



Bradley track commander Sgt. Michael Trask of 1st Squadron, 7th Cavalry Regiment, 1st Cavalry Division, radios grid coordinates of opposing forces during Project Convergence on 2 November 2022 at Fort Irwin, California. The opposing forces were spotted using the Raven, a small, fixed-winged unmanned aircraft. (Photo by Sgt. Brayton Daniel, U.S. Army)

Convergence and Emission Control Tension and Reconciliation



Maj. Matthew Tetreau, U.S. Army

Continuous communication allows enemy forces to detect and target commanders, subordinates, and command posts. It should be avoided whenever possible.

—Field Manual 3-0, *Operations*

In October 2022, the U.S. Army published updated doctrine describing their new operational concept, Multidomain Operations. Field Manual (FM) 3-0, *Operations*, articulates the Army's



contributions to the joint force in a security environment characterized by the threat of great power competition with peer competitors. The new doctrine represents a major step toward optimizing Army warfighting for twenty-first-century conditions and addressing contemporary and emerging threats. Perhaps most crucially, the doctrine explicitly recognizes China's People's Liberation Army (PLA) as the pacing threat and speaks directly to how the U.S. Army approaches anticipated challenges posed by that adversary. Despite all the progress represented by the new FM 3-0, commanders and staffs will face a major challenge in implementation due to the discordant nature of two of the publication's key concepts.

One of the Army's most critical contributions to the joint force, and a driving force behind development of the new operating concept, is to defeat components of enemy antiaccess/area denial (A2/AD) systems. The concept for defeating A2/AD systems specifies a "multidomain" approach facilitated by *convergence*. Convergence, one of the four "tenets of operations," is the integration and

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Communication between ground units and satellite, aircraft, and other sensor systems increases access to information, but the corresponding increase in electromagnetic emissions increases the potential for discovery by signals intelligence platforms. (Illustration courtesy of Lockheed-Martin)

synchronization of capabilities from various domains and echelons at predetermined points in space and time to achieve decisive effects.¹ Implicit in this definition is the necessity of a commander and staff to bring these disparate capabilities to bear at the proper place and time through rigorous planning and coordination. Facilitating this centralized planning, distribution of mission orders, and coordination will require a robust communication architecture and, unless properly managed, a high volume of communication leading up to and at the point of convergence.

A second welcome addition to the new field manual is the necessity of electromagnetic emission control (EMCON). Long neglected in Army operations doctrine, EMCON recognizes the threat posed by unmanaged electromagnetic signatures and seeks to minimize or mitigate them.² Given the growing ubiquity and sophistication of signals intelligence (SIGINT) platforms and the increasing efficiency of kill chains of sensors and shooters, the service is right



(Illustration courtesy of the U.S. Army)

to address the threat. FM 3-0 describes the problem set and offers several measures to manage electromagnetic signatures. Some of these, such as operating radios at the lowest practicable power setting, are no doubt familiar to contemporary leaders. Others, such as using landlines or other means of communication with no electromagnetic signature, are practically unknown to a generation of warfighters who cut their teeth in a largely uncontested electromagnetic environment. The most effective means of evading SIGINT detection, simply not emitting during periods of acute threat, will require a fundamental reorientation of command as currently practiced.

Though convergence and EMCON are much-needed improvements to Army operations doctrine, a definite tension exists between them. How is a corps headquarters to communicate mission orders to several subordinate commands, liaise with adjacent and supporting units, coordinate space and cyber support from distant functional commands, and battle track a highly complex operation while minimizing electromagnetic signatures? As currently written and understood, convergence is untenable due to the vulnerability of the coordinating headquarters. Leaders may overcome the vulnerability inherent in achieving convergence against

a peer threat, however, by judiciously setting conditions for convergence, deliberately managing all emissions, and obfuscating electromagnetic signatures to deceive and complicate the enemy's targeting efforts.

