to meet prior to the USCENTCOM deployment. Combat training centers such as the Joint Readiness Training Center are focused on LSCO-based scenarios that entail attack and seize, defense in depth, and non-combatant evacuation operations, and while important for the next major conflict, the training did not fully prepare the brigade for a combat deployment to the Middle East in which it would be primarily conducting force protection operations.

Upon the brigade's return from the Joint Readiness Training Center, its senior leaders and staff officers conducted a predeployment site survey in Iraq and Syria to prepare for the brigade's deployment in support of Operation

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A mobile-low, slow, small, unmanned aircraft integrated defeat system engages a target on 4 March 2024 during Green Sands "CONUS" predeployment training at McGregor Range Complex, New Mexico. Crews from the 44th Infantry Brigade Combat Team Base Defense Operations Center observed the live-fire exercise to instill confidence in kinetic systems capable of shooting down one-way unmanned aircraft. Green Sands was held in two parts: the first part, Green Sands "CONUS," built the foundation of base defense operations, and the second part, Green Sands "Heavy," was a final rehearsal held subsequently overseas. (Photo by Sgt. Raquel Birk, U.S. Army)

Inherent Resolve. It became readily apparent during the site survey that counter-UAS (C-UAS) and force protection were paramount to the mission's success, and 2nd Brigade had to immediately shift its training objectives to align with the threat present in the theater it was about to enter. One such training objective was proficiency in base defense operation center (BDOC) tactics, techniques, and procedures that heavily focused on force protection and C-UAS battle drills. These operations estranged the brigade from its original training objectives that are typical for fires and maneuver WfFs; training for 11B (infantrymen), 13F (fire support specialists), and 19D (cavalry scouts) military occupational specialties (MOS) became focused on tactics and training originally tailored for air defense artillery.

Operation Inherent Resolve, during 2023 and 2024, foreshadows enemy capabilities that will be employed against coalition forces during future conflicts in large-scale combat. While the proliferation of weaponized UAS technology was made known through recent conflicts across the world including the Nagorno-Karabakh War and the recent Russo-Ukrainian War, the Air

Defense Artillery branch was not able to adequately maintain its pace to counter these threats in preparation for the next conflict. While extensive modernization efforts and force structure changes have been underway—such as the creation of Maneuver-Short Range Air Defense battalions and the rapid fielding of C-UAS technologies such as Land-Based Phalanx Weapon Systems to combatant commands—success of the operation now rested upon the 11-, 13- and 19-series MOSs. The solution for the brigade to meet this demand was through mission readiness exercises that helped train infantry, cavalry, and artillerymen to conduct C-UAS battle drills in simulated environments. Concurrent with these efforts, the fielding of upgraded sensors such as the Q-53 MMR aided in developing the brigade's organic capabilities to meet the UAS threat in the USCENTCOM area of responsibility.

The usage of existing organic counterfire sensors such as the Q-50 and Q-53 radars coupled with tried-and-true air defense artillery sensors such as the Q-64 Sentinel Radar, typically seen at the division level, introduced an organic capability at the brigade

level to provide early detection and warning of UAS threats. Additionally, rapidly fielded assets such as the Fixed Site Low, Slow, Small C-UAS Integrated Defeat System (FS-LIDS) and the Palletized High-Energy Laser capitalize on the current fielded sensors of the brigade. Such an example would be the Q-50MMR,

to provide freedom of maneuver and redundancy in sensor coverage.

The FAADC2, facilitated by the Joint Data Network, currently provides the best solution to share a near-real-time common operating picture down to the company level. It allows for the combination of all field-



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which is a relative of the FS-LIDS family of systems that rely on the sensor's active search capabilities to detect smaller threats.

Furthermore, the Forward Area Air Defense Command and Control (FAADC2)—originally a brigade-echelon piece of equipment for air defense, airspace management cells—are now proliferated down to the company level to fuse these sensors under the “single pane of glass.” The “single pane of glass” is shared through the Joint Data Network, which allows all echelons using a FAADC2 a near-real-time common operating picture. This enables all units, including task forces, adjacent units, and coalition partners, to see and react to UAS threats.