The State of the Electromagnetic Environment

James Bruce's seminal 2006 article advocating an adaptation strategy for the U.S. intelligence community adroitly describes the nature of intelligence contests between adversaries. Bruce popularized the concept of an ongoing "cyclical struggle between the 'hidiers' and 'finders,'" and the constant state of adaptation necessary to remain hidden in the face of ever-evolving finders.³ The United States lost its "revolution in military affairs" monopoly as adversaries invested in the now-mature technologies that appeared novel when displayed to the world during the First Gulf War. As of 2021, China operated over two hundred intelligence, surveillance, and reconnaissance satellites, many outfitted with SIGINT sensors.⁴ Further, the PLA possess a fleet of ground, air, and sea surface SIGINT sensors capable of saturating areas of likely conflict, particularly in the South China Sea.⁵ The family of SIGINT assets



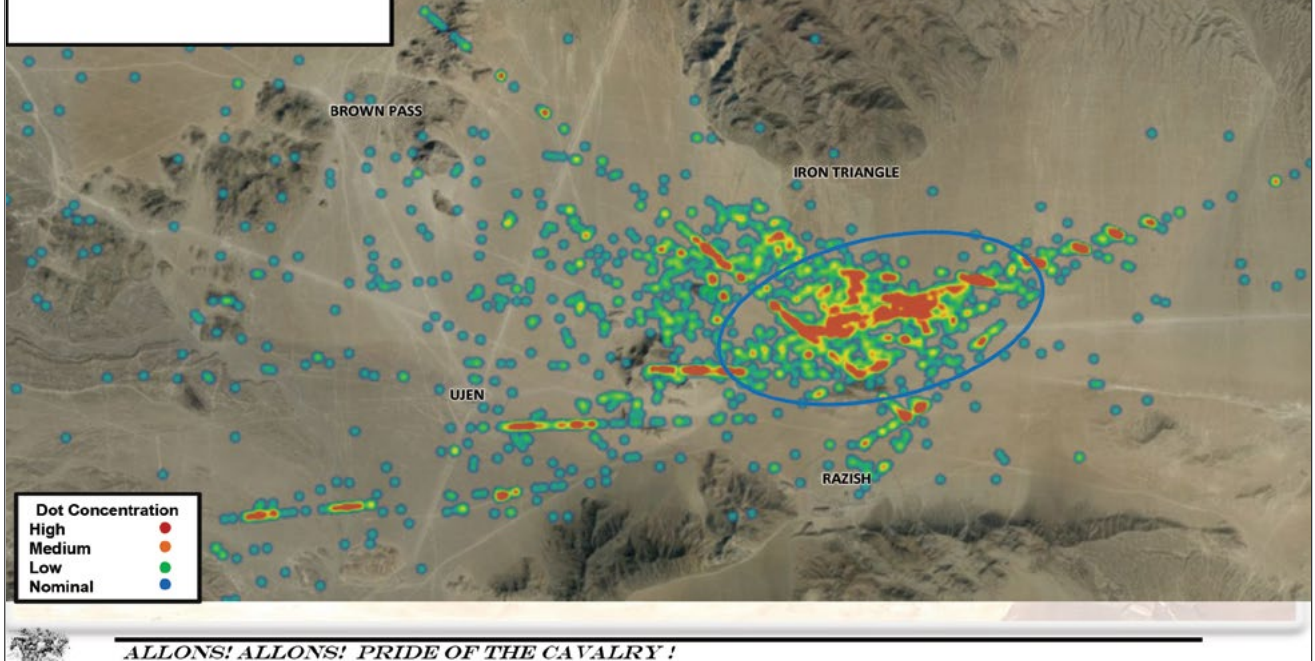
NESTS Common Operating Picture



TIME STAMP: D+5 1800 – D+6 0600
TOTAL TRACKS: 3582

Overall Assessment: NESTS IVO Y54 continued to collect on 3CR and enabler signatures in Hill 780 and through Pizza hut terrain targeting FM/JBCP.

Fire Missions: None



described above is a crucial component of the Chinese A2/AD system, potentially for targeting intervening forces but more often to find, fix, and/or track those forces and tip or cue other intelligence, surveillance, and reconnaissance or weapons platforms. Radio, satellite communication, and active radar emissions are potential catalysts for the enemy's kill chain, initiating systems and processes that could destroy the transmitter. In this environment, every electromagnetic emission by a hider is a signature available for detection and exploitation by a finder.

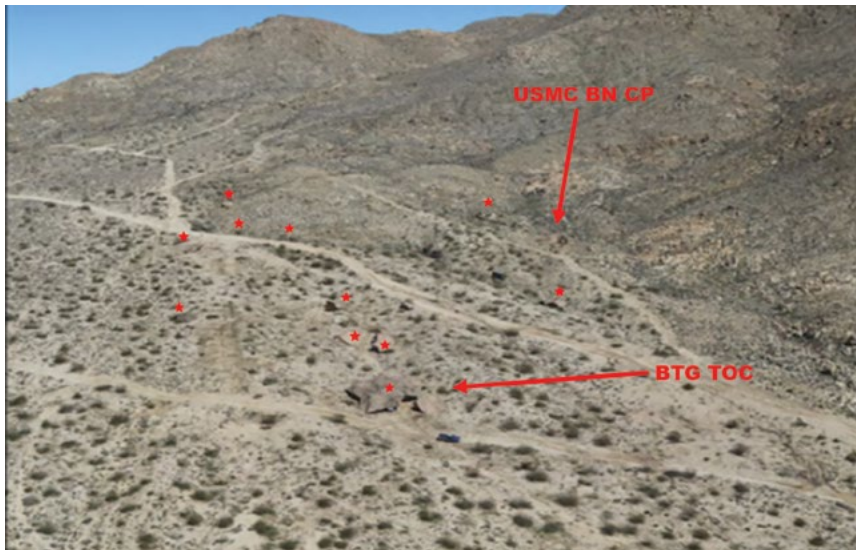
Those who have trained at the National Training Center are no doubt familiar with the electromagnetic signature heat maps of the rotational unit reviewed during the end of rotation after action review. Invariably, these maps indicate the location of brigade and battalion command posts as epicenters of electromagnetic emissions with such clarity that they require no sophisticated intelligence analysis to discern. The image above of the electromagnetic

A heatmap of Joint Battle Command Platform and FM transmissions observed from 3rd Cavalry Regiment during rotation 23-09 in August 2023. Data was collected from the Networked Electronic Support Threat Sensors system at the National Training Center, Fort Irwin, California. (Photo courtesy of Col. Timothy Ferguson, U.S. Army)

signature of a headquarters element at the National Training Center illustrates the conspicuousness of unmitigated emissions.⁶ Operating communications systems on high power, transmitting frequently and at length, and aggregating the headquarters in a static position all contribute to this condition. While communications are detectable even at the level of individual tactical radios, they are particularly problematic in command posts, which present large, dense, and static signatures. Tactical elements such as platoons or even individual vehicles present smaller electromagnetic signatures, tend to be highly mobile, and offer a lower payoff for adversaries seeking to maximize the effects of finite resources.



Experimenting with dispersion at the NTC. The photo above demonstrates the effectiveness of visual obfuscation by dispersed command-and-control (C2) elements under camouflage nets at the National Training Center, Fort Irwin, California, circa 2019. An opposing force brigade tactical group with an attached U.S. Marine Corps regimental tactical operational center and other C2 elements are identified in red in the same photo below. (Photos courtesy of the National Training Center)



Sister Services

The Army should study the practices of the sister services to inform the optimization of multidomain operations in a contested electromagnetic environment. The maritime services have a robust tradition of managing electromagnetic signatures to evade detection. Against the blank backdrop of the open ocean, even relatively limited signatures are conspicuous, requiring careful management of all emissions. Couple that with the longstanding SIGINT cat-and-mouse

game between the U.S. and Soviet navies during the Cold War, and the U.S. Navy possessing an impressive body of knowledge when it comes to operating dispersed formations at EMCON postures.⁷ EMCON, “the selective and controlled use of ... emitters to optimize command and control capabilities while minimizing ... detection by enemy sensors,” is central to survivability for all of the services when facing a contemporary peer adversary.⁸ Predictably, the Navy allowed this knowledge to atrophy during the post-Cold War conflicts in which enemies presented no significant SIGINT threat. With the adoption of their new operating concept, Distributed Maritime Operations, the Navy is returning to a tradition of electromagnetic signature management to adapt to the threats posed by the PLA and others.