These examples of combining existing, program-of-record equipment to rapidly fielded systems demonstrate the existing ability for multiple WfFs to combine efforts toward a common goal. The Q-53, known commonly as a weapon-locating radar, is now augmented with interrogator hardware and improved software and serves as a force protection asset with its Identification, Friend or Foe capability, and its ability to detect aerial threats. This newly upgraded system provides potential to expand the brigade's aperture against UAS threats in a counterinsurgency or a LSCO environment by providing the brigade its own organic air defense capabilities. As previously mentioned, the Q-64 Sentinel was originally established as a division-level asset, commonly located in division artillery units. With the Q-53 MMR, brigades will not be constrained with the limited availability of the Sentinel radar in order

ed sensors and shooters to defend against UAS threats. However, the digital architecture required to use the FAADC2 to its full potential is currently constrained to the subject-matter expertise of a 140A (air defense systems integrator) warrant officer at the brigade and above levels, along with reliance on civilian contractors to properly maintain it and its systems. Additionally, the force-wide shortage of 14P (air and missile defense crewmember) and 14G (air defense battle management system operator) MOSs may yield a shortage of operators when dozens of FAADC2s may be used in an area of operations such as USCENTCOM. To alleviate this shortfall, cross-training must be provided for other MOSs based on operational requirements, or a newer system must be developed that is MOS-agnostic.

Training for C-UAS must also be provided for leaders beyond the BDOC battle captain and NCO. Base defense commanders need to understand the capabilities and limitations of the C-UAS systems their BDOC controls to make informed decisions. Understanding the concept of layered defense and the planning of such is essential for base defense commanders as they should be the ones response for the C-UAS defense design of their base. Key leaders such as battalion and brigade commanders must be familiar with echelons above brigade entities such as the 727th Expeditionary Air Control Squadron “Kingpin” tactical command and control unit at Shaw Air Force Base and what it provides for synchronizing command and control. Furthermore, building early relationships with contracted government leads will prove essential while deployed as it promotes a shared understanding of

the contractor-based logistics system that is currently sustaining much of the C-UAS capabilities in theater. In addition, these relationships enable a purview into existing systems improvements.

## Conclusion

U.S. forces need to imagine a battlefield wherein they conduct offensive operations against a near-peer threat while simultaneously defend against enemy UASs as well as rockets, artillery, and mortars. Forces will need to be arrayed and echeloned across the battlefield to execute both missions simultaneously. Joint forces need to leverage available resources across doctrine, organizations, training, materiel, leadership and education, personnel, facilities, and policy to develop capabilities, formations, and systems that can achieve battlefield success while executing these operations. Right now, 2nd Brigade Combat Team is at the spear tip of C-UAS knowledge from its experience in the Middle East. Having deployed in support of Operation Inherent Resolve in Iraq, Syria, and Kuwait, the brigade was faced with the demanding task of protecting the force against aerial threats that have been prevalent in the theater for years. The future challenge during its next fight will be the execution of offensive operations while simultaneously defending against enemy UAS.

The brigade at large is seeking innovative solutions not just for the unit or the mission, but for the Armed Forces overall in developing C-UAS solutions that can be incorporated on a future battlefield. Combined with the subject-matter expertise from multiple branches

and WfFs while soliciting unit feedback from multiple locations in the USCENTCOM area of responsibility, the brigade is proactively developing and requesting capabilities to stay a step ahead of its adversaries and defeat the incoming threats. The brigade sees the incredible, and much needed, potential of the rapidly fielded systems and capabilities in the theater.

Our success on the battlefield during future conflicts will depend on our ability to preserve combat power for our respective commanders at echelon. Our enemies' ability to disrupt friendly forces with UAS will continue to improve, as will their respective joint force capabilities, and they will continue to hone in on their ability to utilize sequential and swarm attacks to support their maneuver forces during LSCO. We need to continue to develop layered defense systems that both provide mobile and static protection in support of maneuver forces. While moving, we may be less vulnerable to one-way UAS attacks; however, our command and sustainment nodes will continue to require protection. In addition, we should assume our enemies will improve their capabilities against mobile formations. The efforts and combined observations of leaders and soldiers from 2nd Brigade Combat Team, 10th Mountain Division, will not only help to shape the C-UAS fight for tomorrow but will also help determine how we simultaneously echelon assets to conduct offensive and protection operations. In conjunction with the Air Defense branch, we will continue sharing lessons learned to support improving knowledge, training, and support gaps. ■

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## Notes

1. "Ground-Based Air Surveillance: AN/TPQ-53 Radar System," Lockheed Martin, accessed 7 June 2024, <https://www.lockheedmartin.com/en-us/products/tpq-53.html>.

2. Thomas A. Walsh and Alexandra L. Huber, "A Symphony of Capabilities: How the Joint Warfighting Concept Guides Service Force Design and Development," *Joint Force Quarterly* 111 (30 October 2023), <https://ndupress.ndu.edu/Media/News/>

[News-Article-View/Article/3568312/a-symphony-of-capabilities-how-the-joint-warfighting-concept-guides-service-for/](https://www.lockheedmartin.com/en-us/products/tpq-53.html).

3. Arthur Holland Michel, *Counter-Drone Systems*, 2nd ed. (Annandale-on-Hudson, NY: Center for the Study of the Drone at Bard College, December 2019), 8.