The 2020 *Tri-Service Maritime Strategy* (formally known as *Advantage at Sea: Prevailing with Integrated All-Domain Naval Power*) defines distributed maritime operations as “leverage[ing] the principles of distribution, integration, and maneuver to mass overwhelming combat power and effects at the time and place of our choosing.”⁹ The document describes how the concept relies on “low probability of intercept and detection networks” for the purpose of “complicating the ene-

my’s own scouting efforts.”¹⁰ Managing electromagnetic signatures and evading detection are at the heart of the Navy’s operating concept and enable maneuver, surprise, and massing effects and combat power from all domains. Further, the Navy’s tradition of incorporating EMCON into their doctrine, plans, and operations provides a common lexicon and intellectual foundation for operationalizing the concepts.

Wayne Hughes’s 1986 book *Fleet Tactics: Theory and Practice* is a classic of naval literature and is still

widely read by naval officers and sea power enthusiasts. The work features a vignette that succinctly illustrates the degree to which the maritime services have analyzed the challenge of evading SIGINT detection and incorporated the findings into standard procedures.¹¹ The anecdote describes how a surface action group approaching a land-based target with powerful radars manages their electromagnetic signatures to approach undetected and strike the target. Much like an Army headquarters achieving convergence, the group commander must bring capabilities from multiple domains, both internal and external to their formation, to bear at the appropriate time and place to achieve the desired effect. By calculating the range of weapons and targeting systems, the detection range of the radars, and the time required for the adversary to mount a strike against the group, the author illustrates the optimal conditions for the group to transition from a state of minimum emissions (EMCON A) to full use of all sensors and communications (EMCON C).

If we make allowances for fundamental differences between naval and ground combat, we can glean several applicable lessons from this vignette. First, the naval formation set conditions before emitting freely. By degrading enemy fires beyond the range of over-the-horizon radars, the force altered the balance of risk to enable maneuver. Second, the blue force deliberately managed all emissions in support of its scheme of maneuver. By closing the distance with the enemy at EMCON A, the force fired just within the outer effective range of enemy reconnaissance aircraft, then turned to EMCON C to take full advantage of defensive sensors and communications to coordinate the close fight, in this case with its carrier-based aircraft. Finally, the blue force used “radiating deception units,” or decoys, to obfuscate its signatures. Understanding that reconnaissance and fires capabilities are finite, any effort that complicates the finders’ targeting process and consumes time and resources is a benefit to the hider.

Recommendations

Solutions for achieving convergence in a contested and lethal electromagnetic environment fall into three categories: setting conditions, deliberate emissions management, and obfuscation. Just as they set conditions for a combined-arms breach through

suppression and obscuration, commanders must set conditions for achieving convergence to mitigate the risk to mission. In the case of convergence, conditions should be preestablished to trigger headquarters to operate at less restrictive EMCON levels to enable effective command and control. Units must tailor enemy-based conditions to individual operations but should include conditions related to the degradation of the adversary’s kill chain. These efforts should include some combination of suppression or neutralization of fires assets, jamming, destruction or deception of sensors, and/or disruption of fires networks through kinetic, electronic warfare, or cyber means.

Prudent management of the balance between command and control on the one hand and risk of detection on the other requires that all emissions are deliberate. In other words, commands minimize electromagnetic signatures until the need to emit surpasses the risk of detection, or they manage emissions to limit the risk of detection or attack. This degree of emissions discipline is largely unknown to the force but must become ingrained to survive the sensor-rich environments of contemporary battlefields. First, the Army should publish a dedicated, classified EMCON doctrine with guidance for the employment of individual systems based on the threat level. Further, they should publish unclassified guidance for subordinate commanders and staffs to develop unit-level EMCON standard operating procedures—a practice that the Marine Corps Intelligence Schools undertook years ago.¹² These first two measures will provide the force with the common lexicon necessary to ingrain EMCON into the operational culture. Next, units from battalion to corps should develop EMCON standard operating procedures based on their assigned equipment and mission set and incorporate those procedures into all collective training. Transitioning from one EMCON posture to another must become a battle drill such that the element can fluidly transition from all emitters “on” to “off” and vice versa. The use of communications windows, brevity codes, EMCON-informed communication (primary, alternate, contingency, and emergency, or PACE) plans, and similar practices must likewise become routine. Finally, low probability of intercept and low probability of detection communications must become the norm for transmissions between

echelons in a high SIGINT risk environment. Achieving more consistent low probability of intercept and low probability of detection communications requires investing in hardware and training to build capacity at tactical echelons. The service can enhance these efforts by restoring the capacity (both in hardware and expertise) to use wired communications, such as field telephones, to communicate securely over short distances.

Finally, the force must focus on making headquarters harder to detect and engage through obfuscation. As Lt. Gen. Milford Beagle, Brig. Gen. Jason Slider, and Lt. Col. Matthew Arrol explain in “The Graveyard of Command Posts,” dispersing a large command post across a series of mobile nodes creates multiple challenges for even sophisticated adversary kill chains.¹³ Importantly, even if detected, a small, mobile command node may be indistinguishable from other tactical formations. The concept ensures redundancy, so if the enemy targets and destroys a command node, surviving nodes can continue command and control of the fight. To further confuse enemy targeting efforts, formations of all sizes should take advantage of the electromagnetic “noise” afforded by the infrastructure in the area of operations. The heat map referenced above presents a less clear picture if superimposed on population centers, with all their attendant emissions, as opposed to a desert. The service should invest in ground-based decoys to complicate the target landscape and draw sensors and munitions away from manned systems. The new Terrestrial Layer System, currently in the Army’s acquisition pipeline, reportedly includes decoy capabilities as one feature of a sophisticated electronic warfare suite.¹⁴ The service should take these efforts a step further, investing in research and development for families of expendable emitting decoys to replicate the electromagnetic signatures of various systems and formations. Doctrine and training must likewise reflect the need to leverage electromagnetic

deception. Even if the adversary eventually identifies the decoy as such, it will likely cost them valuable manpower and resources to confirm.

Conclusion

The most effective way to avoid SIGINT detection is to minimize or eliminate electromagnetic emissions. The paragraphs above offer some general recommendations about how to improve emissions management practices and achieve convergence prudently. More important than material, doctrinal, or training solutions, the service must fully embrace the mission command approach to command and control. Two facts work against this optimization of the concept. First, commanders possess the technical means of practicing detailed command over subordinate elements. Second, the environment they have operated in for the entirety of their careers has not punished detailed command, and the bureaucracy has, in many cases, rewarded it. Habitual detailed command is as much a threat as enemy SIGINT sensors.

The Army’s operations and mission command doctrine has long supported the command approach necessary to survive and thrive given the threats envisioned in this article. As Army Doctrine Publication 6-0, *Mission Command: Command and Control of Army Forces*, states, “Mission orders and application of the mission command approach to command and control mitigates the need for continuous communication.”¹⁵ This article’s epigraph stresses the need to limit continuous communications specifically to avoid targeting. These statements are no longer aspirational but imperative. Achieving convergence and practicing prudent emissions management are not mutually exclusive but will challenge the force to adapt doctrinally, materially, and philosophically. Our success in adapting to the new reality of persistent SIGINT reconnaissance will prove critical to achieving convergence and optimizing the multidomain operations concept. ■

Notes

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